



Monitor and troubleshoot

StorageGRID

NetApp

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Monitor and troubleshoot

Monitor and troubleshoot: Overview

Use these instructions to monitor a StorageGRID system and to assess and resolve issues that might occur.

About these instructions

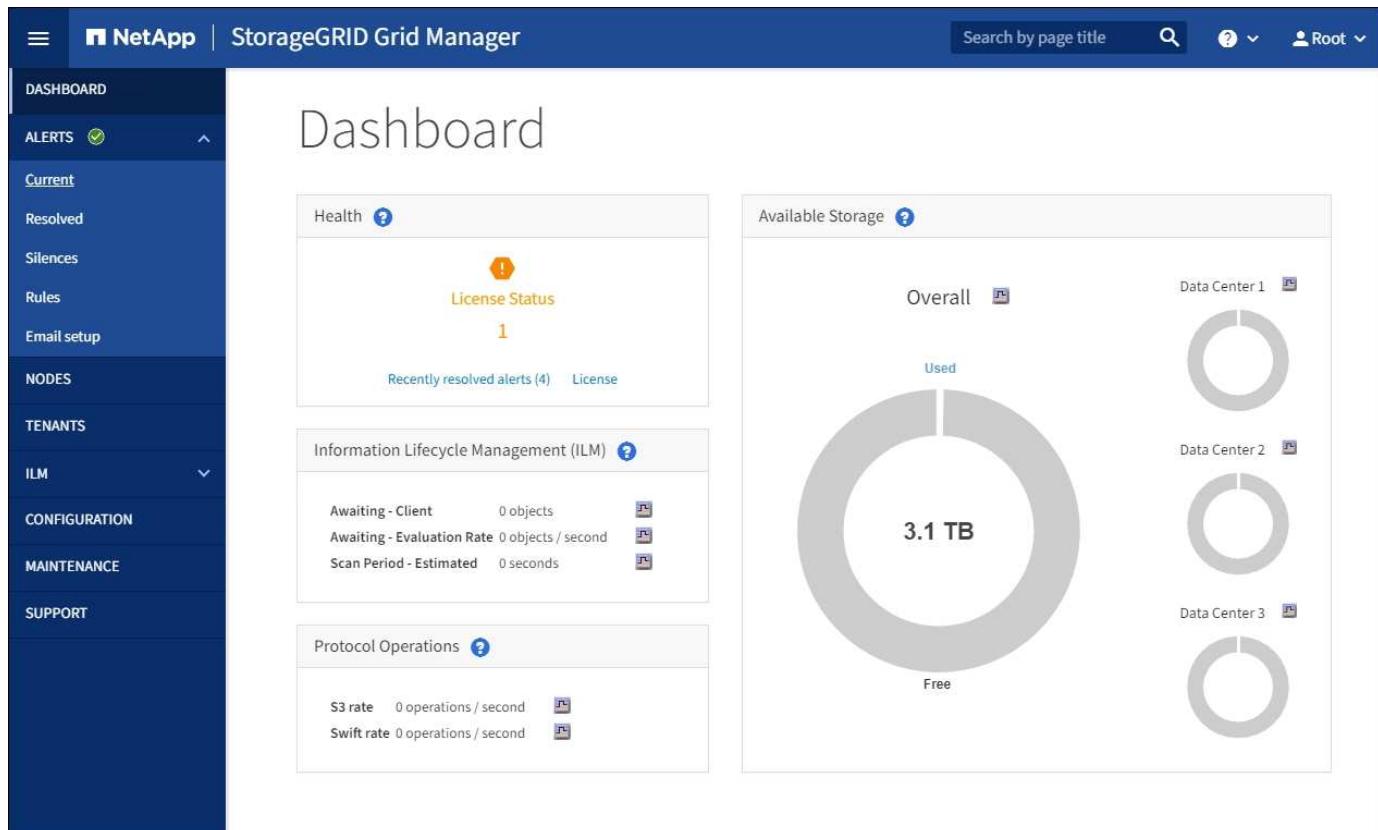
These instructions describe how to use the Grid Manager to monitor a StorageGRID system. You will learn which information you should monitor regularly, how to manage alerts and legacy alarms, how to use SNMP for monitoring, and how to obtain additional StorageGRID data, including metrics and diagnostics.

These instructions also describe how to troubleshoot a StorageGRID system and describe all system alerts, legacy alarms, and log files.

Use these instructions if you will be monitoring and supporting a StorageGRID system after it has been installed.

View the Dashboard

When you first sign in to the Grid Manager, you can use the Dashboard to monitor system activities at a glance. The Dashboard includes information about system health, usage metrics, and operational trends and charts.



Search field

The **Search** field in the header bar allows you to quickly navigate to a specific page or sidebar entry within the Grid Manager. For example, you can enter **key** to access the Key Management Server page.

Health panel

Description	View additional details	Learn more
Summarizes the system's health. A green checkmark means that there are no current alerts and all grid nodes are connected. Any other icon means that there is at least one current alert or disconnected node.	<p>You might see one or more of the following links:</p> <ul style="list-style-type: none">• Grid details: Appears if any nodes are disconnected (connection state Unknown or Administratively Down). Click the link, or click the blue or gray icon to determine which node or nodes are affected.• Current alerts: Appears if any alerts are currently active. Click the link, or click Critical, Major, or Minor to see the details on the ALERTS > Current page.• Recently resolved alerts: Appears if any alerts triggered in the past week are now resolved. Click the link to see the details on the ALERTS > Resolved page.• Legacy alarms: Appears if any alarms (legacy system) are currently active. Click the link to see the details on the SUPPORT > Alarms (Legacy) > Current alarms page.• License: Appears if there is an issue with the software license for this StorageGRID system. Click the link to see the details on the MAINTENANCE > System > License page.	<ul style="list-style-type: none">• Monitor node connection states• View current alerts• View resolved alerts• View legacy alarms• Administer StorageGRID

Available Storage panel

Description	View additional details	Learn more
<p>Displays the available and used storage capacity in the entire grid, not including archival media.</p> <p>The Overall chart presents grid-wide totals. If this is a multi-site grid, additional charts appear for each data center site.</p> <p>You can use this information to compare the used storage with the available storage. If you have a multi-site grid, you can determine which site is consuming more storage.</p>	<ul style="list-style-type: none"> To view the capacity, place your cursor over the chart's available and used capacity sections. To view capacity trends over a date range, click the chart icon  for the overall grid, or for a data center site. To see details, select NODES. Then, view the Storage tab for the entire grid, an entire site, or a single Storage Node. 	<ul style="list-style-type: none"> View the Storage tab Monitor storage capacity

Information Lifecycle Management (ILM) panel

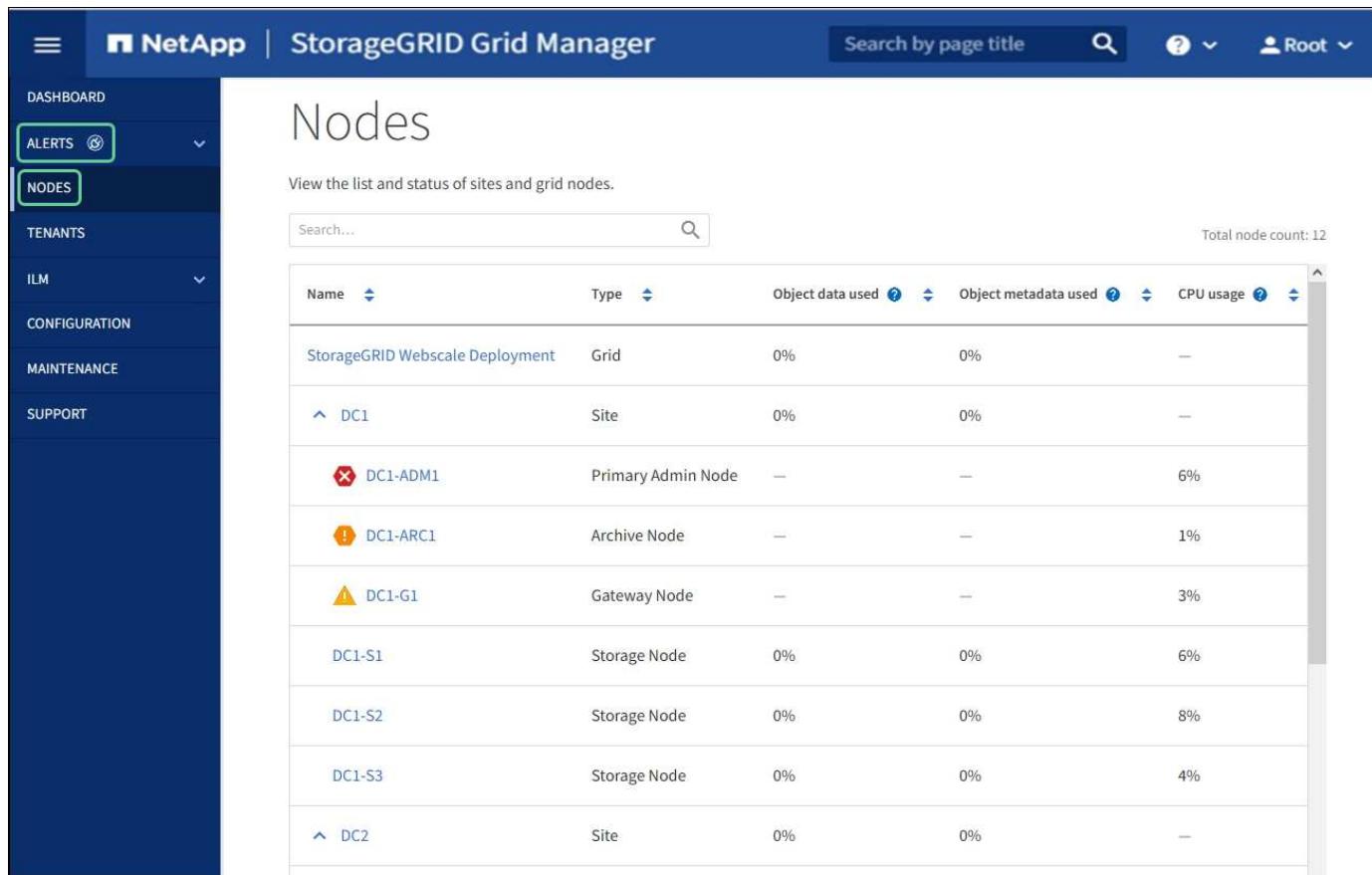
Description	View additional details	Learn more
<p>Displays current ILM operations and ILM queues for your system. You can use this information to monitor your system's workload.</p> <ul style="list-style-type: none"> Awaiting - Client: The total number of objects awaiting ILM evaluation from client operations (for example, ingest). Awaiting - Evaluation Rate: The current rate at which objects are evaluated against the ILM policy in the grid. Scan Period - Estimated: The estimated time to complete a full ILM scan of all objects. Note: A full scan does not guarantee that ILM has been applied to all objects. 	<ul style="list-style-type: none"> To see details, select NODES. Then, view the ILM tab for the entire grid, an entire site, or a single Storage Node. To see the existing ILM rules, select ILM > Rules. To see the existing ILM policies, select ILM > Policies. 	<ul style="list-style-type: none"> View the ILM tab Administer StorageGRID

Protocol Operations panel

Description	View additional details	Learn more
<p>Displays the number of protocol-specific operations (S3 and Swift) performed by your system.</p> <p>You can use this information to monitor your system's workloads and efficiencies. Protocol rates are averaged over the last two minutes.</p>	<ul style="list-style-type: none"> To see details, select NODES. Then, view the Objects tab for the entire grid, an entire site, or a single Storage Node. To view trends over a date range, click the chart icon  to the right of the S3 or Swift protocol rate. 	<ul style="list-style-type: none"> View the Objects tab Use S3 Use Swift

View the Nodes page

When you need more detailed information about your StorageGRID system than the Dashboard provides, you can use the Nodes page to view metrics for the entire grid, each site in the grid, and each node at a site.



Name	Type	Object data used	Object metadata used	CPU usage
StorageGRID Webscale Deployment	Grid	0%	0%	—
DC1	Site	0%	0%	—
DC1-ADM1	Primary Admin Node	—	—	6%
DC1-ARC1	Archive Node	—	—	1%
DC1-G1	Gateway Node	—	—	3%
DC1-S1	Storage Node	0%	0%	6%
DC1-S2	Storage Node	0%	0%	8%
DC1-S3	Storage Node	0%	0%	4%
DC2	Site	0%	0%	—

The Nodes table lists all the sites and nodes in your StorageGRID system. Summary information is displayed for each node. If a node has an active alert, an icon appears next to the node name. If the node is connected and has no active alerts, no icon is shown.

Connection state icons

- Not connected - Unknown**  : The node is not connected to the grid for an unknown reason. For

example, the network connection between nodes has been lost or the power is down. The **Unable to communicate with node** alert might also be triggered. Other alerts might be active as well. This situation requires immediate attention.



A node might appear as Unknown during managed shutdown operations. You can ignore the Unknown state in these cases.

- **Not connected - Administratively down** : The node is not connected to the grid for an expected reason. 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.

If a node is disconnected from the grid, it might have an underlying alert, but only the “Not connected” icon appears. To see the active alerts for a node, select the node.

Alert icons

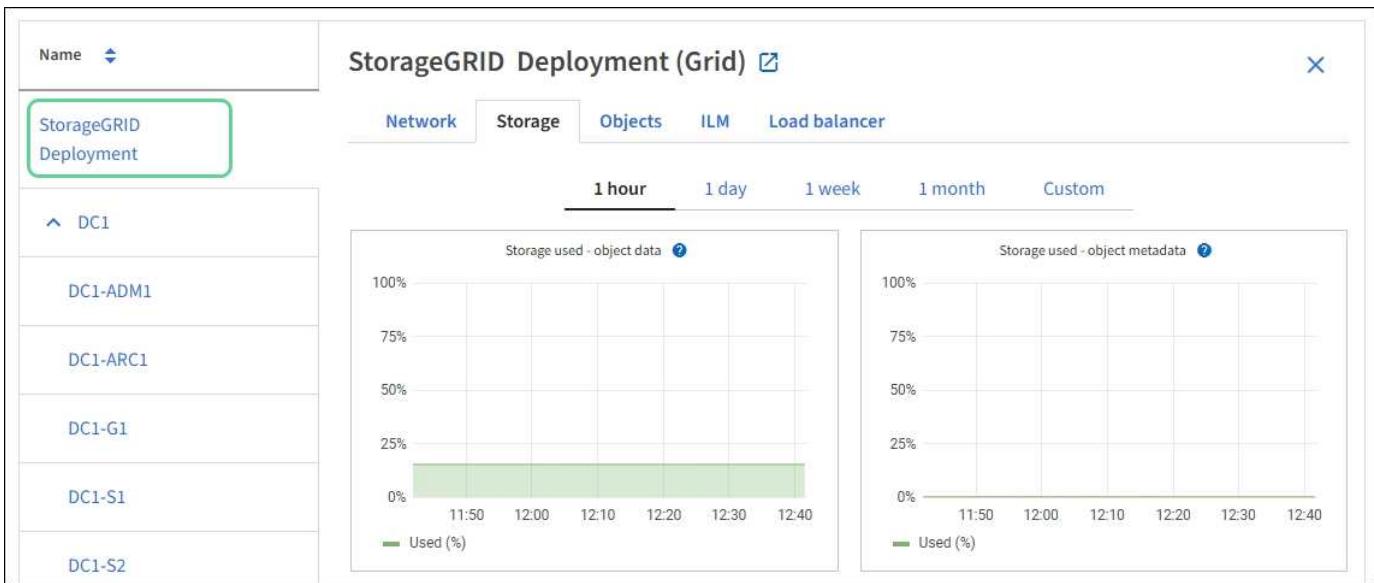
If there is an active alert for a node, one of the following icons appears next to the node name:

- **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.
- **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.
- **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 do not clear on their own to ensure they do not result in a more serious problem.

Viewing details for a system, site, or node

To view the available information, select the name of the grid, site, or node as follows:

- Select the grid name to see an aggregate summary of the statistics for your entire StorageGRID system.
- Select a specific data center site to see an aggregate summary of the statistics for all nodes at that site.
- Select a specific node to view detailed information for that node.



View the Overview tab

The Overview tab provides basic information about each node. It also shows any alerts currently affecting the node.

The Overview tab is shown for all nodes.

Node Information

The Node Information section of the Overview tab lists basic information about the grid node.

DC1-S2 (Storage Node)

- [Overview](#)
- [Hardware](#)
- [Network](#)
- [Storage](#)
- [Objects](#)

Node information [?](#)

Name:	DC1-S2
Type:	Storage Node
ID:	e12e3f95-da25-4c56-8ca1-ec796b3fdbd9
Connection state:	✓ Connected
Storage used:	Object data: <div style="width: 26%;">26%</div> i Object metadata: <div style="width: 0%;">0%</div> i
Software version:	11.6.0
IP addresses:	10.224.1.227 - eth0 (Grid Network)

[Show additional IP addresses ▾](#)

The overview information for a node includes the following:

- **Name**: The hostname assigned to the node and displayed in the Grid Manager.
- **Type**: The type of node — Admin Node, primary Admin Node, Storage Node, Gateway Node, or Archive Node.
- **ID**: The unique identifier for the node, which is also referred to as the UUID.
- **Connection state**: One of three states. The icon for the most severe state is shown.
 - **Unknown**  : The node is not connected to the grid for an unknown reason. For example, the network connection between nodes has been lost or the power is down. The **Unable to communicate with node** alert might also be triggered. Other alerts might be active as well. This situation requires immediate attention.



A node might appear as Unknown during managed shutdown operations. You can ignore the Unknown state in these cases.

- **Administratively down**  : The node is not connected to the grid for an expected reason. 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.
 - **Connected**  : The node is connected to the grid.
- **Storage used**: For Storage Nodes only.
 - **Object data**: The percentage of the total usable space for object data that has been used on the Storage Node.
 - **Object metadata**: The percentage of the total allowed space for object metadata that has been used on the Storage Node.
 - **Software version**: The version of StorageGRID that is installed on the node.
 - **HA groups**: For Admin Node and Gateway Nodes only. Shown if a network interface on the node is included in a high availability group and whether that interface is the Primary interface.
 - **IP addresses**: The node's IP addresses. Click **Show additional IP addresses** to view the node's IPv4 and IPv6 addresses and interface mappings.

Alerts

The Alerts section of the Overview tab lists any alerts currently affecting this node that have not been silenced. Click the alert name to view additional details and recommended actions.

Alerts				
Alert name	Severity	Time triggered	Current values	
Low installed node memory 	 Critical	11 hours ago 	Total RAM size: 8.37 GB	
The amount of installed memory on a node is low.				

Related information

[Monitor node connection states](#)

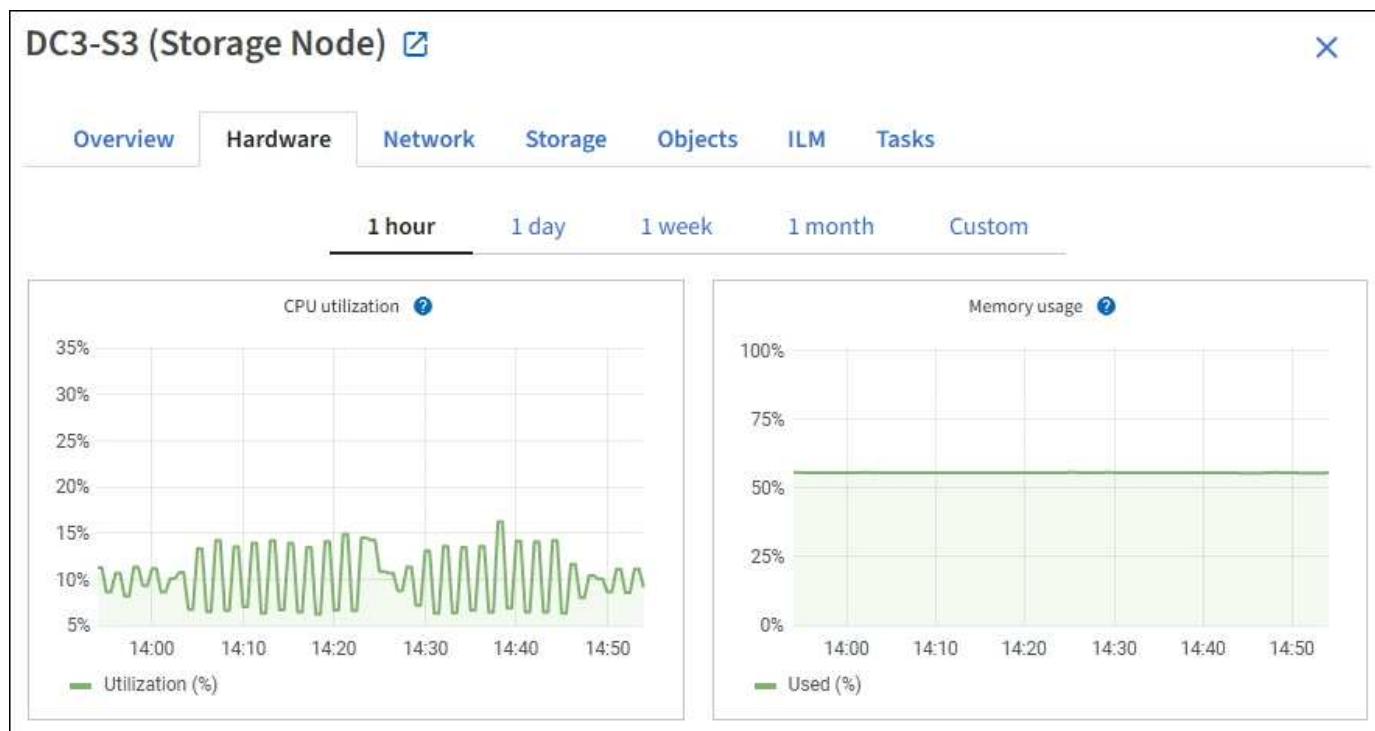
[View current alerts](#)

[View a specific alert](#)

View the Hardware tab

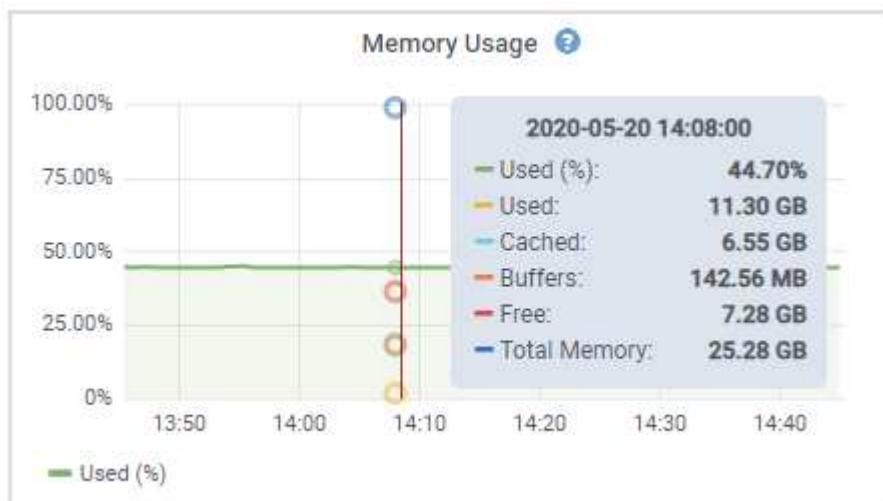
The Hardware tab displays CPU utilization and memory usage for each node, and additional hardware information about appliances.

The Hardware tab is shown for all nodes.



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.

To see details for CPU utilization and memory usage, hover your cursor over each graph.



If the node is an appliance node, this tab also includes a section with more information about the appliance hardware.

View information about appliance Storage Nodes

The Nodes page lists information about service health and all computational, disk device, and network resources for each appliance Storage Node. You can also see memory, storage hardware, controller firmware version, network resources, network interfaces, network addresses, and receive and transmit data.

Steps

1. From the Nodes page, select an appliance Storage Node.
2. Select **Overview**.

The Node information section of the Overview tab displays summary information for the node, such as the node's name, type, ID, and connection state. The list of IP addresses includes the name of the interface for each address, as follows:

- **eth**: The Grid Network, Admin Network, or Client Network.
- **hic**: One of the physical 10, 25, or 100 GbE ports on the appliance. These ports can be bonded together and connected to the StorageGRID Grid Network (eth0) and Client Network (eth2).
- **mtc**: One of the physical 1 GbE ports on the appliance. One or more mtc interfaces are bonded to form the StorageGRID Admin Network interface (eth1). You can leave other mtc interfaces available for temporary local connectivity for a technician in the data center.

DC2-SGA-010-096-106-021 (Storage Node)

X

Overview **Hardware** Network Storage Objects ILM Tasks

Node information

Name:	DC2-SGA-010-096-106-021
Type:	Storage Node
ID:	f0890e03-4c72-401f-ae92-245511a38e51
Connection state:	 Connected
Storage used:	Object data  7%  Object metadata  5% 
Software version:	11.6.0 (build 20210915.1941.afce2d9)
IP addresses:	10.96.106.21 - eth0 (Grid Network)

[Hide additional IP addresses](#) 

Interface 	IP address 
eth0 (Grid Network)	10.96.106.21
eth0 (Grid Network)	fe80::2a0:98ff:fe64:6582
hic2	10.96.106.21
hic4	10.96.106.21
mtc2	169.254.0.1

Alerts

Alert name 	Severity 	Time triggered 	Current values
ILM placement unachievable 	 Major	2 hours ago 	A placement instruction in an ILM rule cannot be achieved for certain objects.

The Alerts section of the Overview tab displays any active alerts for the node.

3. Select **Hardware** to see more information about the appliance.

- View the CPU Utilization and Memory graphs to determine the percentages of CPU and memory usage over time. 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.



- b. Scroll down to view the table of components for the appliance. This table contains information such as the model name of the appliance; controller names, serial numbers, and IP addresses; and the status of each component.



Some fields, such as Compute controller BMC IP and Compute hardware, appear only for appliances with that feature.

Components for the storage shelves, and expansion shelves if they are part of the installation, appear in a separate table below the appliance table.

StorageGRID Appliance

Appliance model:	SG5660
Storage controller name:	StorageGRID-SGA-Lab11
Storage controller A management IP:	10.224.2.192
Storage controller WWID:	600a098000a4a707000000005e8ed5fd
Storage appliance chassis serial number:	1142FG000135
Storage controller firmware version:	08.40.60.01
Storage hardware:	Nominal
Storage controller failed drive count:	0
Storage controller A:	Nominal
Storage controller power supply A:	Nominal
Storage controller power supply B:	Nominal
Storage data drive type:	NL-SAS HDD
Storage data drive size:	2.00 TB
Storage RAID mode:	RAID6
Storage connectivity:	Nominal
Overall power supply:	Nominal
Compute controller serial number:	SV54365519
Compute controller CPU temperature:	Nominal
Compute controller chassis temperature:	Nominal

Storage shelves

Shelf chassis serial number	Shelf ID	Shelf status	IOM status
SN SV13304553	0	Nominal	N/A

Field in the Appliance table	Description
Appliance model	The model number for this StorageGRID appliance shown in SANtricity software.
Storage controller name	The name for this StorageGRID appliance shown in SANtricity software.
Storage controller A management IP	IP address for management port 1 on storage controller A. You use this IP to access SANtricity software to troubleshoot storage issues.

Field in the Appliance table	Description
Storage controller B management IP	<p>IP address for management port 1 on storage controller B. You use this IP to access SANtricity software to troubleshoot storage issues.</p> <p>Some appliance models do not have a storage controller B.</p>
Storage controller WWID	The worldwide identifier of the storage controller shown in SANtricity software.
Storage appliance chassis serial number	The chassis serial number of the appliance.
Storage controller firmware version	The version of the firmware on the storage controller for this appliance.
Storage hardware	<p>The overall status of the storage controller hardware. If SANtricity System Manager reports a status of Needs Attention for the storage hardware, the StorageGRID system also reports this value.</p> <p>If the status is “needs attention,” first check the storage controller using SANtricity software. Then, ensure that no other alarms exist that apply to the compute controller.</p>
Storage controller failed drive count	The number of drives that are not optimal.
Storage controller A	The status of storage controller A.
Storage controller B	The status of storage controller B. Some appliance models do not have a storage controller B.
Storage controller power supply A	The status of power supply A for the storage controller.
Storage controller power supply B	The status of power supply B for the storage controller.
Storage data drive type	The type of drives in the appliance, such as HDD (hard disk drive) or SSD (solid state drive).
Storage data drive size	<p>The effective size of one data drive.</p> <p>Note: For nodes with expansion shelves, use the Data drive size for each shelf instead. Effective drive size might differ by shelf.</p>
Storage RAID mode	The RAID mode configured for the appliance.

Field in the Appliance table	Description
Storage connectivity	The storage connectivity state.
Overall power supply	The status of all power supplies for the appliance.
Compute controller BMC IP	<p>The IP address of the baseboard management controller (BMC) port in the compute controller. You use this IP to connect to the BMC interface to monitor and diagnose the appliance hardware.</p> <p>This field is not displayed for appliance models that do not contain a BMC.</p>
Compute controller serial number	The serial number of the compute controller.
Compute hardware	The status of the compute controller hardware. This field is not displayed for appliance models that do not have separate compute hardware and storage hardware.
Compute controller CPU temperature	The temperature status of the compute controller's CPU.
Compute controller chassis temperature	The temperature status of the compute controller.

Column in the Storage shelves table	Description
Shelf chassis serial number	The serial number for the storage shelf chassis.
Shelf ID	<p>The numeric identifier for the storage shelf.</p> <ul style="list-style-type: none"> • 99: Storage controller shelf • 0: First expansion shelf • 1: Second expansion shelf <p>Note: Expansion shelves apply to the SG6060 only.</p>
Shelf status	The overall status of the storage shelf.
IOM status	The status of the input/output modules (IOMs) in any expansion shelves. N/A if this is not an expansion shelf.
Power supply status	The overall status of the power supplies for the storage shelf.

Column in the Storage shelves table	Description
Drawer status	The status of the drawers in the storage shelf. N/A if the shelf does not contain drawers.
Fan status	The overall status of the cooling fans in the storage shelf.
Drive slots	The total number of drive slots in the storage shelf.
Data drives	The number of drives in the storage shelf that are used for data storage.
Data drive size	The effective size of one data drive in the storage shelf.
Cache drives	The number of drives in the storage shelf that are used as cache.
Cache drive size	The size of the smallest cache drive in the storage shelf. Normally, cache drives are all the same size.
Configuration status	The configuration status of the storage shelf.

- c. Confirm that all statuses are “Nominal.”

If a status is not “Nominal,” review any current alerts. You can also use SANtricity System Manager to learn more about some of these hardware values. See the instructions for installing and maintaining your appliance.

4. Select **Network** to view information for each network.

The Network Traffic graph provides a summary of overall network traffic.



- a. Review the Network Interfaces section.

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

Use the following table with the values in the **Speed** column in the Network Interfaces table to determine whether the 10/25-GbE network ports on the appliance were configured to use active/backup mode or LACP mode.



The values shown in the table assume all four links are used.

Link mode	Bond mode	Individual HIC link speed (hic1, hic2, hic3, hic4)	Expected Grid/Client Network speed (eth0,eth2)
Aggregate	LACP	25	100
Fixed	LACP	25	50
Fixed	Active/Backup	25	25
Aggregate	LACP	10	40
Fixed	LACP	10	20
Fixed	Active/Backup	10	10

See the installation and maintenance instructions for your appliance for more information about configuring the 10/25-GbE ports.

- Review the Network Communication section.

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 transmit metrics.

Network communication

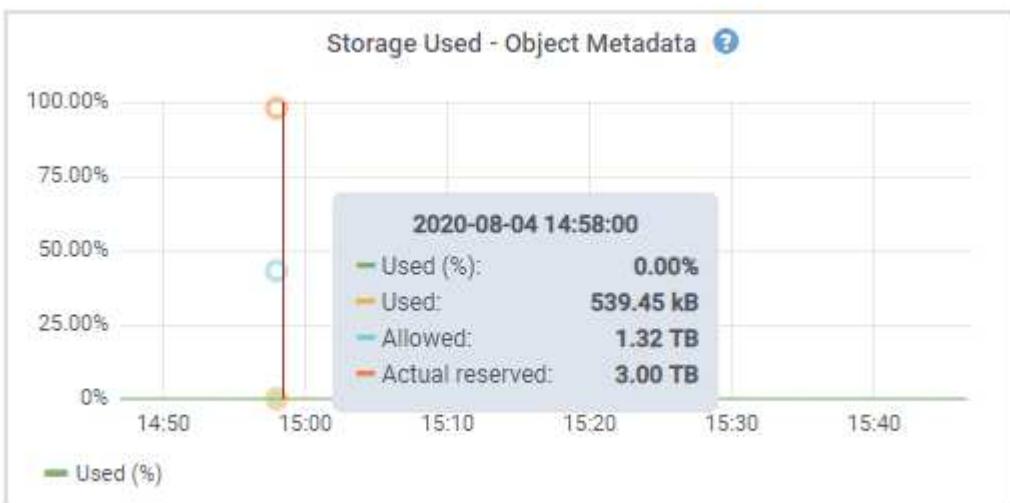
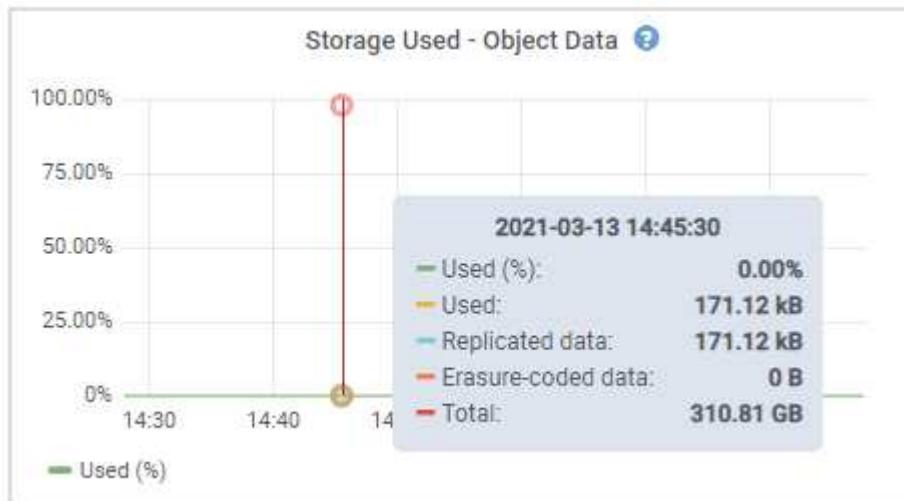
Receive

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

5. Select **Storage** to view graphs that show the percentages of storage used over time for object data and object metadata, as well as information about disk devices, volumes, and object stores.



- a. Scroll down to view the amounts of available storage for each volume and object store.

The Worldwide Name for each disk matches the volume world-wide identifier (WWID) that appears when you view standard volume properties in SANtricity software (the management software connected to the appliance's storage controller).

To help you interpret disk read and write statistics related to volume mount points, the first portion of the name shown in the **Name** column of the Disk Devices table (that is, *sdc*, *sdd*, *sde*, and so on) matches the value shown in the **Device** column of the Volumes table.

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

Related information

[SG6000 storage appliances](#)

[SG5700 storage appliances](#)

[SG5600 storage appliances](#)

View information about appliance Admin Nodes and Gateway Nodes

The Nodes page lists information about service health and all computational, disk device, and network resources for each services appliance that is used as an Admin Node or a Gateway Node. You can also see memory, storage hardware, network resources, network interfaces, network addresses, and receive and transmit data.

Steps

1. From the Nodes page, select an appliance Admin Node or an appliance Gateway Node.
2. Select **Overview**.

The Node information section of the Overview tab displays summary information for the node, such as the node's name, type, ID, and connection state. The list of IP addresses includes the name of the interface for each address, as follows:

- **adllb** and **adlli**: Shown if active/backup bonding is used for the Admin Network interface
- **eth**: The Grid Network, Admin Network, or Client Network.
- **hic**: One of the physical 10, 25, or 100 GbE ports on the appliance. These ports can be bonded together and connected to the StorageGRID Grid Network (eth0) and Client Network (eth2).
- **mtc**: One of the physical 1-GbE ports on the appliance. One or more mtc interfaces are bonded to form the Admin Network interface (eth1). You can leave other mtc interfaces available for temporary local connectivity for a technician in the data center.

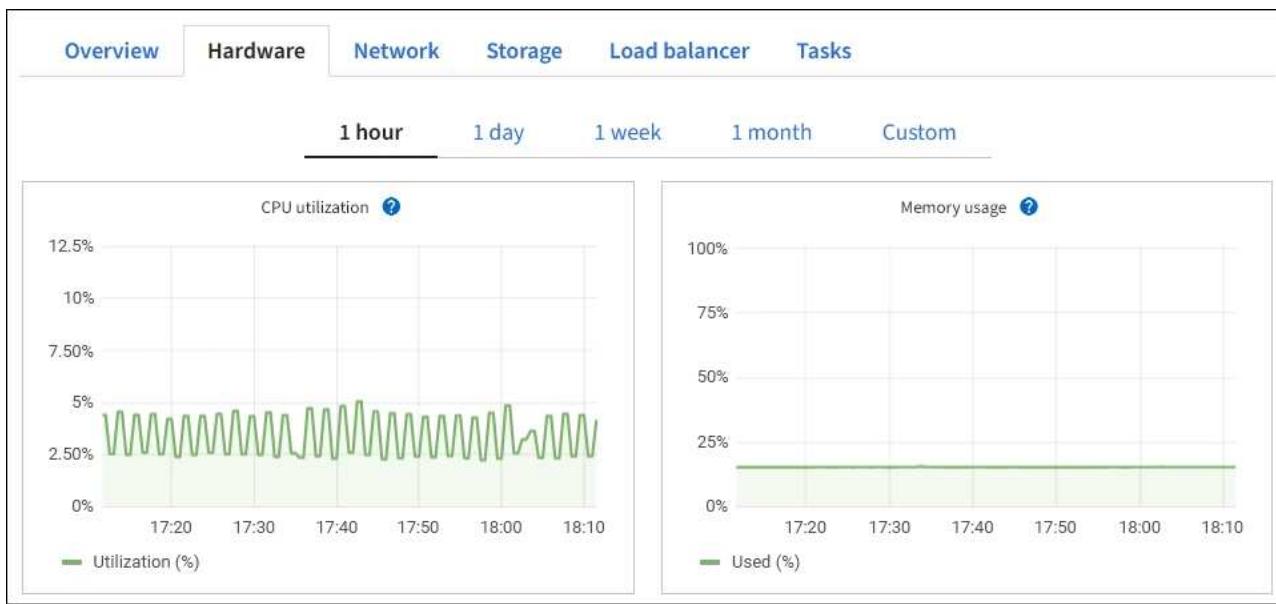
Node information

Interface	IP address
eth2 (Client Network)	47.47.7.241
eth2 (Client Network)	fd20:332:332:0:e42:a1ff:fe86:b5b0
eth2 (Client Network)	fe80::e42:a1ff:fe86:b5b0
hic1	47.47.7.241
hic2	47.47.7.241
hic3	47.47.7.241

The Alerts section of the Overview tab displays any active alerts for the node.

3. Select **Hardware** to see more information about the appliance.

- View the CPU Utilization and Memory graphs to determine the percentages of CPU and memory usage over time. 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.



- b. Scroll down to view the table of components for the appliance. This table contains information such as the model name, serial number, controller firmware version, and the status of each component.

StorageGRID Appliance	
Appliance model:	SG100
Storage controller failed drive count:	0
Storage data drive type:	SSD
Storage data drive size:	960.20 GB
Storage RAID mode:	RAID1 [healthy]
Storage connectivity:	Nominal
Overall power supply:	Nominal
Compute controller BMC IP:	10.60.8.38
Compute controller serial number:	372038000093
Compute hardware:	Nominal
Compute controller CPU temperature:	Nominal
Compute controller chassis temperature:	Nominal
Compute controller power supply A:	Nominal
Compute controller power supply B:	Nominal

Field in the Appliance table	Description
Appliance model	The model number for this StorageGRID appliance.

Field in the Appliance table	Description
Storage controller failed drive count	The number of drives that are not optimal.
Storage data drive type	The type of drives in the appliance, such as HDD (hard disk drive) or SSD (solid state drive).
Storage data drive size	The effective size of one data drive.
Storage RAID mode	The RAID mode for the appliance.
Overall power supply	The status of all power supplies in the appliance.
Compute controller BMC IP	<p>The IP address of the baseboard management controller (BMC) port in the compute controller. You can use this IP to connect to the BMC interface to monitor and diagnose the appliance hardware.</p> <p>This field is not displayed for appliance models that do not contain a BMC.</p>
Compute controller serial number	The serial number of the compute controller.
Compute hardware	The status of the compute controller hardware.
Compute controller CPU temperature	The temperature status of the compute controller's CPU.
Compute controller chassis temperature	The temperature status of the compute controller.

c. Confirm that all statuses are “Nominal.”

If a status is not “Nominal,” review any current alerts.

4. Select **Network** to view information for each network.

The Network Traffic graph provides a summary of overall network traffic.



a. Review the Network Interfaces section.

Network interfaces					
Name	Hardware address	Speed	Duplex	Auto-negotiation	Link status
eth0	0C:42:A1:86:B5:B0	100 Gigabit	Full	Off	Up
eth1	B4:A9:FC:71:68:36	Gigabit	Full	Off	Up
eth2	0C:42:A1:86:B5:B0	100 Gigabit	Full	Off	Up
hic1	0C:42:A1:86:B5:B0	25 Gigabit	Full	On	Up
hic2	0C:42:A1:86:B5:B0	25 Gigabit	Full	On	Up
hic3	0C:42:A1:86:B5:B0	25 Gigabit	Full	On	Up
hic4	0C:42:A1:86:B5:B0	25 Gigabit	Full	On	Up
mtc1	B4:A9:FC:71:68:36	Gigabit	Full	On	Up
mtc2	B4:A9:FC:71:68:35	Gigabit	Full	On	Up

Use the following table with the values in the **Speed** column in the Network Interfaces table to determine whether the four 40/100-GbE network ports on the appliance were configured to use active/backup mode or LACP mode.



The values shown in the table assume all four links are used.

Link mode	Bond mode	Individual HIC link speed (hic1, hic2, hic3, hic4)	Expected Grid/Client Network speed (eth0, eth2)
Aggregate	LACP	100	400
Fixed	LACP	100	200
Fixed	Active/Backup	100	100
Aggregate	LACP	40	160
Fixed	LACP	40	80
Fixed	Active/Backup	40	40

b. Review the Network Communication section.

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	

5. Select **Storage** to view information about the disk devices and volumes on the services appliance.

DO-REF-DC1-GW1 (Gateway Node)



Overview Hardware Network Storage Load balancer Tasks

Disk devices

Name	World Wide Name	I/O load	Read rate	Write rate
croot(8:1,sda1)	N/A	0.02%	0 bytes/s	3 KB/s
cvloc(8:2,sda2)	N/A	0.03%	0 bytes/s	6 KB/s

Volumes

Mount point	Device	Status	Size	Available	Write cache status
/	croot	Online	21.00 GB	14.73 GB 	Unknown
/var/local	cvloc	Online	85.86 GB	84.63 GB 	Unknown

Related information

[SG100 and SG1000 services appliances](#)

View the Network tab

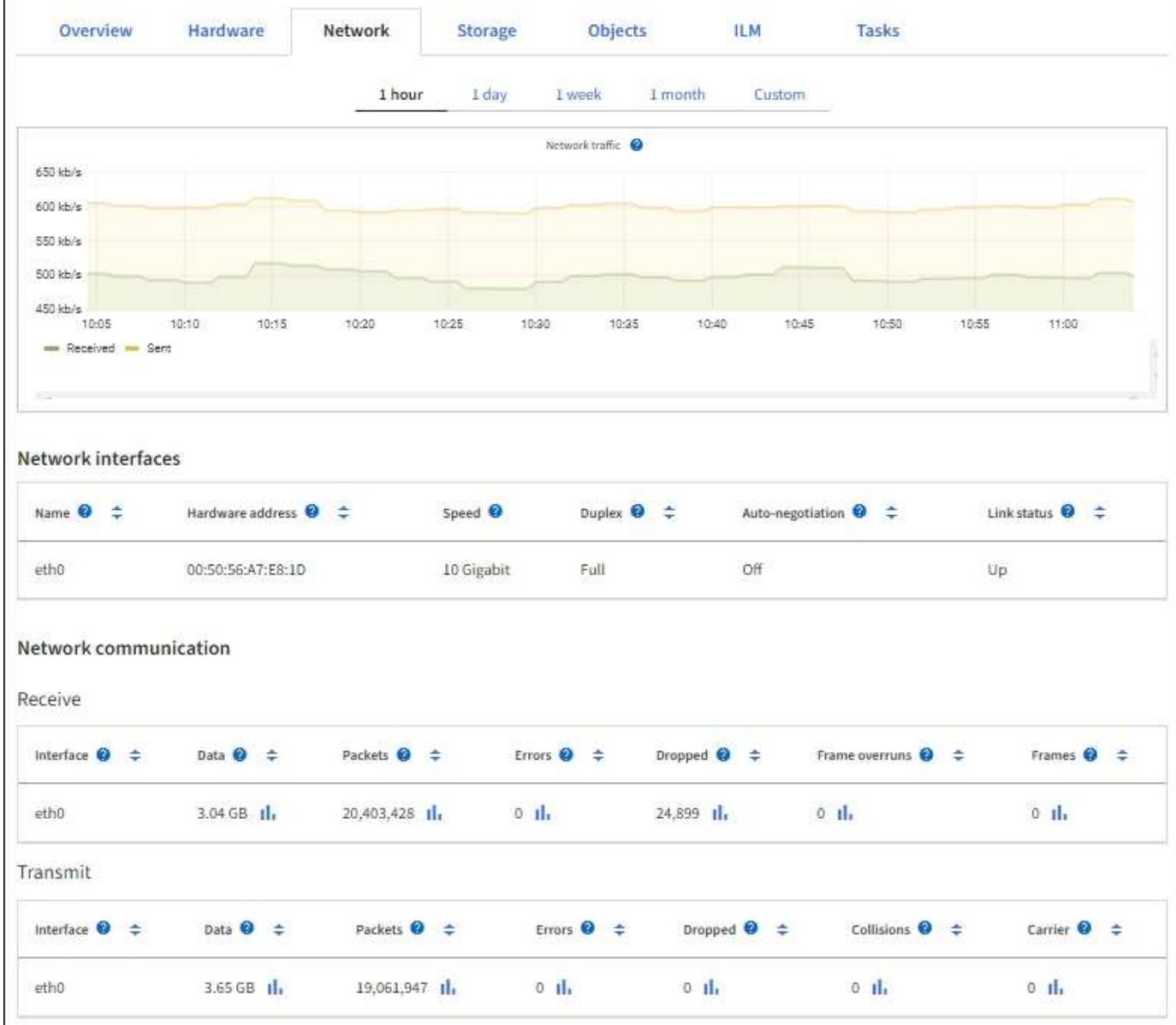
The Network tab displays a graph showing the network traffic received and sent across all of the network interfaces on the node, site, or grid.

The Network tab is shown for all nodes, each site, and the entire grid.

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.

For nodes, the Network interfaces table provides information about each node's physical network ports. The Network communications table provides details about each node's receive and transmit operations and any driver reported fault counters.

DC1-S2 (Storage Node)



View the Storage tab

The Storage tab summarizes storage availability and other storage metrics.

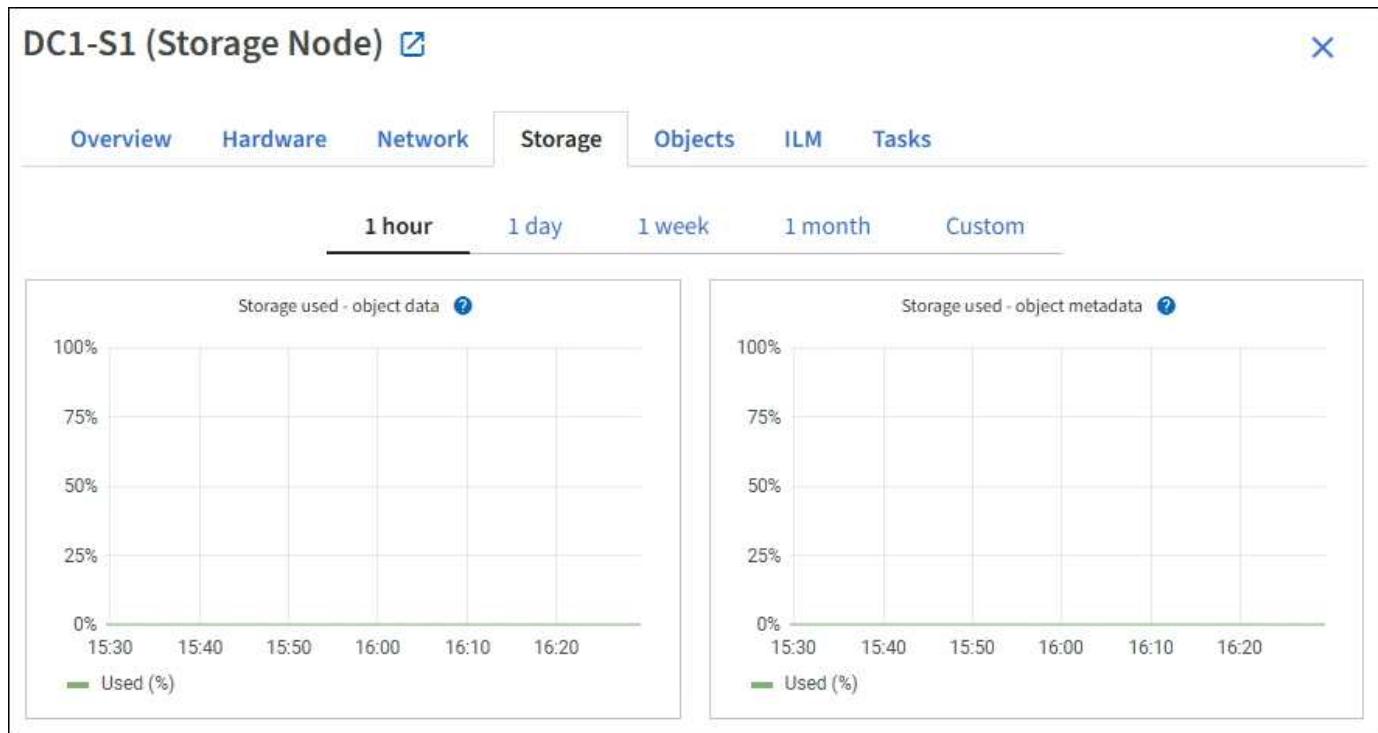
The Storage tab is shown for all nodes, each site, and the entire grid.

Storage used graphs

For Storage Nodes, each site, and the entire grid, the Storage tab includes graphs showing how much storage has been used by object data and object metadata over time.



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



Disk devices, Volumes, and Object stores tables

For all nodes, the Storage tab contains details for the disk devices and volumes on the node. For Storage Nodes, the Object Stores table provides information about each storage volume.

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

Related information

[Monitor storage capacity](#)

Use the Task tab to reboot a grid node

The Task tab allows you to reboot the selected node. The Task tab is shown for all nodes.

What you'll need

- You are signed in to the Grid Manager using a [supported web browser](#).
- You have the Maintenance or Root access permission.

- You have the provisioning passphrase.

About this task

You can use the Task tab to reboot a node. For appliance nodes, you can also use the Task tab to place the appliance into maintenance mode.

- Rebooting a grid node from the Task tab issues the reboot command on the target node. When you reboot a node, the node shuts down and restarts. All services are restarted automatically.

If you plan to reboot a Storage Node, note the following:

- If an ILM rule specifies an ingest behavior of Dual commit or the rule specifies Balanced and it is not possible to immediately create all required copies, StorageGRID immediately commits any newly ingested objects to two Storage Nodes on the same site and evaluates ILM later. If you want to reboot two or more Storage Nodes on a given site, you might not be able to access these objects for the duration of the reboot.
- To ensure you can access all objects while a Storage Node is rebooting, stop ingesting objects at a site for approximately one hour before rebooting the node.
- You might need to put a StorageGRID appliance into maintenance mode to perform certain procedures, such as changing the link configuration or replacing a storage controller. For instructions, see the hardware installation and maintenance instructions for the appliance.



In rare instances, placing a StorageGRID appliance into maintenance mode might make the appliance unavailable for remote access.

Steps

1. Select **NODES**.
2. Select the grid node you want to reboot.
3. Select the **Tasks** tab.

The screenshot shows the StorageGRID management interface. At the top, there is a navigation bar with tabs: Overview, Hardware, Network, Storage, Objects, ILM, and Tasks. The Tasks tab is currently selected. Below the navigation bar, there are two main sections: "Reboot" and "Maintenance mode".

Reboot

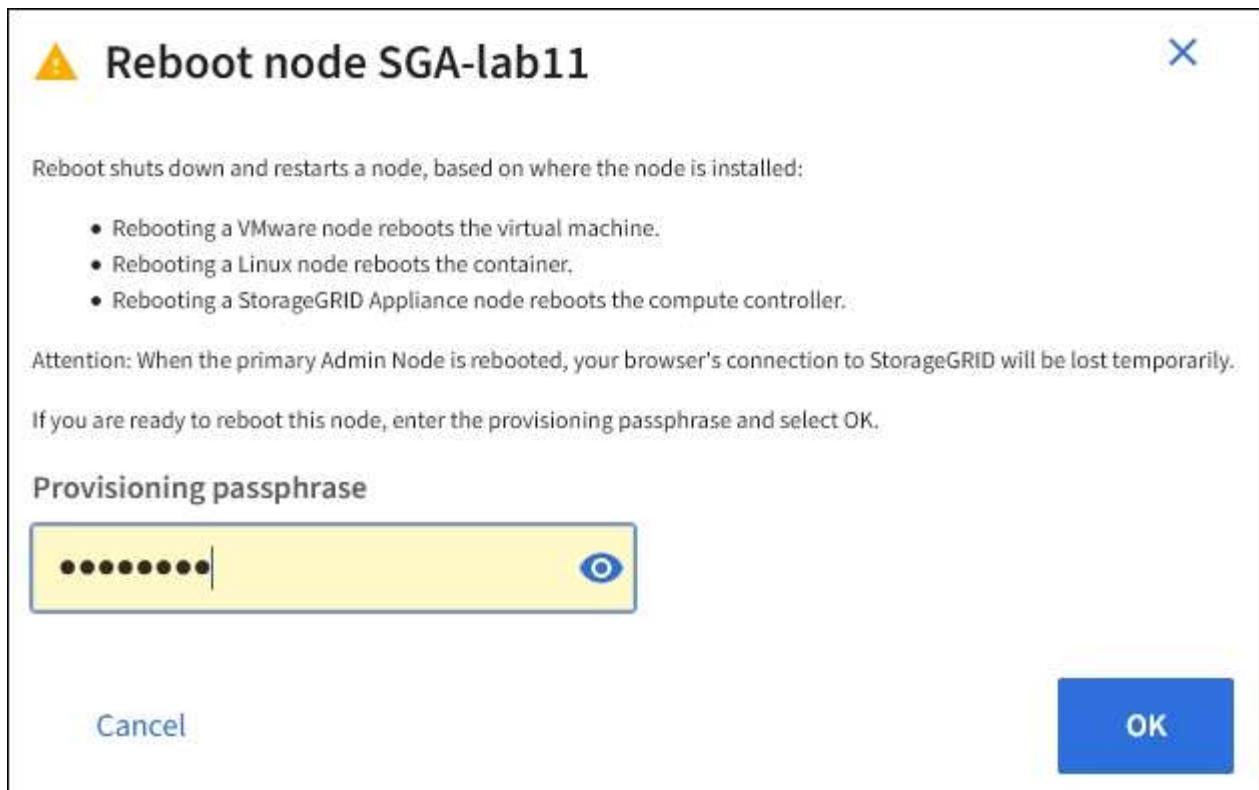
Reboots the node. **Reboot**

Maintenance mode

Places the appliance's compute controller into maintenance mode. **Maintenance mode**

4. Select **Reboot**.

A confirmation dialog box appears.



If you are rebooting the primary Admin Node, the confirmation dialog box reminds you that your browser's connection to the Grid Manager will be lost temporarily when services are stopped.

5. Enter the provisioning passphrase, and click **OK**.
6. Wait for the node to reboot.

It might take some time for services to shut down.

When the node is rebooting, the gray icon (Administratively Down) appears on the left side of the **Nodes** page. When all services have started again and the node is successfully connected to the grid, the **Nodes** page should display a normal status (no icons to the left of the node name), indicating that no alerts are active and the node is connected to the grid.

Related information

[SG6000 storage appliances](#)

[SG5700 storage appliances](#)

[SG5600 storage appliances](#)

[SG100 and SG1000 services appliances](#)

View the Objects tab

The Objects tab provides information about **S3** and **Swift** ingest and retrieve rates.

The Objects tab is shown for each Storage Node, each site, and the entire grid. For Storage Nodes, the Objects tab also provides object counts and information about metadata queries and background verification.

DC1-S1 (Storage Node)



Overview Hardware Network Storage **Objects** ILM Tasks

1 hour 1 day 1 week 1 month Custom



Object counts

Total objects:  1,295

Lost objects:  0 

S3 buckets and Swift containers:  161

Metadata store queries

Average latency:  10.00 milliseconds

Queries - successful:  14,587 

Queries - failed (timed out):  0 

Queries - failed (consistency level unmet):  0 

Verification

Status:  No errors 

Percent complete:  47.14% 

Average stat time:  0.00 microseconds 

Objects verified:  0 

Object verification rate:  0.00 objects / second 

Data verified:  0 bytes 

Data verification rate:  0.00 bytes / second 

Missing objects:  0 

Corrupt objects:  0 

Corrupt objects unidentified:  0

Quarantined objects:  0 

View the ILM tab

The ILM tab provides information about Information Lifecycle Management (ILM) operations.

The ILM tab is shown for each Storage Node, each site, and the entire grid. For each site and the grid, the ILM tab shows a graph of the ILM queue over time. For the grid, this tab also provides the estimated time to complete a full ILM scan of all objects.

For Storage Nodes, the ILM tab provides details about ILM evaluation and background verification for erasure coded objects.

DC2-S1 (Storage Node)

Overview Hardware Network Storage Objects **ILM** Tasks

Evaluation

Awaiting - all:  0	objects	
Awaiting - client:  0	objects	
Evaluation rate:  0.00	objects / second	
Scan rate:  0.00	objects / second	

Erasure coding verification

Status:  Idle	
Next scheduled:  2021-09-09 17:36:44 MDT	
Fragments verified:  0	
Data verified:  0 bytes	
Corrupt copies:  0	
Corrupt fragments:  0	
Missing fragments:  0	

Related information

[Monitor information lifecycle management](#)

[Administer StorageGRID](#)

View the Load Balancer tab

The Load Balancer tab includes performance and diagnostic graphs related to the operation of the Load Balancer service.

The Load Balancer tab is shown for Admin Nodes and Gateway Nodes, each site, and the entire grid. For each site, the Load Balancer tab provides an aggregate summary of the statistics for all nodes at that site. For the entire grid, the Load Balancer tab provides an aggregate summary of the statistics for all sites.

If there is no I/O being run through the Load Balancer service, or there is no load balancer configured, the graphs display "No data."



Request traffic

This graph provides a 3-minute moving average of the throughput of data transmitted between load balancer endpoints and the clients making the requests, in bits per second.



This value is updated at the completion of each request. As a result, this value might differ from the real-time throughput at low request rates or for very long-lived requests. You can look at the Network tab to get a more realistic view of the current network behavior.

Incoming request rate

This graph provides a 3-minute moving average of the number of new requests per second, broken down by request type (GET, PUT, HEAD, and DELETE). This value is updated when the headers of a new request have been validated.

Average request duration (non-error)

This graph provides a 3-minute moving average of request durations, broken down by request type (GET, PUT, HEAD, and DELETE). Each request duration starts when a request header is parsed by the Load Balancer service and ends when the complete response body is returned to the client.

Error response rate

This graph provides a 3-minute moving average of the number of error responses returned to clients per second, broken down by the error response code.

Related information

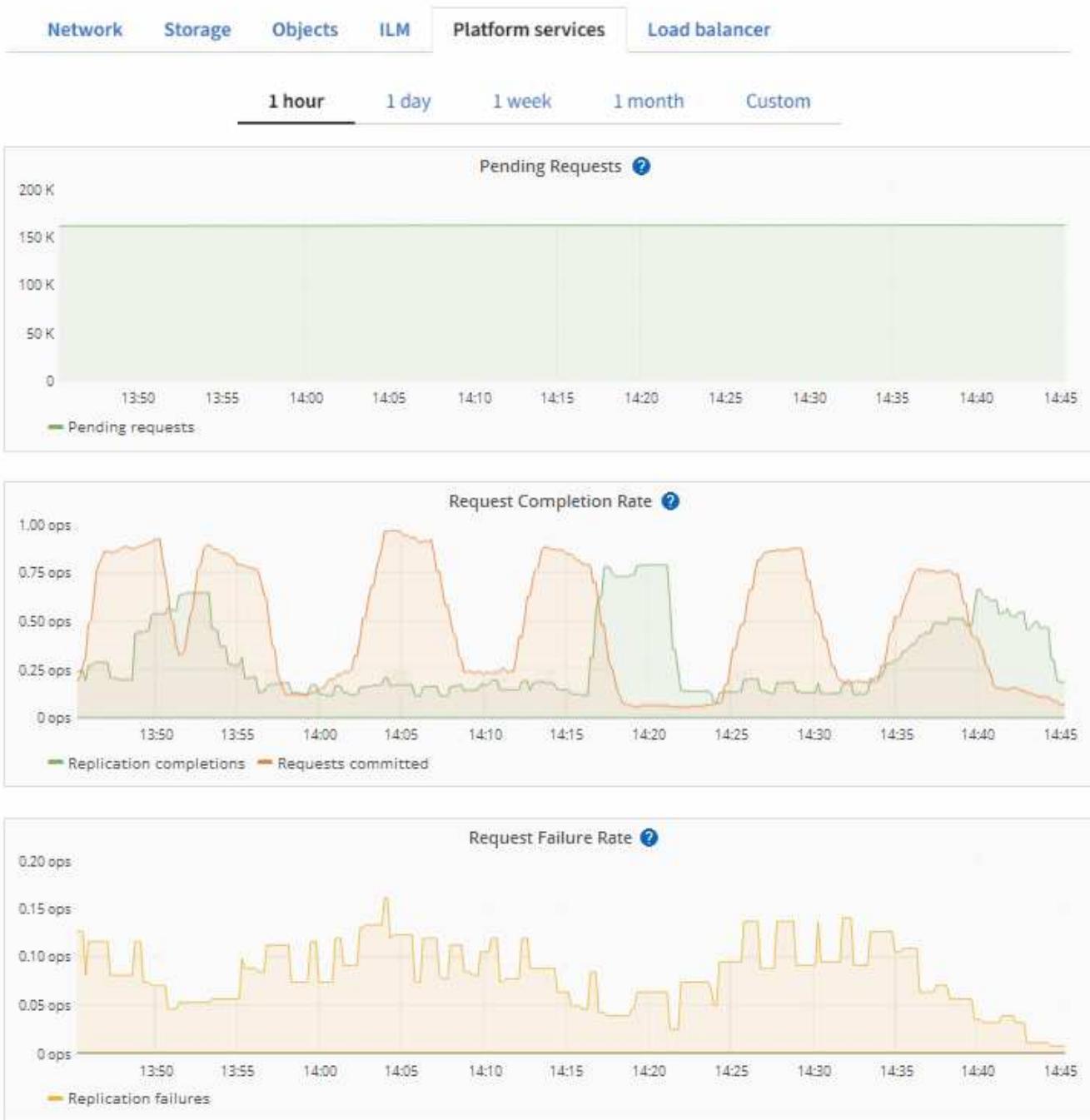
[Monitor load balancing operations](#)

[Administer StorageGRID](#)

View the Platform services tab

The Platform services tab provides information about any S3 platform service operations at a site.

The Platform services tab is shown for each site. This tab provides information about S3 platform services, such as CloudMirror replication and the search integration service. Graphs on this tab display metrics such as the number of pending requests, request completion rate, and request failure rate.



For more information about S3 platform services, including troubleshooting details, see the [instructions for administering StorageGRID](#).

View the SANtricity System Manager tab

The SANtricity System Manager tab enables you to access SANtricity System Manager without having to configure or connect the management port of the storage appliance. You can use this tab to review hardware diagnostic and environmental information as well as issues related to the drives.

The SANtricity System Manager tab is shown for storage appliance nodes.

Using SANtricity System Manager, you can do the following:

- View performance data such as storage array level performance, I/O latency, storage controller CPU utilization, and throughput
- Check hardware component status
- Perform support functions including viewing diagnostic data, and configuring E-Series AutoSupport



To use SANtricity System Manager to configure a proxy for E-Series AutoSupport, see the instructions in [administeringStorageGRID](#).

[Administer StorageGRID](#)

To access SANtricity System Manager through Grid Manager, you must have the Storage Appliance Administrator permission or Root Access permission.



You must have SANtricity firmware 8.70 or higher to access SANtricity System Manager using the Grid Manager.



Accessing SANtricity System Manager from the Grid Manager is generally meant only to monitor appliance hardware and configure E-Series AutoSupport. Many features and operations within SANtricity System Manager such as upgrading firmware do not apply to monitoring your StorageGRID appliance. To avoid issues, always follow the hardware installation and maintenance instructions for your appliance.

The tab displays the home page of SANtricity System Manager.

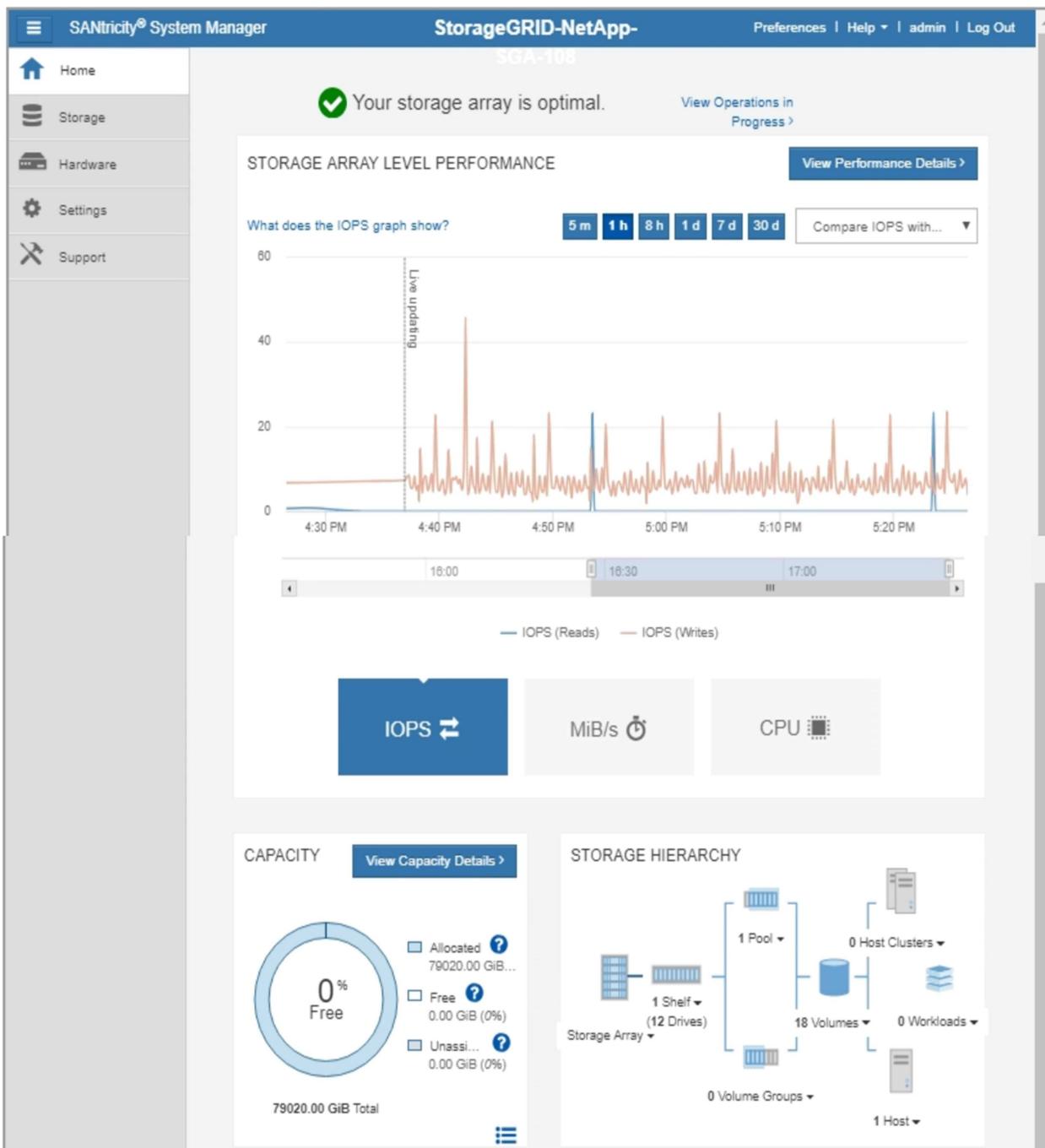
NetApp-SGA-108 (Storage Node)

Overview Hardware Network Storage Objects ILM Events Tasks SANtricity System Manager

Use SANtricity System Manager to monitor and manage the hardware components in this storage appliance. From SANtricity System Manager, you can review hardware diagnostic and environmental information as well as issues related to the drives.

Note: Many features and operations within SANtricity Storage Manager do not apply to your StorageGRID appliance. To avoid issues, always follow the hardware installation and maintenance instructions for your appliance model.

Open [SANtricity System Manager](#) in a new browser tab.



You can use the SANtricity System Manager link to open the SANtricity System Manager in a new browser window for easier viewing.

To see details for storage array level performance and capacity usage, hover your cursor over each graph.

For more details on viewing the information accessible from the SANtricity System Manager tab, see [NetApp E-Series and SANtricity documentation](#).

Information you should monitor regularly

StorageGRID is a fault-tolerant, distributed storage system that is designed to continue operating even when errors occur, or when nodes or sites are unavailable. You must proactively monitor system health, workloads, and usage statistics so that you can take action to address potential issues before they affect the grid's efficiency or availability.

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

What to monitor	Frequency
The system health data shown on the Grid Manager Dashboard. Note if anything has changed from the previous day.	Daily
Rate at which Storage Node object and metadata capacity is being consumed	Weekly
Information lifecycle management operations	Weekly
Performance, networking, and system resources: <ul style="list-style-type: none">• Query latency• Connectivity and networking• Node-level resources	Weekly
Tenant activity	Weekly
Capacity of the external archival storage system	Weekly
Load balancing operations	After the initial configuration and after any configuration changes
Availability of software hotfixes and software upgrades	Monthly

Monitor system health

You should monitor the overall health of your StorageGRID system on a daily basis.

About this task

The StorageGRID system is fault tolerant and can continue to operate even when parts of the grid are unavailable. The first sign of a potential issue with your StorageGRID system is likely to be an alert or an alarm (legacy system) and not necessarily an issue with system operations. Paying attention to system health can help you detect minor issues before they affect operations or grid efficiency.

The Health panel on the Grid Manager Dashboard provides a summary of issues that might be affecting your system. You should investigate any issues that are shown on the Dashboard.



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

Steps

1. Sign in to the Grid Manager to view the Dashboard.
2. Review the information in the Health panel.



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

Link	Indicates
Grid details	Appears if any nodes are disconnected (connection state Unknown or Administratively Down). Click the link, or click the blue or gray icon to determine which node or nodes are affected.
Current alerts	Appears if any alerts are currently active. Click the link, or click Critical , Major , or Minor to see the details on the ALERTS > Current page.
Recently resolved alerts	Appears if any alerts triggered in the past week are now resolved. Click the link to see the details on the ALERTS > Resolved page.
License	Appears if there is an issue with the software license for this StorageGRID system. Click the link to see the details on the MAINTENANCE > System > License page.

Related information

- [Administer StorageGRID](#)
- [Set up email notifications for alerts](#)
- [Use SNMP monitoring](#)

Monitor node connection states

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

What you'll need

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

About this task

Nodes can have one of three connection states:

- **Not connected - Unknown** : The node is not connected to the grid for an unknown reason. For example, the network connection between nodes has been lost or the power is down. The **Unable to communicate with node** alert might also be triggered. Other alerts might be active as well. This situation requires immediate attention.

 A node might appear as Unknown during managed shutdown operations. You can ignore the Unknown state in these cases.
- **Not connected - Administratively down** : The node is not connected to the grid for an expected reason. 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.
- **Connected** : The node is connected to the grid.

Steps

1. If a blue or gray icon appears on the Health panel of the Dashboard, click the icon or click **Grid details**. (The blue or gray icons and the **Grid details** link appear only if at least one node is disconnected from the grid.)

The Overview page for the first blue node in the node tree appears. If there are no blue nodes, the Overview page for the first gray node in the tree appears.

In the example, the Storage Node named DC1-S3 has a blue icon. The **Connection State** on the Node Information panel is **Unknown**, and the **Unable to communicate with node** alert is active. The alert indicates that one or more services are unresponsive, or the node cannot be reached.

2. If a node has a blue icon, follow these steps:

- Select each alert in the table, and follow the recommended actions.

For example, you might need to restart a service that has stopped or restart the host for the node.

- If you are unable to bring the node back online, contact technical support.

3. If a node has a gray icon, follow these steps:

Gray nodes are expected during maintenance procedures and might be associated with one or more alerts. Based on the underlying issue, these “administratively down” nodes often go back online with no intervention.

- Review the Alerts section, and determine if any alerts are affecting this node.
- If one or more alerts are active, select each alert in the table, and follow the recommended actions.
- If you are unable to bring the node back online, contact technical support.

Related information

[Alerts reference](#)

[Recover and maintain](#)

View 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. An email notification might also be sent, unless the alert has been silenced.

What you'll need

- You must be signed in to the Grid Manager using a [supported web browser](#).
- Optionally, you have watched the video: [Video: Overview of Alerts](#).



Steps

1. If one or more alerts are active, do either of the following:

- From the Health panel on the Dashboard, click the alert icon or click **Current alerts**. (An alert icon and the **Current alerts** link appear only if at least one alert is currently active.)
- Select **ALERTS > Current**.

The Current Alerts page appears. It lists all alerts currently affecting your StorageGRID system.

Current Alerts [Learn more](#)

View the current alerts affecting your StorageGRID system.

Name	Severity	Time triggered	Site / Node	Status	Current values
Unable to communicate with node	2 Major	9 minutes ago (newest) 19 minutes ago (oldest)		2 Active	Disk space available: 2.00 GB Total disk space: 21.00 GB
Low root disk capacity	Minor	25 minutes ago	Data Center 1 / DC1-S1-99-51	Active	Days remaining: 14
Expiration of server certificate for Storage API Endpoints	Major	31 minutes ago	Data Center 1 / DC1-ADM1-99-49	Active	Days remaining: 30
Expiration of server certificate for Management Interface	Minor	31 minutes ago	Data Center 1 / DC1-ADM1-99-49	Active	Days remaining: 30
Low installed node memory	8 Critical	a day ago (newest) a day ago (oldest)		8 Active	

By default, 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 are not 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. Review the information in the table.

Column header	Description
Name	The name of the alert and its description.
Severity	<p>The severity of the alert. If multiple alerts are grouped, the title row shows how many instances of that alert are occurring at each severity.</p> <ul style="list-style-type: none"> • 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. • 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. • 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 do not clear on their own to ensure they do not result in a more serious problem.
Time triggered	How long ago the alert was triggered. 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>).
Site/Node	The name of the site and node where the alert is occurring. If multiple alerts are grouped, the site and node names are not shown in the title row.
Status	Whether the alert is active or has been silenced. 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.
Current values	<p>The current 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 alerts are grouped, current values are not shown in the title row.</p>

3. To expand and collapse groups of alerts:

- To show the individual alerts in a group, click the down caret in the heading, or click the group's name.
- To hide the individual alerts in a group, click the up caret in the heading, or click the group's name.

Name	Severity	Time triggered	Site / Node	Status	Current values
^ Low object data storage The disk space available for storing object data is low.	⚠ Minor	a day ago (newest) a day ago (oldest)		5 Active	Disk space remaining: 525.17 GB Disk space used: 243.06 KB Disk space used (%): 0.000%
Low object data storage The disk space available for storing object data is low.	⚠ Minor	a day ago	DC2 231-236 / DC2-S2-233	Active	Disk space remaining: 525.17 GB Disk space used: 325.65 KB Disk space used (%): 0.000%
Low object data storage The disk space available for storing object data is low.	⚠ Minor	a day ago	DC1 225-230 / DC1-S1-226	Active	Disk space remaining: 525.17 GB Disk space used: 381.55 KB Disk space used (%): 0.000%
Low object data storage The disk space available for storing object data is low.	⚠ Minor	a day ago	DC2 231-236 / DC2-S3-234	Active	Disk space remaining: 525.17 GB Disk space used: 282.19 KB Disk space used (%): 0.000%
Low object data storage The disk space available for storing object data is low.	⚠ Minor	a day ago	DC1 225-230 / DC1-S2-227	Active	Disk space remaining: 525.17 GB Disk space used: 189.24 KB Disk space used (%): 0.000%
Low object data storage The disk space available for storing object data is low.	⚠ Minor	a day ago	DC2 231-236 / DC2-S1-232	Active	Disk space remaining: 525.17 GB Disk space used: 189.24 KB Disk space used (%): 0.000%

4. To display individual alerts instead of groups of alerts, unselect the **Group alerts** check box at the top of the table.



5. To sort alerts or alert groups, click 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 unselected, 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.

6. To filter the alerts by status, use the drop-down menu at the top of the table.



- Select **All alerts** to view all current alerts (both active and silenced alerts).
- Select **Active** to view only the current alerts that are active.
- Select **Silenced** to view only the current alerts that have been silenced. See [Silence alert notifications](#).

7. To view details for a specific alert, select the alert from the table.

A dialog box for the alert appears. See [View a specific alert](#).

View resolved alerts

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

What you'll need

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

Steps

1. To view resolved alerts, do either of the following:

- From the Health panel on the Dashboard, click **Recently resolved alerts**.

The **Recently resolved alerts** link appears only if one or more alerts were triggered in the past week and are now resolved.

- Select **ALERTS > Resolved**. The Resolved Alerts page appears. By default, resolved alerts that were triggered in the last week are shown, with the most recently triggered alerts shown first. The alerts on this page were previously shown on the Current Alerts page or in an email notification.

Resolved Alerts

Search and view alerts that have been resolved.

When triggered	Severity	Alert rule	Node	Search
Last week	Filter by severity	Filter by rule	Filter by node	
Name				
Low installed node memory The amount of installed memory on a node is low.	Critical	2 days ago	a day ago	Data Center 1 / DC1-S2 Total RAM size: 8.37 GB
Low installed node memory The amount of installed memory on a node is low.	Critical	2 days ago	a day ago	Data Center 1 / DC1-S3 Total RAM size: 8.37 GB
Low installed node memory The amount of installed memory on a node is low.	Critical	2 days ago	a day ago	Data Center 1 / DC1-S4 Total RAM size: 8.37 GB
Low installed node memory The amount of installed memory on a node is low.	Critical	2 days ago	a day ago	Data Center 1 / DC1-ADM1 Total RAM size: 8.37 GB
Low installed node memory The amount of installed memory on a node is low.	Critical	2 days ago	a day ago	Data Center 1 / DC1-ADM2 Total RAM size: 8.37 GB
Low installed node memory The amount of installed memory on a node is low.	Critical	2 days ago	a day ago	Data Center 1 / DC1-S1 Total RAM size: 8.37 GB

2. Review the information in the table.

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

Column header	Description
Severity	<p>The severity of the alert.</p> <ul style="list-style-type: none"> • 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. • 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. • 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 do not clear on their own to ensure they do not result in a more serious problem.
Time triggered	How long ago the alert was triggered.
Time resolved	How long ago the alert was resolved.
Site/Node	The name of the site and node where the alert occurred.
Triggered values	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.

3. To sort the entire list of resolved alerts, click the up/down arrows in each column header.

For example, you might want to sort resolved alerts by **Site/Node** to see the alerts that affected a specific node.

4. Optionally, filter the list of resolved alerts by using the drop-down menus at the top of the table.

- Select a time period from the **When triggered** drop-down menu to show resolved alerts based on how long ago they were triggered.

You can search for alerts that were triggered within the following time periods:

- Last hour
 - Last day
 - Last week (default view)
 - Last month
 - Any time period
 - Custom (allows you to specify the start date and the end date for the time period)
- b. Select one or more severities from the **Severity** drop-down menu to filter on resolved alerts of a specific severity.
 - c. 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.
 - d. Select one or more nodes from the **Node** drop-down menu to filter on resolved alerts related to a specific node.
 - e. Click **Search**.

5. To view details for a specific resolved alert, select the alert from the table.

A dialog box for the alert appears. See [View a specific alert](#).

View a specific alert

You can view detailed information about an alert that is currently affecting your StorageGRID system or an alert that has been resolved. The details include recommended corrective actions, the time the alert was triggered, and the current value of the metrics related to this alert.

Optionally, you can [silence a current alert](#) or [update the alert rule](#).

What you'll need

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

Steps

1. Do one of the following, based on whether you want to view a current or resolved alert:

Column header	Description
Current alert	<ul style="list-style-type: none">• From the Health panel on the Dashboard, click the Current alerts link. This link appears only if at least one alert is currently active. This link is hidden if there are no current alerts or if all current alerts have been silenced.• Select ALERTS > Current.• From the NODES page, select the Overview tab for a node that has an alert icon. Then, in the Alerts section, click the alert name.

Column header	Description
Resolved alert	<ul style="list-style-type: none"> From the Health panel on the Dashboard, click the Recently resolved alerts link. (This link appears only if one or more alerts were triggered in the past week and are now resolved. This link is hidden if no alerts were triggered and resolved in the last week.) Select ALERTS > Resolved.

2. As required, expand a group of alerts and then select the alert you want to view.



Select the alert, not the heading for a group of alerts.

▲ Low installed node memory The amount of installed memory on a node is low.	✖ 8 Critical a day ago (newest) a day ago (oldest)	8 Active
Low installed node memory The amount of installed memory on a node is low.	✖ Critical a day ago	Data Center 2 / DC2-S1-99-56 Active Total RAM size: 8.38 GB

A dialog box appears and provides details for the selected alert.

Low installed node memory

The amount of installed memory on a node is low.

Recommended actions

Increase the amount of RAM available to the virtual machine or Linux host. Check the threshold value for the major alert to determine the default minimum requirement for a StorageGRID node.

See the instructions for your platform:

- [VMware installation](#)
- [Red Hat Enterprise Linux or CentOS installation](#)
- [Ubuntu or Debian installation](#)

Time triggered

2019-07-15 17:07:41 MDT (2019-07-15 23:07:41 UTC)

Status
Active ([silence this alert](#))

Site / Node
Data Center 2 / DC2-S1-99-56

Severity
✖ Critical

Total RAM size
8.38 GB

Condition
[View conditions](#) | [Edit rule](#)

[Close](#)

3. Review the alert details.

Information	Description
<i>title</i>	The name of the alert.
<i>first paragraph</i>	The description of the alert.
Recommended actions	The recommended actions for this alert.

Information	Description
Time triggered	The date and time the alert was triggered in your local time and in UTC.
Time resolved	For resolved alerts only, the date and time the alert was resolved in your local time and in UTC.
Status	The status of the alert: Active, Silenced, or Resolved.
Site/Node	The name of the site and node affected by the alert.
Severity	<p>The severity of the alert.</p> <ul style="list-style-type: none"> • 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. • 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. • 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 do not clear on their own to ensure they do not result in a more serious problem.
<i>data values</i>	The current value of the metric for this alert. For some alerts, additional values are shown to help you understand and investigate the alert. For example, the values shown for a Low metadata storage alert include the percent of disk space used, the total amount of disk space, and the amount of disk space used.

4. Optionally, click **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.

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

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

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

Low installed node memory

Total RAM size
8.38 GB

Condition

[View conditions](#) | [Edit rule](#)

Major `node_memory_MemTotal_bytes < 240000000000`

Critical `node_memory_MemTotal_bytes < 120000000000`

- b. To close the pop-up, click anywhere outside of the pop-up.
6. Optionally, click **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.

7. To close the alert details, click **Close**.

View legacy alarms

Alarms (legacy system) are triggered when system attributes reach alarm threshold values. You can view the currently active alarms from the Current Alarms page.



While the legacy alarm system continues to be supported, the alert system offers significant benefits and is easier to use.

What you'll need

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

Steps

1. Select **SUPPORT > Alarms (legacy) > Current alarms**.

The alarm system is the legacy system. The alert system offers significant benefits and is easier to use. See [Managing alerts and alarms](#) in the instructions for monitoring and troubleshooting StorageGRID.

Current Alarms

Last Refreshed: 2020-05-27 09:41:39 MDT

Show Acknowledged Alarms (1 - 1 of 1)

Severity	Attribute	Service	Description	Alarm Time	Trigger Value	Current Value
Major	ORSU (Outbound Replication Status)	Data Center 1/DC1-ARC1/ARC	Storage Unavailable	2020-05-26 21:47:18 MDT	Storage Unavailable	Storage Unavailable

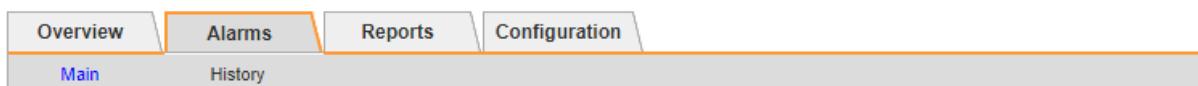
Show 50 ▾ Records Per Page Refresh Previous < 1 > Next

The alarm icon indicates the severity of each alarm, as follows:

Icon	Color	Alarm severity	Meaning
	Yellow	Notice	The node is connected to the grid, but an unusual condition exists that does not affect normal operations.
	Light Orange	Minor	The node is connected to the grid, but an abnormal condition exists that could affect operation in the future. You should investigate to prevent escalation.
	Dark Orange	Major	The node is connected to the grid, but an abnormal condition exists that currently affects operation. This requires prompt attention to prevent escalation.
	Red	Critical	The node is connected to the grid, but an abnormal condition exists that has stopped normal operations. You should address the issue immediately.

2. To learn about the attribute that caused the alarm to be triggered, right click the attribute name in the table.
3. To view additional details about an alarm, click the service name in the table.

The Alarms tab for the selected service appears (**SUPPORT > Tools > Grid topology > Grid Node > Service > Alarms**).



Alarms: ARC (DC1-ARC1) - Replication

Updated: 2019-05-24 10:46:48 MDT

Severity	Attribute	Description	Alarm Time	Trigger Value	Current Value	Acknowledge Time	Acknowledge
	ORSU (Outbound Replication Status)	Storage Unavailable	2019-05-23 21:40:08 MDT	Storage Unavailable	Storage Unavailable		<input type="checkbox"/>

[Apply Changes](#)

4. If you want to clear the count of current alarms, you can optionally do the following:
 - Acknowledge the alarm. An acknowledged alarm is no longer included in the count of legacy alarms unless it is triggered at the next severity level or it is resolved and occurs again.
 - Disable a particular Default alarm or Global Custom alarm for the entire system to prevent it from being triggered again.

Related information

[Alarms reference \(legacy system\)](#)

[Acknowledge current alarms \(legacy system\)](#)

[Disable alarms \(legacy system\)](#)

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

You must 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.

What you'll need

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

About this task

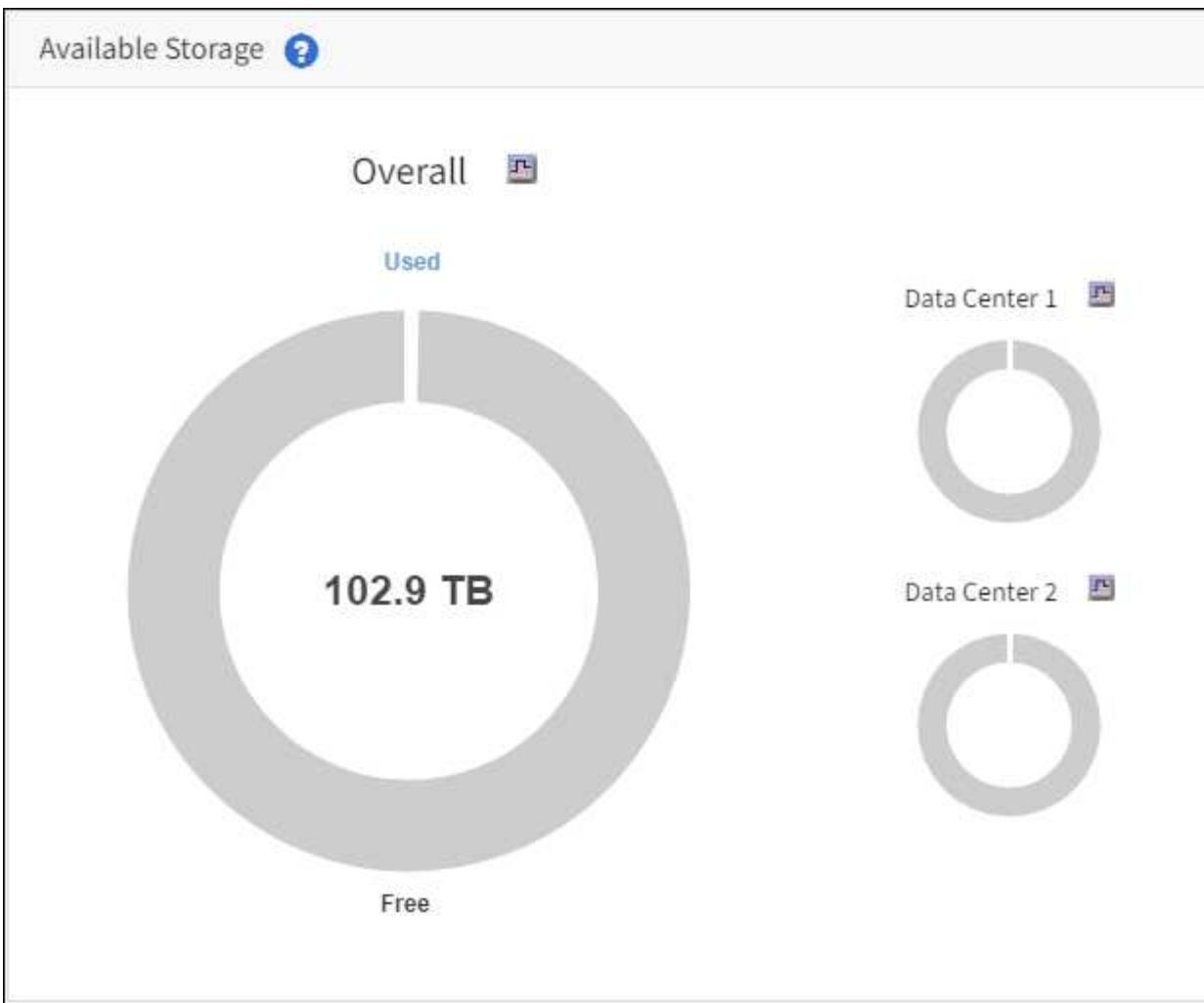
The Dashboard in the Grid Manager lets you quickly assess how much storage is available for the entire grid and for each data center. The Nodes page provides more detailed values for object data and object metadata.

Steps

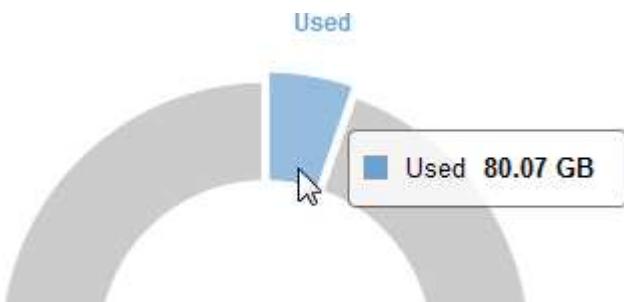
1. Assess how much storage is available for the entire grid and for each data center.
 - a. Select **Dashboard**.
 - b. In the Available Storage panel, note the overall summary of free and used storage capacity.



The summary does not include archival media.



- c. Place your cursor over the chart's Free or Used capacity sections to see exactly how much space is free or used.



- d. For multi-site grids, review the chart for each data center.
- e. Click the chart icon for the overall chart or for an individual data center to view a graph showing capacity usage over time.

A graph showing Percentage Storage Capacity Used (%) vs. Time appears.

2. Determine how much storage has been used and how much storage remains available for object data and object metadata.
 - a. Select **NODES**.
 - b. Select **grid > Storage**.



- c. Hover 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 do not 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 on planning a storage expansion, see the [instructions for expanding StorageGRID](#).

Monitor storage capacity for each Storage Node

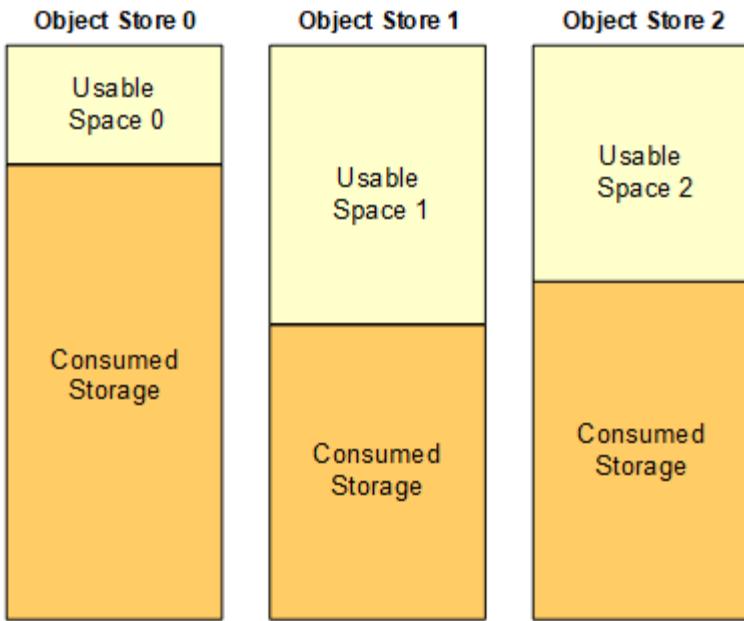
Monitor the total usable space for each Storage Node to ensure that the node has enough space for new object data.

What you'll need

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

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

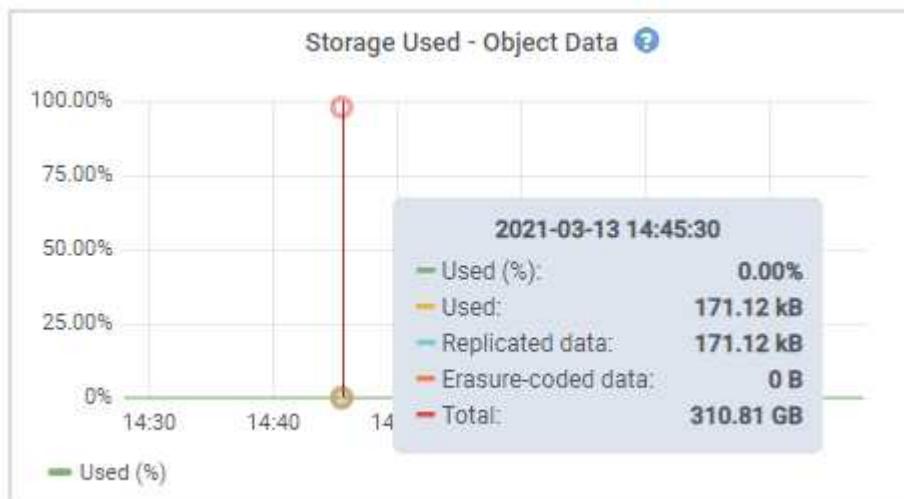
1. Select **NODES > Storage Node > Storage**.

The graphs and tables for the node appear.

2. Hover 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 on 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.

What you'll need

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

About this task

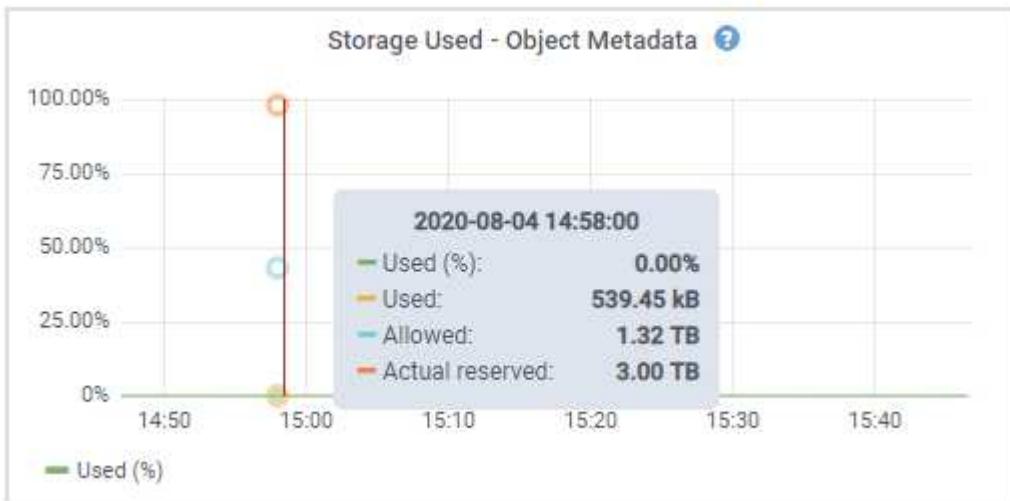
StorageGRID maintains three copies of object metadata at each site to provide redundancy and to protect object metadata from loss. The three copies are evenly distributed across all Storage Nodes at each site using the space reserved for metadata on storage volume 0 of each Storage Node.

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. Hover your cursor over the Storage used - object metadata graph to see the values for a specific time.



Value	Description	Prometheus metric
Used (%)	The percentage of the allowed metadata space that has been used on this Storage Node.	storagegrid_storage_utilization_metadata_bytes/storagegrid_storage_utilization_metadata_allowed_bytes
Used	The bytes of the allowed metadata space that have been used on this Storage Node.	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 instructions for administering StorageGRID .	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 instructions for administering StorageGRID .	<i>Metric will be added in a future release.</i>



The total values for a site or the grid do not 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 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.

What you'll need

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

About this task

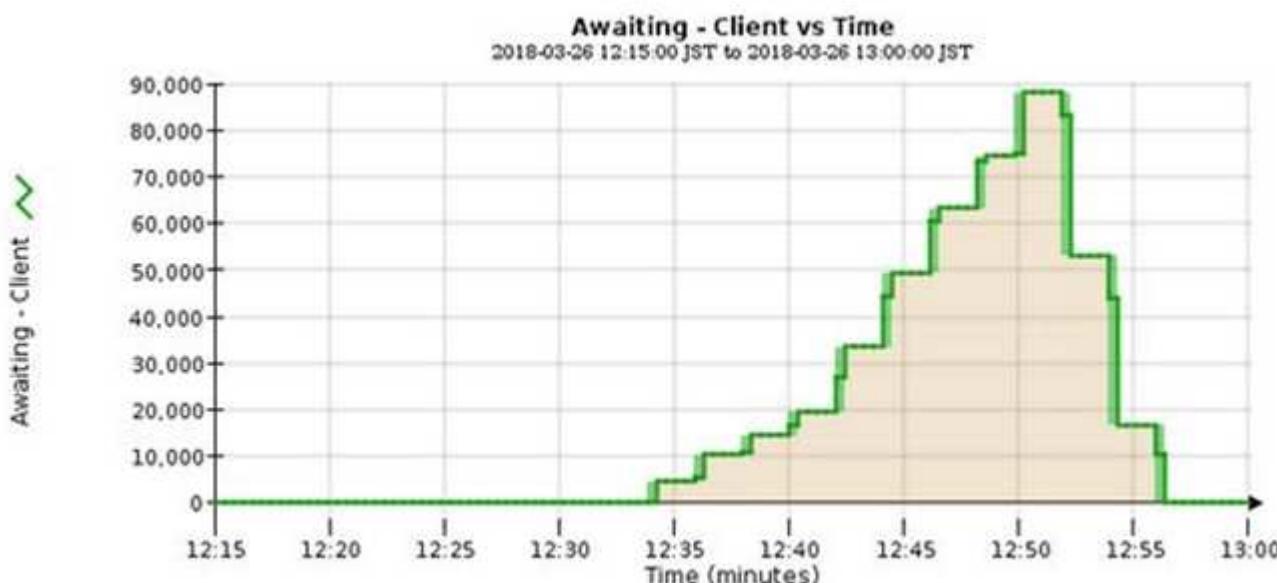
The StorageGRID system manages objects by applying the active ILM policy. The ILM policy and associated ILM rules determine how many copies are made, the type of copies that are created, where copies are placed, and the length of time each copy is retained.

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 cannot 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 in the Information Lifecycle Management (ILM) panel.
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. Hover 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 network connections and performance

Grid nodes must be able to communicate with one another to permit the grid to operate. The integrity of the network between nodes and sites, and the network bandwidth between sites, are critical to efficient operations.

What you'll need

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

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 simply to poor ingest performance and ILM backlogs.

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

Additionally, consider creating network traffic classification policies to provide monitoring and limiting for traffic related to specific tenants, buckets, subnets, or load balancer endpoints. See the [instructions for administering StorageGRID](#).

Steps

1. Select **NODES**.

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

NetApp | StorageGRID Grid Manager

Search by page title ? Root

DASHBOARD

ALERTS

NODES

TENANTS

ILM

CONFIGURATION

MAINTENANCE

SUPPORT

Nodes

View the list and status of sites and grid nodes.

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	—	—	5%
DC1-ARC1	Archive Node	—	—	4%
DC1-G1	Gateway Node	—	—	2%
DC1-S1	Storage Node	0%	0%	12%
DC1-S2	Storage Node	0%	0%	10%

- 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.



- 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.

<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	223b0ccb-6968-4646-b32d-7665bddc894b	

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.

To create, edit, or delete traffic classification policies, see the [instructions for administering StorageGRID](#).

Related information

[View the Network tab](#)

[Monitor node connection states](#)

Monitor node-level resources

You should monitor individual grid nodes to check their resource utilization levels.

What you'll need

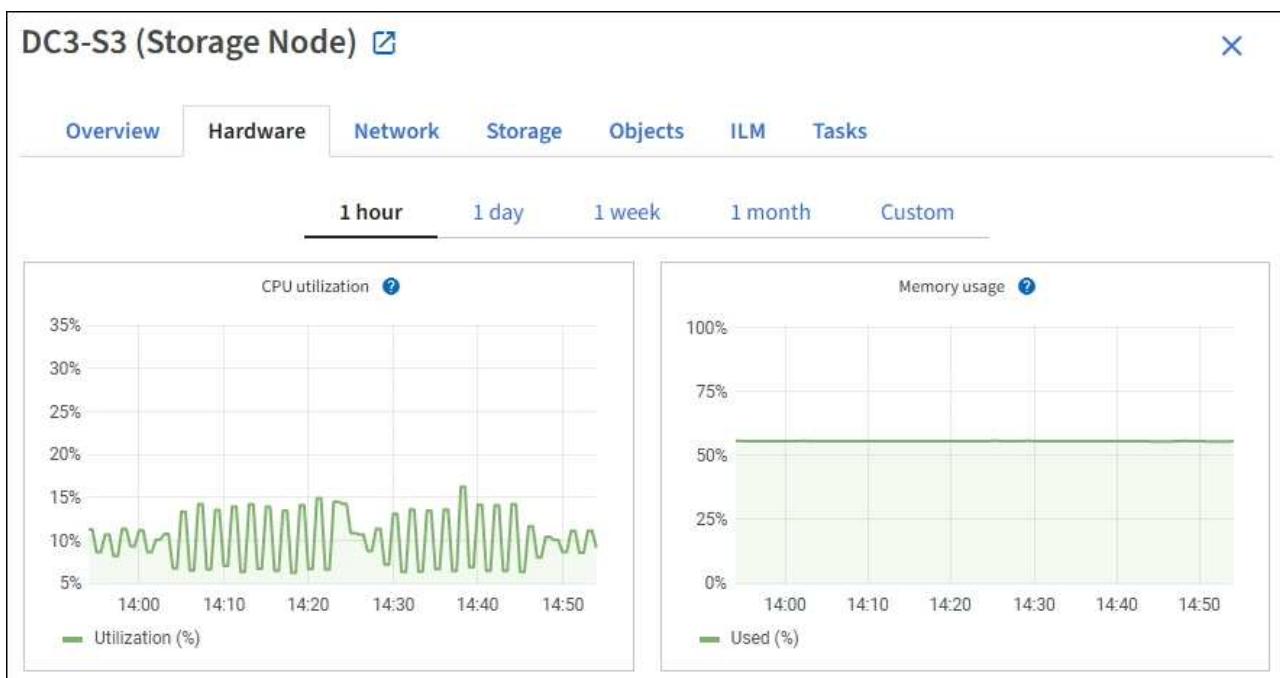
- You must be signed in to the Grid Manager using a [supported web browser](#).

About this task

If nodes are consistently overloaded, more nodes might be required for efficient operations.

Steps

1. To view information about hardware utilization of a grid node:
 - a. From the **NODES** page, select the node.
 - b. Select the **Hardware** tab to display graphs of CPU Utilization and Memory Usage.



- c. 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.
- d. 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 client activity is associated with a tenant account. You can use the Grid Manager to monitor a tenant's storage usage or network traffic, or you can use the audit log or

Grafana dashboards to gather more detailed information about how tenants are using StorageGRID.

What you'll need

- You are signed in to the Grid Manager using a [supported web browser](#).
- You have the Root Access or Administrator permission.

About this task



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

Steps

1. Select **TENANTS** to review the amount of storage used by all tenants.

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 (—).

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

You can sign in to a tenant account by selecting the sign-in link → in the **Sign in/Copy URL** column of the table.

You can copy the URL for a tenant's sign-in page by selecting the copy URL link [Copy](#) in the **Sign in/Copy URL** column of the table.

2. 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 a .csv file look like the following example:

Tenant ID	Display Name	Space Used (Bytes)	Quota utilization (%)	Quota (Bytes)	Object Count	Protocol
12659822378459233654	Tenant 01	20000000000	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.

- To view details for a specific tenant, including usage charts, select the tenant account name from the Tenants page.

Tenant 02

Tenant ID: 4103 1879 2208 5551 2180 [Edit](#) Quota utilization: 85%

Protocol: S3 Logical space used: 85.00 GB

Object count: 500 Quota: 100.00 GB

[Sign in](#) [Edit](#) [Actions ▾](#)

[Space breakdown](#) [Allowed features](#)

Bucket space consumption [?](#)

85.00 GB of 100.00 GB used

15.00 GB remaining (15%).

Bucket	Space Used (GB)	Percentage
bucket-01	85.00	85%
bucket-02	15.00	15%
bucket-03	0.00	0%

0 25% 50% 75% 100%

bucket-01 bucket-02 bucket-03

Bucket details

[Export to CSV](#) [Search](#) Displaying 3 results

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

- Tenant overview

The overview area for the tenant contains values for object count, quota utilization, logical space used, and the quota setting.

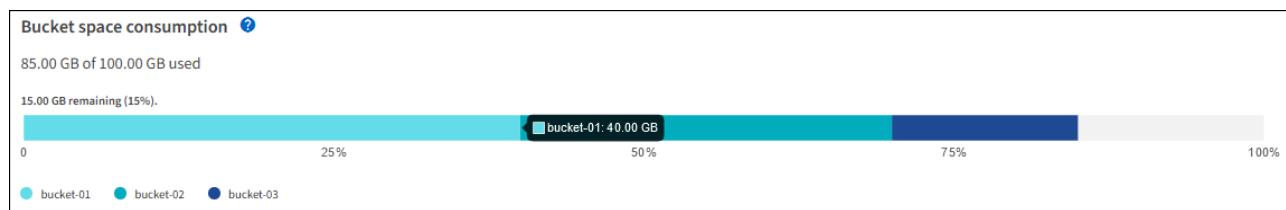
- Space breakdown — Space consumption

The Space breakdown tab includes values for bucket (S3) or container (Swift) total space consumption as well as space used and object count for each bucket or container.

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 to determine if tenants are consuming their quotas. If enabled, this alert is triggered when a tenant has used 90% of its quota. For more information, see the alerts reference.

- **Space breakdown — Bucket or container details**

The **Bucket details** (S3) or **Container details** (Swift) table lists the buckets or 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.

4. 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.

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

- 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.

Actions			
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	223b0ccb-6968-4646-b32d-7665bddc894b	
Displaying 2 traffic classification policies.			

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

To create, edit, or delete traffic classification policies, see the instructions for administering StorageGRID.

6. Optionally, 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 the instructions for understanding audit messages for more information.

7. 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.

Related information

[Alerts reference](#)

[Review audit logs](#)

Administer StorageGRID

Review support metrics

Monitor archival capacity

You cannot 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.

What you'll need

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

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.

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.

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.

What you'll need

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

About this task

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



The CLB service is deprecated.

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.

See the section on configuring client connections in the instructions for administering StorageGRID.

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 Master.
Nodes with the role of Master and nodes that are not 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 do not 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 breakdown of traffic being served by the Load Balancer service.
2. If S3 or Swift clients connect using the CLB service (deprecated), perform the following checks:
 - a. Select **NODES**.
 - b. Select a Gateway 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 Master.

Nodes with the role of Master and nodes that are not in an HA group should be actively distributing requests to clients.
- d. For each Gateway Node that should be actively distributing client requests, select **SUPPORT > Tools > Grid topology**.
- e. Select **Gateway Node > CLB > HTTP > Overview > Main**.
- f. Review the number of **Incoming Sessions - Established** to verify that the Gateway Node has been actively handling requests.

3. 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.

Related information

[Administer StorageGRID](#)

[View the Load Balancer tab](#)

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 the NetApp Downloads page for StorageGRID.

[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 pull-down menu, and click **Go**.
 - b. Sign in using the username and password for your NetApp account.
 - c. Read the End User License Agreement, select the check box, and then select **Accept & Continue**.

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 the “What’s new” topic in the instructions for upgrading StorageGRID.
 - 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 StorageGRID.
 - For a hotfix, locate the hotfix procedure in the recovery and maintenance instructions

Related information

[Upgrade software](#)

[Recover and maintain](#)

Manage alerts and alarms

Manage alerts and alarms: Overview

The StorageGRID alert system is designed to inform you about operational issues that require your attention. The legacy alarm system is deprecated.

Alert system

The alert system is designed to be your primary tool for monitoring any issues that might occur in your StorageGRID system. The alert system provides an easy-to-use interface for detecting, evaluating, and resolving issues.

Alerts are triggered at specific severity levels when alert rule conditions evaluate as true. When an alert is triggered, the following actions occur:

- An alert severity icon is shown on the Dashboard in the Grid Manager, and the count of Current Alerts is incremented.
- The alert is shown on the **NODES** summary page and on the **NODES > node > Overview** tab.
- An email notification is sent, assuming you have configured an SMTP server and provided email addresses for the recipients.
- An Simple Network Management Protocol (SNMP) notification is sent, assuming you have configured the StorageGRID SNMP agent.

Legacy alarm system

Like alerts, alarms are triggered at specific severity levels when attributes reach defined threshold values. However, unlike alerts, many alarms are triggered for events that you can safely ignore, which might result in an excessive number of email or SNMP notifications.



The alarm system is deprecated and will be removed in a future release. If you are still using legacy alarms, you should fully transition to the alert system as soon as possible.

When an alarm is triggered, the following actions occur:

- The alarm appears on the **SUPPORT > Alarms (legacy) > Current alarms** page.

- An email notification is sent, assuming you have configured an SMTP server and configured one or more mailing lists.
- An SNMP notification might be sent, assuming you have configured the StorageGRID SNMP agent. (SNMP notifications are not sent for all alarms or alarm severities.)

Compare alerts and alarms

There are a number of similarities between the alert system and the legacy alarm system, but the alert system offers significant benefits and is easier to use.

Refer to the following table to learn how to perform similar operations.

	Alerts	Alarms (legacy system)
How do I see which alerts or alarms are active?	<ul style="list-style-type: none"> • Select the Current alerts link on the Dashboard. • Select the alert on the NODES > Overview page. • Select ALERTS > Current. View current alerts	Select SUPPORT > Alarms (legacy) > Current alarms . Manage alarms (legacy system)
What causes an alert or an alarm to be triggered?	Alerts are triggered when a Prometheus expression in an alert rule evaluates as true for the specific trigger condition and duration. View alert rules	Alarms are triggered when a StorageGRID attribute reaches a threshold value. Manage alarms (legacy system)
If an alert or alarm is triggered, how do I resolve the underlying problem?	The recommended actions for an alert are included in email notifications and are available from the Alerts pages in the Grid Manager. As required, additional information is provided in the StorageGRID documentation. Alerts reference	You can learn about an alarm by selecting the attribute name, or you can search for an alarm code in the StorageGRID documentation. Alarms reference (legacy system)
Where can I see a list of alerts or alarms that have been resolved?	Select ALERTS > Resolved . View resolved alerts	Select SUPPORT > Alarms (legacy) > Historical alarms . Manage alarms (legacy system)

	Alerts	Alarms (legacy system)
Where do I manage the settings?	Select ALERTS > Rules . Manage alerts	Select SUPPORT . Then, use the options in the Alarms (legacy) section of the menu. Manage alarms (legacy system)
What user group permissions do I need?	<ul style="list-style-type: none"> Anyone who can sign in to the Grid Manager can view current and resolved alerts. You must have the Manage Alerts permission to manage silences, alert notifications, and alert rules. Administer StorageGRID	<ul style="list-style-type: none"> Anyone who can sign in to the Grid Manager can view legacy alarms. You must have the Acknowledge Alarms permission to acknowledge alarms. You must have both the Grid Topology Page Configuration and Other Grid Configuration permissions to manage global alarms and email notifications. Administer StorageGRID
How do I manage email notifications?	Select ALERTS > Email setup . Note: Because alarms and alerts are independent systems, the email setup used for alarm and AutoSupport notifications is not used for alert notifications. However, you can use the same mail server for all notifications. Set up email notifications for alerts	Select SUPPORT > Alarms (legacy) > Legacy email setup . Manage alarms (legacy system)
How do I manage SNMP notifications?	Select CONFIGURATION > Monitoring > SNMP agent . Use SNMP monitoring	Select CONFIGURATION > Monitoring > SNMP agent . Use SNMP monitoring Note: SNMP notifications are not sent for every alarm or alarm severity. Alarms that generate SNMP notifications (legacy system)

	Alerts	Alarms (legacy system)
How do I control who receives notifications?	<p>1. Select ALERTS > Email setup.</p> <p>2. In the Recipients section, enter an email address for each email list or person who should receive an email when an alert occurs.</p> <p>Set up email notifications for alerts</p>	<p>1. Select SUPPORT > Alarms (legacy) > Legacy email setup.</p> <p>2. Creating a mailing list.</p> <p>3. Select Notifications.</p> <p>4. Select the mailing list.</p> <p>Manage alarms (legacy system)</p>
Which Admin Nodes send notifications?	<p>A single Admin Node (the “preferred sender”).</p> <p>Administer StorageGRID</p>	<p>A single Admin Node (the “preferred sender”).</p> <p>Administer StorageGRID</p>
How do I suppress some notifications?	<p>1. Select ALERTS > Silences.</p> <p>2. Select the alert rule you want to silence.</p> <p>3. Specify a duration for the silence.</p> <p>4. Select the severity of alert you want to silence.</p> <p>5. Select to apply the silence to the entire grid, a single site, or a single node.</p> <p>Note: If you have enabled the SNMP agent, silences also suppress SNMP traps and informs.</p> <p>Silence alert notifications</p>	<p>1. Select SUPPORT > Alarms (legacy) > Legacy email setup.</p> <p>2. Select Notifications.</p> <p>3. Select a mailing list, and select Suppress.</p> <p>Manage alarms (legacy system)</p>
How do I suppress all notifications?	<p>Select ALERTS > Silences. Then, select All rules.</p> <p>Note: If you have enabled the SNMP agent, silences also suppress SNMP traps and informs.</p> <p>Silence alert notifications</p>	<p>1. Select CONFIGURATION > System > Display options.</p> <p>2. Select the Notification Suppress All check box.</p> <p>Note: Suppressing email notifications system wide also suppresses event-triggered AutoSupport emails.</p> <p>Manage alarms (legacy system)</p>

	Alerts	Alarms (legacy system)
How do I customize the conditions and triggers?	<p>1. Select ALERTS > Rules. 2. Select a default rule to edit, or select Create custom rule.</p> <p>Edit alert rules Create custom alert rules</p>	<p>1. Select SUPPORT > Alarms (legacy) > Global alarms. 2. Create a Global Custom alarm to override a Default alarm or to monitor an attribute that does not have a Default alarm.</p> <p>Manage alarms (legacy system)</p>
How do I disable an individual alert or alarm?	<p>1. Select ALERTS > Rules. 2. Select the rule, and select Edit rule. 3. Unselect the Enabled check box.</p> <p>Disable alert rules</p>	<p>1. Select SUPPORT > Alarms (legacy) > Global alarms. 2. Select the rule, and select the Edit icon. 3. Unselect the Enabled check box.</p> <p>Manage alarms (legacy system)</p>

Manage alerts

Manage alerts: overview

Alerts allow you to monitor various events and conditions within your StorageGRID system. You can manage alerts by creating custom alerts, editing or disabling the default alerts, setting up email notifications for alerts, and silencing alert notifications.

About StorageGRID alerts

The alert system provides an easy-to-use interface for detecting, evaluating, and resolving the issues that can occur during StorageGRID operation.

- The alert system focuses on actionable problems in the system. Alerts are triggered for events that require your immediate attention, not for events that can safely be ignored.
- The Current Alerts page provides a user-friendly interface for viewing current problems. You can sort the listing by individual alerts and alert groups. For example, you might want to sort all alerts by node/site to see which alerts are affecting a specific node. Or, you might want to sort the alerts in a group by time triggered to find the most recent instance of a specific alert.
- The Resolved Alerts page provides similar information as on the Current Alerts page, but it allows you to search and view a history of the alerts that have been resolved, including when the alert was triggered and when it was resolved.
- Multiple alerts of the same type are grouped into one email to reduce the number of notifications. In addition, multiple alerts of the same type are shown as a group on the Alerts page. You can expand and collapse alert groups to show or hide the individual alerts. For example, if several nodes report the **Unable to communicate with node** alert at about the same time, only one email is sent and the alert is shown as a group on the Alerts page.
- Alerts use intuitive names and descriptions to help you quickly understand the problem. Alert notifications include details about the node and site affected, the alert severity, the time when the alert rule was

triggered, and the current value of metrics related to the alert.

- Alert emails notifications and the alert listings on the Current Alerts and Resolved Alerts pages provide recommended actions for resolving an alert. These recommended actions often include direct links to the StorageGRID documentation center to make it easier to find and access more detailed troubleshooting procedures.
- If you need to temporarily suppress the notifications for an alert at one or more severity levels, you can easily silence a specific alert rule for a specified duration and for the entire grid, a single site, or a single node. You can also silence all alert rules, for example, during a planned maintenance procedure such as a software upgrade.
- You can edit the default alert rules as required. You can disable an alert rule completely, or change its trigger conditions and duration.
- You can create custom alert rules to target the specific conditions that are relevant to your situation and to provide your own recommended actions. To define the conditions for a custom alert, you create expressions using the Prometheus metrics available from the Metrics section of the Grid Management API.

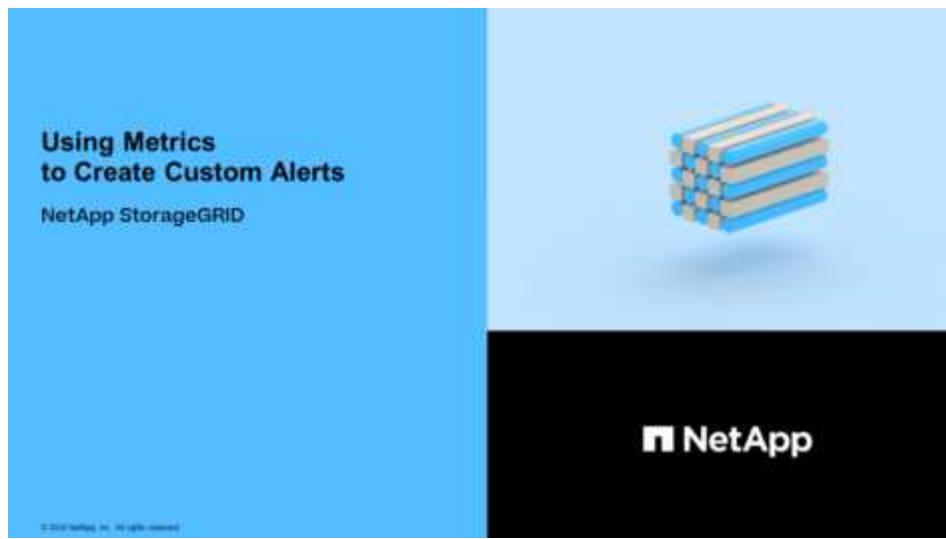
Learn more

To learn more, review these videos:

- [Video: Overview of Alerts](#)



- [Video: Using Metrics to Create Custom Alerts](#)



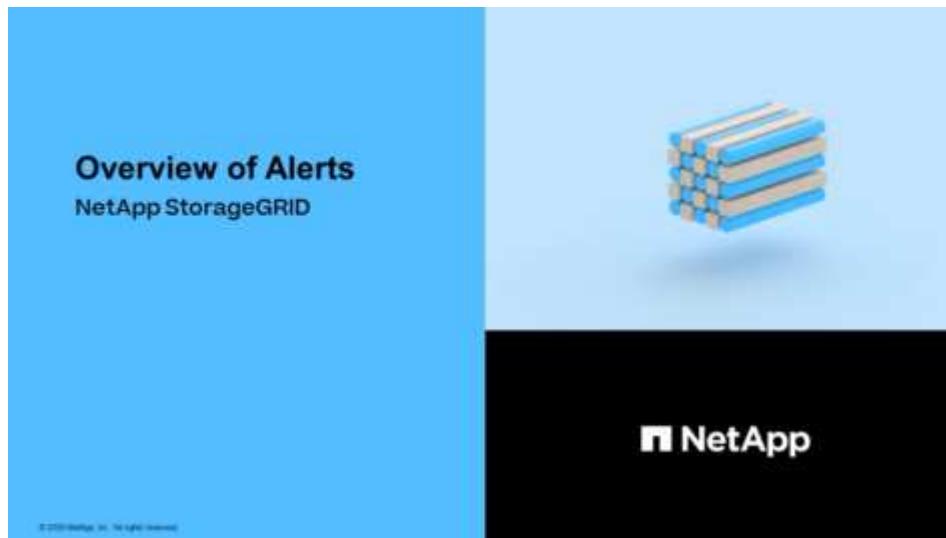
View alert rules

Alert rules define the conditions that trigger [specific alerts](#). StorageGRID includes a set of default alert rules, which you can use as is or modify, or you can create custom alert rules.

You can view the list of all default and custom alert rules to learn which conditions will trigger each alert and to see whether any alerts are disabled.

What you'll need

- You are signed in to the Grid Manager using a [supported web browser](#).
- You have the Manage Alerts or Root Access permission.
- Optionally, you have watched the video: [Video: Overview of Alerts](#)



Steps

1. Select **ALERTS > Rules**.

The Alert Rules page appears.

Alert rules define which conditions trigger specific alerts.

You can edit the conditions for default alert rules to better suit your environment, or create custom alert rules that use your own conditions for triggering alerts.

 Create custom rule	 Edit rule	 Remove custom rule
Name	Conditions	Type
Appliance battery expired The battery in the appliance's storage controller has expired.	storagegrid_appliance_component_failure(type="REC_EXPIRED_BATTERY") Major > 0	Default Enabled
Appliance battery failed The battery in the appliance's storage controller has failed.	storagegrid_appliance_component_failure(type="REC_FAILED_BATTERY") Major > 0	Default Enabled
Appliance battery has insufficient learned capacity The battery in the appliance's storage controller has insufficient learned capacity.	storagegrid_appliance_component_failure(type="REC_BATTERY_WARN") Major > 0	Default Enabled
Appliance battery near expiration The battery in the appliance's storage controller is nearing expiration.	storagegrid_appliance_component_failure(type="REC_BATTERY_NEAR_EXPIRATION") Major > 0	Default Enabled
Appliance battery removed The battery in the appliance's storage controller is missing.	storagegrid_appliance_component_failure(type="REC_REMOVED_BATTERY") Major > 0	Default Enabled
Appliance battery too hot The battery in the appliance's storage controller is overheated.	storagegrid_appliance_component_failure(type="REC_BATTERY_OVERTEMP") Major > 0	Default Enabled
Appliance cache backup device failed A persistent cache backup device has failed.	storagegrid_appliance_component_failure(type="REC_CACHE_BACKUP_DEVICE_FAILED") Major > 0	Default Enabled
Appliance cache backup device insufficient capacity There is insufficient cache backup device capacity.	storagegrid_appliance_component_failure(type="REC_CACHE_BACKUP_DEVICE_INSUFFICIENT_CAPACITY") Major > 0	Default Enabled
Appliance cache backup device write-protected A cache backup device is write-protected.	storagegrid_appliance_component_failure(type="REC_CACHE_BACKUP_DEVICE_WRITE_PROTECTED") Major > 0	Default Enabled
Appliance cache memory size mismatch The two controllers in the appliance have different cache sizes.	storagegrid_appliance_component_failure(type="REC_CACHE_MEM_SIZE_MISMATCH") Major > 0	Default Enabled

Displaying 62 alert rules.

2. Review the information in the alert rules table:

Column header	Description
Name	The unique name and description of the alert rule. Custom alert rules are listed first, followed by default alert rules. The alert rule name is the subject for email notifications.
Conditions	<p>The Prometheus expressions that determine when this alert is triggered. An alert can be triggered at one or more of the following severity levels, but a condition for each severity is not required.</p> <ul style="list-style-type: none"> • 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. • 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. • 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 do not clear on their own to ensure they do not result in a more serious problem.

Column header	Description
Type	<p>The type of alert rule:</p> <ul style="list-style-type: none"> • Default: An alert rule provided with the system. You can disable a default alert rule or edit the conditions and duration for a default alert rule. You cannot remove a default alert rule. • Default*: A default alert rule that includes an edited condition or duration. As required, you can easily revert a modified condition back to the original default. • Custom: An alert rule that you created. You can disable, edit, and remove custom alert rules.
Status	<p>Whether this alert rule is currently enabled or disabled. The conditions for disabled alert rules are not evaluated, so no alerts are triggered.</p>

Create custom alert rules

You can create custom alert rules to define your own conditions for triggering alerts.

What you'll need

- You are signed in to the Grid Manager using a [supported web browser](#)
- You have the Manage Alerts or Root Access permission
- You are familiar with the [commonly used Prometheus metrics](#)
- You understand the [syntax of Prometheus queries](#)
- Optionally, you have watched the video: [Video: Using Metrics to Create Custom Alerts](#)



About this task

StorageGRID does not validate custom alerts. If you decide to create custom alert rules, follow these general guidelines:

- Look at the conditions for the default alert rules, and use them as examples for your custom alert rules.

- If you define more than one condition for an alert rule, use the same expression for all conditions. Then, change the threshold value for each condition.
- Carefully check each condition for typos and logic errors.
- Use only the metrics listed in the Grid Management API.
- When testing an expression using the Grid Management API, be aware that a “successful” response might simply be an empty response body (no alert triggered). To see if the alert is actually triggered, you can temporarily set a threshold to a value you expect to be true currently.

For example, to test the expression `node_memory_MemTotal_bytes < 24000000000`, first execute `node_memory_MemTotal_bytes >= 0` and ensure you get the expected results (all nodes return a value). Then, change the operator and the threshold back to the intended values and execute again. No results indicate there are no current alerts for this expression.

- Do not assume a custom alert is working unless you have validated that the alert is triggered when expected.

Steps

1. Select **ALERTS > Rules**.

The Alert Rules page appears.

2. Select **Create custom rule**.

The Create Custom Rule dialog box appears.

Create Custom Rule

Enabled

Unique Name

Description

Recommended Actions
(optional)

Conditions

Minor

Major

Critical

Enter the amount of time a condition must continuously remain in effect before an alert is triggered.

Duration

 5 minutes ▾

Cancel

Save

3. Select or unselect the **Enabled** check box to determine if this alert rule is currently enabled.

If an alert rule is disabled, its expressions are not evaluated and no alerts are triggered.

4. Enter the following information:

Field	Description
Unique Name	A unique name for this rule. The alert rule name is shown on the Alerts page and is also the subject for email notifications. Names for alert rules can be between 1 and 64 characters.
Description	A description of the problem that is occurring. The description is the alert message shown on the Alerts page and in email notifications. Descriptions for alert rules can be between 1 and 128 characters.

Field	Description
Recommended Actions	Optionally, the recommended actions to take when this alert is triggered. Enter recommended actions as plain text (no formatting codes). Recommended actions for alert rules can be between 0 and 1,024 characters.

5. In the Conditions section, enter a Prometheus expression for one or more of the alert severity levels.

A basic expression is usually of the form:

```
[metric] [operator] [value]
```

Expressions can be any length, but appear on a single line in the user interface. At least one expression is required.

This expression causes an alert to be triggered if the amount of installed RAM for a node is less than 24,000,000,000 bytes (24 GB).

```
node_memory_MemTotal_bytes < 24000000000
```

To see available metrics and to test Prometheus expressions, select the help icon  and follow the link to the Metrics section of the Grid Management API.

6. In the **Duration** field, enter the amount of time a condition must continuously remain in effect before the alert is triggered, and select a unit of time.

To trigger an alert immediately when a condition becomes true, enter **0**. Increase this value to prevent temporary conditions from triggering alerts.

The default is 5 minutes.

7. Select **Save**.

The dialog box closes, and the new custom alert rule appears in the Alert Rules table.

Edit alert rules

You can edit an alert rule to change the trigger conditions. For a custom alert rule, you can also update the rule name, description, and recommended actions.

What you'll need

- You are signed in to the Grid Manager using a [supported web browser](#).
- You have the Manage Alerts or Root Access permission.

About this task

When you edit a default alert rule, you can change the conditions for minor, major, and critical alerts; and the duration. When you edit a custom alert rule, you can also edit the rule's name, description, and recommended actions.



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.

Steps

1. Select **ALERTS > Rules**.

The Alert Rules page appears.

2. Select the radio button for the alert rule you want to edit.

3. Select **Edit rule**.

The Edit Rule dialog box appears. This example shows a default alert rule—the Unique Name, Description, and Recommended Actions fields are disabled and cannot be edited.

Edit Rule - Low installed node memory

Enabled	<input checked="" type="checkbox"/>
Unique Name	Low installed node memory
Description	The amount of installed memory on a node is low.
Recommended Actions (optional)	Increase the amount of RAM available to the virtual machine or Linux host. Check the threshold value for the major alert to determine the default minimum requirement for a StorageGRID node. See the instructions for your platform: <ul style="list-style-type: none">• VMware installation• Red Hat Enterprise Linux or CentOS installation• Ubuntu or Debian installation
Conditions ?	
Minor	
Major	node_memory_MemTotal_bytes < 24000000000
Critical	node_memory_MemTotal_bytes <= 12000000000
Enter the amount of time a condition must continuously remain in effect before an alert is triggered.	
Duration	2 minutes ▾
Cancel Save	

4. Select or unselect the **Enabled** check box to determine if this alert rule is currently enabled.

If an alert rule is disabled, its expressions are not evaluated and no alerts are triggered.



If you disable the alert rule for a current alert, you must wait a few minutes for the alert to no longer appear as an active alert.



In general, disabling a default alert rule is not recommended. If an alert rule is disabled, you might not detect an underlying problem until it prevents a critical operation from completing.

5. For custom alert rules, update the following information as required.



You cannot edit this information for default alert rules.

Field	Description
Unique Name	A unique name for this rule. The alert rule name is shown on the Alerts page and is also the subject for email notifications. Names for alert rules can be between 1 and 64 characters.
Description	A description of the problem that is occurring. The description is the alert message shown on the Alerts page and in email notifications. Descriptions for alert rules can be between 1 and 128 characters.
Recommended Actions	Optionally, the recommended actions to take when this alert is triggered. Enter recommended actions as plain text (no formatting codes). Recommended actions for alert rules can be between 0 and 1,024 characters.

6. In the Conditions section, enter or update the Prometheus expression for one or more of the alert severity levels.



If you want to restore a condition for an edited default alert rule back to its original value, select the three dots to the right of the modified condition.

Conditions

Minor	<input type="text"/>
Major	<input type="text"/> node_memory_MemTotal_bytes < 24000000000
Critical	<input type="text"/> node_memory_MemTotal_bytes <= 14000000000



If you update the conditions for a current alert, your changes might not be implemented until the previous condition is resolved. The next time one of the conditions for the rule is met, the alert will reflect the updated values.

A basic expression is usually of the form:

```
[metric] [operator] [value]
```

Expressions can be any length, but appear on a single line in the user interface. At least one expression is required.

This expression causes an alert to be triggered if the amount of installed RAM for a node is less than 24,000,000,000 bytes (24 GB).

```
node_memory_MemTotal_bytes < 24000000000
```

7. In the **Duration** field, enter the amount of time a condition must continuously remain in effect before the

alert is triggered, and select the unit of time.

To trigger an alert immediately when a condition becomes true, enter **0**. Increase this value to prevent temporary conditions from triggering alerts.

The default is 5 minutes.

8. Select **Save**.

If you edited a default alert rule, **Default*** appears in the Type column. If you disabled a default or custom alert rule, **Disabled** appears in the **Status** column.

Disable alert rules

You can change the enabled/disabled state for a default or custom alert rule.

What you'll need

- You are signed in to the Grid Manager using a [supported web browser](#).
- You have the Manage Alerts or Root Access permission.

About this task

When an alert rule is disabled, its expressions are not evaluated and no alerts are triggered.



In general, disabling a default alert rule is not recommended. If an alert rule is disabled, you might not detect an underlying problem until it prevents a critical operation from completing.

Steps

1. Select **ALERTS > Rules**.

The Alert Rules page appears.

2. Select the radio button for the alert rule you want to disable or enable.

3. Select **Edit rule**.

The Edit Rule dialog box appears.

4. Select or unselect the **Enabled** check box to determine if this alert rule is currently enabled.

If an alert rule is disabled, its expressions are not evaluated and no alerts are triggered.



If you disable the alert rule for a current alert, you must wait a few minutes for the alert to no longer display as an active alert.

5. Select **Save**.

Disabled appears in the **Status** column.

Remove custom alert rules

You can remove a custom alert rule if you no longer want to use it.

What you'll need

- You are signed in to the Grid Manager using a [supported web browser](#).
- You have the Manage Alerts or Root Access permission.

Steps

1. Select **ALERTS > Rules**.

The Alert Rules page appears.

2. Select the radio button for the custom alert rule you want to remove.

You cannot remove a default alert rule.

3. Select **Remove custom rule**.

A confirmation dialog box appears.

4. Select **OK** to remove the alert rule.

Any active instances of the alert will be resolved within 10 minutes.

Manage alert notifications

Set up SNMP notifications for alerts

If you want StorageGRID to send SNMP notifications when alerts occur, you must enable the StorageGRID SNMP agent and configure one or more trap destinations.

You can use the **CONFIGURATION > Monitoring > SNMP agent** option in the Grid Manager or the SNMP endpoints for the Grid Management API to enable and configure the StorageGRID SNMP agent. The SNMP agent supports all three versions of the SNMP protocol.

To learn how to configure the SNMP agent, see [Use SNMP monitoring](#).

After you configure the StorageGRID SNMP agent, two types of event-driven notifications can be sent:

- Traps are notifications sent by the SNMP agent that do not require acknowledgment by the management system. Traps serve to notify the management system that something has happened within StorageGRID, such as an alert being triggered. Traps are supported in all three versions of SNMP.
- Informs are similar to traps, but they require acknowledgment by the management system. If the SNMP agent does not receive an acknowledgment within a certain amount of time, it resends the inform until an acknowledgment is received or the maximum retry value has been reached. Informs are supported in SNMPv2c and SNMPv3.

Trap and inform notifications are sent when a default or custom alert is triggered at any severity level. To suppress SNMP notifications for an alert, you must configure a silence for the alert. See [Silence alert notifications](#).

Alert notifications are sent by whichever Admin Node is configured to be the preferred sender. By default, the primary Admin Node is selected. See the [instructions for administering StorageGRID](#).



Trap and inform notifications are also sent when certain alarms (legacy system) are triggered at specified severity levels or higher; however, SNMP notifications are not sent for every alarm or every alarm severity. See [Alarms that generate SNMP notifications \(legacy system\)](#).

Set up email notifications for alerts

If you want email notifications to be sent when alerts occur, you must provide information about your SMTP server. You must also enter email addresses for the recipients of alert notifications.

What you'll need

- You are signed in to the Grid Manager using a [supported web browser](#).
- You have the Manage Alerts or Root Access permission.

About this task

Because alarms and alerts are independent systems, the email setup used for alert notifications is not used for alarm notifications and AutoSupport messages. However, you can use the same email server for all notifications.

If your StorageGRID deployment includes multiple Admin Nodes, you can select which Admin Node should be the preferred sender of alert notifications. The same “preferred sender” is also used for alarm notifications and AutoSupport messages. By default, the primary Admin Node is selected. For details, see the [Instructions for administering StorageGRID](#).

Steps

1. Select **ALERTS > Email setup**.

The Email Setup page appears.

Email Setup

You can configure the email server for alert notifications, define filters to limit the number of notifications, and enter email addresses for alert recipients.

Use these settings to define the email server used for alert notifications. These settings are not used for alarm notifications and AutoSupport. See [Managing alerts and alarms in the instructions for monitoring and troubleshooting StorageGRID](#).

Enable Email Notifications

Save

2. Select the **Enable Email Notifications** check box to indicate that you want notification emails to be sent when alerts reach configured thresholds.

The Email (SMTP) Server, Transport Layer Security (TLS), Email Addresses, and Filters sections appear.

3. In the Email (SMTP) Server section, enter the information StorageGRID needs to access your SMTP server.

If your SMTP server requires authentication, you must provide both a username and a password.

Field	Enter
Mail Server	The fully qualified domain name (FQDN) or IP address of the SMTP server.
Port	The port used to access the SMTP server. Must be between 1 and 65535.
Username (optional)	If your SMTP server requires authentication, enter the username to authenticate with.
Password (optional)	If your SMTP server requires authentication, enter the password to authenticate with.

Email (SMTP) Server

Mail Server 	10.224.1.250
Port 	25
Username (optional) 	smtpuser
Password (optional) 	*****

4. In the Email Addresses section, enter email addresses for the sender and for each recipient.
 - a. For the **Sender Email Address**, specify a valid email address to use as the From address for alert notifications.
For example: storagegrid-alerts@example.com
 - b. In the Recipients section, enter an email address for each email list or person who should receive an email when an alert occurs.
Select the plus icon  to add recipients.

Email Addresses

Sender Email Address 	storagegrid-alerts@example.com
Recipient 1 	recipient1@example.com 
Recipient 2 	recipient2@example.com  

5. If Transport Layer Security (TLS) is required for communications with the SMTP server, select **Require TLS** in the Transport Layer Security (TLS) section.
 - a. In the **CA Certificate** field, provide the CA certificate that will be used to verify the identify of the SMTP server.

You can copy and paste the contents into this field, or select **Browse** and select the file.

You must provide a single file that contains the certificates from each intermediate issuing certificate authority (CA). The file should contain each of the PEM-encoded CA certificate files, concatenated in certificate chain order.

- b. Select the **Send Client Certificate** check box if your SMTP email server requires email senders to provide client certificates for authentication.

- c. In the **Client Certificate** field, provide the PEM-encoded client certificate to send to the SMTP server.

You can copy and paste the contents into this field, or select **Browse** and select the file.

- d. In the **Private Key** field, enter the private key for the client certificate in unencrypted PEM encoding.

You can copy and paste the contents into this field, or select **Browse** and select the file.



If you need to edit the email setup, select the pencil icon to update this field.

Transport Layer Security (TLS)

Require TLS

CA Certificate

```
-----BEGIN CERTIFICATE-----  
1234567890abcdefghijklmnopqrstuvwxyz  
ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890  
-----END CERTIFICATE-----
```

[Browse](#)

Send Client Certificate

Client Certificate

```
-----BEGIN CERTIFICATE-----  
1234567890abcdefghijklmnopqrstuvwxyz  
ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890  
-----END CERTIFICATE-----
```

[Browse](#)

Private Key

```
-----BEGIN PRIVATE KEY-----  
1234567890abcdefghijklmnopqrstuvwxyz  
ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890  
-----BEGIN PRIVATE KEY-----
```

[Browse](#)

6. In the Filters section, select which alert severity levels should result in email notifications, unless the rule for a specific alert has been silenced.

Severity	Description
Minor, major, critical	An email notification is sent when the minor, major, or critical condition for an alert rule is met.
Major, critical	An email notification is sent when the major or critical condition for an alert rule is met. Notifications are not sent for minor alerts.
Critical only	An email notification is sent only when the critical condition for an alert rule is met. Notifications are not sent for minor or major alerts.

Filters

Severity Minor, major, critical Major, critical Critical only

7. When you are ready to test your email settings, perform these steps:

- a. Select **Send Test Email**.

A confirmation message appears, indicating that a test email was sent.

- b. Check the inboxes of all email recipients and confirm that a test email was received.



If the email is not received within a few minutes or if the **Email notification failure** alert is triggered, check your settings and try again.

- c. Sign in to any other Admin Nodes and send a test email to verify connectivity from all sites.



When you test alert notifications, you must sign in to every Admin Node to verify connectivity. This is in contrast to testing alarm notifications and AutoSupport messages, where all Admin Nodes send the test email.

8. Select **Save**.

Sending a test email does not save your settings. You must select **Save**.

The email settings are saved.

Information included in alert email notifications

After you configure the SMTP email server, email notifications are sent to the designated recipients when an alert is triggered, unless the alert rule is suppressed by a silence. See [Silence alert notifications](#).

Email notifications include the following information:

Low object data storage (6 alerts) 1The space available for storing object data is low. 2**Recommended actions** 3

Perform an expansion procedure. You can add storage volumes (LUNs) to existing Storage Nodes, or you can add new Storage Nodes. See the instructions for expanding a StorageGRID system.

DC1-S1-226

Node	DC1-S1-226
Site	DC1 225-230
Severity	Minor
Time triggered	Fri Jun 28 14:43:27 UTC 2019
Job	storagegrid
Service	ldr

DC1-S2-227

Node	DC1-S2-227
Site	DC1 225-230
Severity	Minor
Time triggered	Fri Jun 28 14:43:27 UTC 2019
Job	storagegrid
Service	ldr

Sent from: DC1-ADM1-225

5

Callout	Description
1	The name of the alert, followed by the number of active instances of this alert.
2	The description of the alert.
3	Any recommended actions for the alert.
4	Details about each active instance of the alert, including the node and site affected, the alert severity, the UTC time when the alert rule was triggered, and the name of the affected job and service.
5	The hostname of the Admin Node that sent the notification.

How alerts are grouped

To prevent an excessive number of email notifications from being sent when alerts are triggered, StorageGRID attempts to group multiple alerts in the same notification.

Refer to the following table for examples of how StorageGRID groups multiple alerts in email notifications.

Behavior	Example
Each alert notification applies only to alerts that have the same name. If two alerts with different names are triggered at the same time, two email notifications are sent.	<ul style="list-style-type: none"> Alert A is triggered on two nodes at the same time. Only one notification is sent. Alert A is triggered on node 1, and Alert B is triggered on node 2 at the same time. Two notifications are sent—one for each alert.
For a specific alert on a specific node, if the thresholds are reached for more than one severity, a notification is sent only for the most severe alert.	<ul style="list-style-type: none"> Alert A is triggered and the minor, major, and critical alert thresholds are reached. One notification is sent for the critical alert.
The first time an alert is triggered, StorageGRID waits 2 minutes before sending a notification. If other alerts with the same name are triggered during that time, StorageGRID groups all of the alerts in the initial notification.	<ol style="list-style-type: none"> Alert A is triggered on node 1 at 08:00. No notification is sent. Alert A is triggered on node 2 at 08:01. No notification is sent. At 08:02, a notification is sent to report both instances of the alert.
If an another alert with the same name is triggered, StorageGRID waits 10 minutes before sending a new notification. The new notification reports all active alerts (current alerts that have not been silenced), even if they were reported previously.	<ol style="list-style-type: none"> Alert A is triggered on node 1 at 08:00. A notification is sent at 08:02. Alert A is triggered on node 2 at 08:05. A second notification is sent at 08:15 (10 minutes later). Both nodes are reported.
If there are multiple current alerts with the same name and one of those alerts is resolved, a new notification is not sent if the alert reoccurs on the node for which the alert was resolved.	<ol style="list-style-type: none"> Alert A is triggered for node 1. A notification is sent. Alert A is triggered for node 2. A second notification is sent. Alert A is resolved for node 2, but it remains active for node 1. Alert A is triggered again for node 2. No new notification is sent because the alert is still active for node 1.
StorageGRID continues to send email notifications once every 7 days until all instances of the alert are resolved or the alert rule is silenced.	<ol style="list-style-type: none"> Alert A is triggered for node 1 on March 8. A notification is sent. Alert A is not resolved or silenced. Additional notifications are sent on March 15, March 22, March 29, and so on.

Troubleshoot alert email notifications

If the **Email notification failure** alert is triggered or you are unable to receive the test alert email notification, follow these steps to resolve the issue.

What you'll need

- You are signed in to the Grid Manager using a [supported web browser](#).
- You have the Manage Alerts or Root Access permission.

Steps

1. Verify your settings.
 - a. Select **ALERTS > Email setup**.
 - b. Verify that the Email (SMTP) Server settings are correct.
 - c. Verify that you have specified valid email addresses for the recipients.
2. Check your spam filter, and make sure that the email was not sent to a junk folder.
3. Ask your email administrator to confirm that emails from the sender address are not being blocked.
4. Collect a log file for the Admin Node, and then contact technical support.

Technical support can use the information in the logs to help determine what went wrong. For example, the `prometheus.log` file might show an error when connecting to the server you specified.

See [Collect log files and system data](#).

Silence alert notifications

Optionally, you can configure silences to temporarily suppress alert notifications.

What you'll need

- You are signed in to the Grid Manager using a [supported web browser](#).
- You have the Manage Alerts or Root Access permission.

About this task

You can silence alert rules on the entire grid, a single site, or a single node and for one or more severities. Each silence suppresses all notifications for a single alert rule or for all alert rules.

If you have enabled the SNMP agent, silences also suppress SNMP traps and informs.



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



Because alarms and alerts are independent systems, you cannot use this functionality to suppress alarm notifications.

Steps

1. Select **ALERTS > Silences**.

The Silences page appears.

Silences

You can configure silences to temporarily suppress alert notifications. Each silence suppresses the notifications for an alert rule at one or more severities. You can suppress an alert rule on the entire grid, a single site, or a single node.

Create Silence				
Alert Rule	Description	Severity	Time Remaining	Nodes
No results found.				

2. Select **Create**.

The Create Silence dialog box appears.

Create Silence

Alert Rule:

Description (optional):

Duration: Minutes ▾

Severity: Minor only Minor, major Minor, major, critical

Nodes:

- StorageGRID Deployment
 - Data Center 1
 - DC1-ADM1
 - DC1-G1
 - DC1-S1
 - DC1-S2
 - DC1-S3

Cancel **Save**

3. Select or enter the following information:

Field	Description
Alert Rule	<p>The name of the alert rule you want to silence. You can select any default or custom alert rule, even if the alert rule is disabled.</p> <p>Note: Select All rules if you want to silence all alert rules using the criteria specified in this dialog box.</p>
Description	Optionally, a description of the silence. For example, describe the purpose of this silence.

Field	Description
Duration	<p>How long you want this silence to remain in effect, in minutes, hours, or days. A silence can be in effect from 5 minutes to 1,825 days (5 years).</p> <p>Note: You should not silence an alert rule for an extended amount of time. If an alert rule is silenced, you might not detect an underlying problem until it prevents a critical operation from completing. However, you might need to use an extended silence if an alert is triggered by a specific, intentional configuration, such as might be the case for the Services appliance link down alerts and the Storage appliance link down alerts.</p>
Severity	<p>Which alert severity or severities should be silenced. If the alert is triggered at one of the selected severities, no notifications are sent.</p>
Nodes	<p>Which node or nodes you want this silence to apply to. You can suppress an alert rule or all rules on the entire grid, a single site, or a single node. If you select the entire grid, the silence applies to all sites and all nodes. If you select a site, the silence applies only to the nodes at that site.</p> <p>Note: You cannot select more than one node or more than one site for each silence. You must create additional silences if you want to suppress the same alert rule on more than one node or more than one site at one time.</p>

4. Select **Save**.

5. If you want to modify or end a silence before it expires, you can edit or remove it.

Option	Description
Edit a silence	<ol style="list-style-type: none"> Select ALERTS > Silences. From the table, select the radio button for the silence you want to edit. Select Edit. Change the description, the amount of time remaining, the selected severities, or the affected node. Select Save.
Remove a silence	<ol style="list-style-type: none"> Select ALERTS > Silences. From the table, select the radio button for the silence you want to remove. Select Remove. Select OK to confirm you want to remove this silence. <p>Note: Notifications will now be sent when this alert is triggered (unless suppressed by another silence). If this alert is currently triggered, it might take few minutes for email or SNMP notifications to be sent and for the Alerts page to update.</p>

Related information

- Configure the SNMP agent

Manage alarms (legacy system)

The StorageGRID alarm system is the legacy system used to identify trouble spots that sometimes occur during normal operation.



While the legacy alarm system continues to be supported, the alert system offers significant benefits and is easier to use.

Alarm classes (legacy system)

A legacy alarm can belong to one of two mutually exclusive alarm classes.

- Default alarms are provided with each StorageGRID system and cannot be modified. However, you can disable Default alarms or override them by defining Global Custom alarms.
- Global Custom alarms monitor the status of all services of a given type in the StorageGRID system. You can create a Global Custom alarm to override a Default alarm. You can also create a new Global Custom alarm. This can be useful for monitoring any customized conditions of your StorageGRID system.

Alarm triggering logic (legacy system)

A legacy alarm is triggered when a StorageGRID attribute reaches a threshold value that evaluates to true against a combination of alarm class (Default or Global Custom) and alarm severity level.

Icon	Color	Alarm severity	Meaning
	Yellow	Notice	The node is connected to the grid, but an unusual condition exists that does not affect normal operations.
	Light Orange	Minor	The node is connected to the grid, but an abnormal condition exists that could affect operation in the future. You should investigate to prevent escalation.
	Dark Orange	Major	The node is connected to the grid, but an abnormal condition exists that currently affects operation. This requires prompt attention to prevent escalation.
	Red	Critical	The node is connected to the grid, but an abnormal condition exists that has stopped normal operations. You should address the issue immediately.

The alarm severity and corresponding threshold value can be set for every numerical attribute. The NMS service on each Admin Node continuously monitors current attribute values against configured thresholds. When an alarm is triggered, a notification is sent to all designated personnel.

Note that a severity level of Normal does not trigger an alarm.

Attribute values are evaluated against the list of enabled alarms defined for that attribute. The list of alarms is checked in the following order to find the first alarm class with a defined and enabled alarm for the attribute:

1. Global Custom alarms with alarm severities from Critical down to Notice.
2. Default alarms with alarm severities from Critical down to Notice.

After an enabled alarm for an attribute is found in the higher alarm class, the NMS service only evaluates within that class. The NMS service will not evaluate against the other lower priority classes. That is, if there is an enabled Global Custom alarm for an attribute, the NMS service only evaluates the attribute value against Global Custom alarms. Default alarms are not evaluated. Thus, an enabled Default alarm for an attribute can meet the criteria needed to trigger an alarm, but it will not be triggered because a Global Custom alarm (that does not meet the specified criteria) for the same attribute is enabled. No alarm is triggered and no notification is sent.

Alarm triggering example

You can use this example to understand how Global Custom alarms and Default alarms are triggered.

For the following example, an attribute has a Global Custom alarm and a Default alarm defined and enabled as shown in the following table.

	Global Custom alarm threshold (enabled)	Default alarm threshold (enabled)
Notice	≥ 1500	≥ 1000
Minor	$\geq 15,000$	≥ 1000
Major	$\geq 150,000$	$\geq 250,000$

If the attribute is evaluated when its value is 1000, no alarm is triggered and no notification is sent.

The Global Custom alarm takes precedence over the Default alarm. A value of 1000 does not reach the threshold value of any severity level for the Global Custom alarm. As a result, the alarm level is evaluated to be Normal.

After the above scenario, if the Global Custom alarm is disabled, nothing changes. The attribute value must be reevaluated before a new alarm level is triggered.

With the Global Custom alarm disabled, when the attribute value is reevaluated, the attribute value is evaluated against the threshold values for the Default alarm. The alarm level triggers a Notice level alarm and an email notification is sent to the designated personnel.

Alarms of same severity

If two Global Custom alarms for the same attribute have the same severity, the alarms are evaluated with a “top down” priority.

For instance, if UMEM drops to 50MB, the first alarm is triggered ($= 50000000$), but not the one below it (≤ 100000000).



Global Alarms

Updated: 2016-03-17 16:05:31 PDT

Global Custom Alarms (0 Result(s))

Enabled	Service	Attribute	Severity	Message	Operator	Value	Additional Recipients	Actions
<input checked="" type="checkbox"/>	SSM ▾	UMEM (Available Memory)	Minor	Under 50	=	5000		
<input checked="" type="checkbox"/>	SSM ▾	UMEM (Available Memory)	Minor	under10	<=	1000		

If the order is reversed, when UMEM drops to 100MB, the first alarm (≤ 100000000) is triggered, but not the one below it ($= 50000000$).



Global Alarms

Updated: 2016-03-17 16:05:31 PDT

Global Custom Alarms (0 Result(s))

Enabled	Service	Attribute	Severity	Message	Operator	Value	Additional Recipients	Actions
<input checked="" type="checkbox"/>	SSM ▾	UMEM (Available Memory)	Minor	under10	<=	1000		
<input checked="" type="checkbox"/>	SSM ▾	UMEM (Available Memory)	Minor	Under 50	=	5000		

Default Alarms

Filter by Disabled Defaults ▾

0 Result(s)

Enabled	Service	Attribute	Severity	Message	Operator	Value	Actions
---------	---------	-----------	----------	---------	----------	-------	---------

[Apply Changes](#)

Notifications

A notification reports the occurrence of an alarm or the change of state for a service. Alarm notifications can be sent in email or using SNMP.

To avoid multiple alarms and notifications being sent when an alarm threshold value is reached, the alarm severity is checked against the current alarm severity for the attribute. If there is no change, then no further action is taken. This means that as the NMS service continues to monitor the system, it will only raise an alarm and send notifications the first time it notices an alarm condition for an attribute. If a new value threshold for the attribute is reached and detected, the alarm severity changes and a new notification is sent. Alarms are cleared when conditions return to the Normal level.

The trigger value shown in the notification of an alarm state is rounded to three decimal places. Therefore, an attribute value of 1.9999 triggers an alarm whose threshold is less than ($<$) 2.0, although the alarm notification shows the trigger value as 2.0.

New services

As new services are added through the addition of new grid nodes or sites, they inherit Default alarms and Global Custom alarms.

Alarms and tables

Alarm attributes displayed in tables can be disabled at the system level. Alarms cannot be disabled for individual rows in a table.

For example, the following table shows two critical Entries Available (VMFI) alarms. (Select **SUPPORT > Tools > Grid topology**. Then, select **Storage Node > SSM > Resources**.)

You can disable the VMFI alarm so that the Critical level VMFI alarm is not triggered (both currently Critical alarms would appear in the table as green); however, you cannot disable a single alarm in a table row so that one VMFI alarm displays as a Critical level alarm while the other remains green.

Volumes

Mount Point	Device	Status	Size	Space Available	Total Entries	Entries Available	Write Cache
/	sda1	Online	10.6 GB	7.46 GB	655,360	559,263	Enabled
/var/local	sda3	Online	63.4 GB	59.4 GB	3,932,160	3,931,842	Unknown
/var/local/rangedb/0	sdb	Online	53.4 GB	53.4 GB	52,428,800	52,427,856	Enabled
/var/local/rangedb/1	sdc	Online	53.4 GB	53.4 GB	52,428,800	52,427,848	Enabled
/var/local/rangedb/2	sdd	Online	53.4 GB	53.4 GB	52,428,800	52,427,856	Enabled

Acknowledge current alarms (legacy system)

Legacy alarms are triggered when system attributes reach alarm threshold values. Optionally, if you want to reduce or clear the list of legacy alarms, you can acknowledge the alarms.

What you'll need

- You must be signed in to the Grid Manager using a [supported web browser](#).
- You must have the Acknowledge Alarms permission.

About this task

Because the legacy alarm system continues to be supported, the list of legacy alarms on the Current Alarms page is increased whenever a new alarm occurs. You can typically ignore the alarms (since alerts provide a better view of the system), or you can acknowledge the alarms.



Optionally, when you have completely transitioned to the alert system, you can disable each legacy alarm to prevent it from being triggered and added to the count of legacy alarms.

When you acknowledge an alarm, it is no longer listed on the Current Alarms page in the Grid Manager, unless the alarm is triggered at the next severity level or it is resolved and occurs again.



While the legacy alarm system continues to be supported, the alert system offers significant benefits and is easier to use.

Steps

1. Select **SUPPORT > Alarms (legacy) > Current alarms**.

The alarm system is the legacy system. The alert system offers significant benefits and is easier to use. See [Managing alerts and alarms](#) in the instructions for monitoring and troubleshooting StorageGRID.

Current Alarms

Last Refreshed: 2020-05-27 09:41:39 MDT

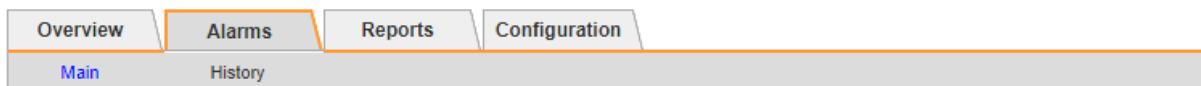
Show Acknowledged Alarms (1 - 1 of 1)

Severity	Attribute	Service	Description	Alarm Time	Trigger Value	Current Value
 Major	ORSU (Outbound Replication Status)	Data Center 1/DC1-ARC1/ARC	Storage Unavailable	2020-05-26 21:47:18 MDT	Storage Unavailable	Storage Unavailable

Show 50 Records Per Page Refresh Previous < 1 > Next

2. Select the service name in the table.

The Alarms tab for the selected service appears (**SUPPORT > Tools > Grid topology > Grid Node > Service > Alarms**).



 Alarms: ARC (DC1-ARC1) - Replication
Updated: 2019-05-24 10:46:48 MDT

Severity	Attribute	Description	Alarm Time	Trigger Value	Current Value	Acknowledge Time	Acknowledge
 Major	ORSU (Outbound Replication Status)	Storage Unavailable	2019-05-23 21:40:08 MDT	Storage Unavailable	Storage Unavailable		<input type="checkbox"/>

Apply Changes 

3. Select the **Acknowledge** check box for the alarm, and click **Apply Changes**.

The alarm no longer appears on the Dashboard or the Current Alarms page.



When you acknowledge an alarm, the acknowledgment is not copied to other Admin Nodes. For this reason, if you view the Dashboard from another Admin Node, you might continue to see the active alarm.

4. As required, view acknowledged alarms.

- Select **SUPPORT > Alarms (legacy) > Current alarms**.
- Select **Show Acknowledged Alarms**.

Any acknowledged alarms are shown.

The alarm system is the legacy system. The alert system offers significant benefits and is easier to use. See [Managing alerts and alarms](#) in the instructions for monitoring and troubleshooting StorageGRID.

Current Alarms

Last Refreshed: 2020-05-27 17:38:58 MDT

Show Acknowledged Alarms (1 - 1 of 1)							
Severity	Attribute	Service	Description	Alarm Time	Trigger Value	Current Value	Acknowledge Time
 Major	ORSU (Outbound Replication Status)	Data Center 1/DC1-ARC1/ARC	Storage Unavailable	2020-05-26 21:47:18 MDT	Storage Unavailable	Storage Unavailable	2020-05-27 17:38:14 MDT

Show Records Per Page

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View Default alarms (legacy system)

You can view the list of all Default legacy alarms.

What you'll need

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



While the legacy alarm system continues to be supported, the alert system offers significant benefits and is easier to use.

Steps

1. Select **SUPPORT > Alarms (legacy) > Global alarms**.
2. For Filter by, select **Attribute Code or Attribute Name**.
3. For equals, enter an asterisk: *
4. Click the arrow  or press **Enter**.

All Default alarms are listed.



Global Custom Alarms (0 Result(s))

Enabled	Service	Attribute	Severity	Message	Operator	Value	Additional Recipients	Actions
<input type="checkbox"/>								

Default Alarms

Filter by Attribute Code ▼ equals *

221 Result(s)

Enabled	Service	Attribute	Severity	Message	Operator	Value	Actions
<input checked="" type="checkbox"/>		IQSZ (Number of Objects)	Major	Greater than 10,000,000	>=	10000000	
<input checked="" type="checkbox"/>		IQSZ (Number of Objects)	Minor	Greater than 1,000,000	>=	1000000	
<input checked="" type="checkbox"/>		IQSZ (Number of Objects)	Notice	Greater than 150,000	>=	150000	
<input checked="" type="checkbox"/>		XCVP (% Completion)	Notice	Foreground Verification Completed	=	100	
<input checked="" type="checkbox"/>	ADC	ADCA (ADC Status)	Minor	Error	>=	10	
<input checked="" type="checkbox"/>	ADC	ADCE (ADC State)	Notice	Standby	=	10	
<input checked="" type="checkbox"/>	ADC	ALIS (Inbound Attribute Sessions)	Notice	Over 100	>=	100	
<input checked="" type="checkbox"/>	ADC	ALOS (Outbound Attribute Sessions)	Notice	Over 200	>=	200	

Review historical alarms and alarm frequency (legacy system)

When troubleshooting an issue, you can review how often a legacy alarm was triggered in the past.

What you'll need

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



While the legacy alarm system continues to be supported, the alert system offers significant benefits and is easier to use.

Steps

1. Follow these steps to get a list of all alarms triggered over a period of time.
 - a. Select **SUPPORT > Alarms (legacy) > Historical alarms**.
 - b. Do one of the following:
 - Click one of the time periods.
 - Enter a custom range, and click **Custom Query**.

2. Follow these steps to find out how often alarms have been triggered for a particular attribute.

- a. Select **SUPPORT > Tools > Grid topology**.
- b. Select **grid node > service or component > Alarms > History**.
- c. Select the attribute from the list.
- d. Do one of the following:
 - Click one of the time periods.
 - Enter a custom range, and click **Custom Query**.

The alarms are listed in reverse chronological order.

- e. To return to the alarms history request form, click **History**.

Create Global Custom alarms (legacy system)

You might have used Global Custom alarms for the legacy system to address specific monitoring requirements. Global Custom alarms might have alarm levels that override Default alarms, or they might monitor attributes that do not have a Default alarm.

What you'll need

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



While the legacy alarm system continues to be supported, the alert system offers significant benefits and is easier to use.

Global Custom alarms override Default alarms. You should not change Default alarm values unless absolutely necessary. By changing Default alarms, you run the risk of concealing problems that might otherwise trigger an alarm.



Be very careful if you change alarm settings. For example, if you increase the threshold value for an alarm, you might not detect an underlying problem. Discuss your proposed changes with technical support before changing an alarm setting.

Steps

1. Select **SUPPORT > Alarms (legacy) > Global alarms**.
2. Add a new row to the Global Custom alarms table:
 - To add a new alarm, click **Edit** (if this is the first entry) or **Insert** .



Global Custom Alarms (0 Result(s))

Enabled	Service	Attribute	Severity	Message	Operator	Value	Additional Recipients	Actions
<input checked="" type="checkbox"/>	ARC	ARCE (ARC State)		Notice	Standby	=	10	
<input checked="" type="checkbox"/>	ARC	AROQ (Objects Queued)		Minor	At least	>=	6000	
<input checked="" type="checkbox"/>	ARC	AROQ (Objects Queued)		Notice	At least	>=	3000	

Default Alarms

Filter by Attribute Code equals AR*

9 Result(s)

Enabled	Service	Attribute	Severity	Message	Operator	Value	Actions	
<input checked="" type="checkbox"/>	ARC	ARCE (ARC State)		Notice	Standby	=	10	
<input checked="" type="checkbox"/>	ARC	AROQ (Objects Queued)		Minor	At least	>=	6000	
<input checked="" type="checkbox"/>	ARC	AROQ (Objects Queued)		Notice	At least	>=	3000	
<input checked="" type="checkbox"/>	ARC	ARRF (Request Failures)		Major	At least	>=	1	
<input checked="" type="checkbox"/>	ARC	ARRV (Verification Failures)		Major	At least	>=	1	
<input checked="" type="checkbox"/>	ARC	ARVF (Store Failures)		Major	At least	>=	1	
<input checked="" type="checkbox"/>	NMS	ARRC (Remaining Capacity)		Notice	Below	<=	10	
<input checked="" type="checkbox"/>	NMS	ARRS (Repository Status)		Major	Disconnected	<=	9	
<input checked="" type="checkbox"/>	NMS	ARRS (Repository Status)		Notice	Standby	<=	19	

Apply Changes

- To modify a Default alarm, search for the Default alarm.
 - i. Under Filter by, select either **Attribute Code** or **Attribute Name**.
 - ii. Type a search string.
- Specify four characters or use wildcards (for example, A??? or AB*). Asterisks (*) represent multiple characters, and question marks (?) represent a single character.
- iii. Click the arrow , or press **Enter**.
 - iv. In the list of results, click **Copy** next to the alarm you want to modify.

The Default alarm is copied to the Global Custom alarms table.

3. Make any necessary changes to the Global Custom alarms settings:

Heading	Description
Enabled	Select or unselect the check box to enable or disable the alarm.

Heading	Description
Attribute	Select the name and code of the attribute being monitored from the list of all attributes applicable to the selected service or component. To display information about the attribute, click Info  next to the attribute's name.
Severity	The icon and text indicating the level of the alarm.
Message	The reason for the alarm (connection lost, storage space below 10%, and so on).
Operator	<p>Operators for testing the current attribute value against the Value threshold:</p> <ul style="list-style-type: none"> • = equals • > greater than • < less than • >= greater than or equal to • <= less than or equal to • ≠ not equal to
Value	The alarm's threshold value used to test against the attribute's actual value using the operator. The entry can be a single number, a range of numbers specified with a colon (1:3), or a comma-delineated list of numbers and ranges.
Additional Recipients	<p>A supplementary list of email addresses to be notified when the alarm is triggered. This is in addition to the mailing list configured on the Alarms > Email Setup page. Lists are comma delineated.</p> <p>Note: Mailing lists require SMTP server setup in order to operate. Before adding mailing lists, confirm that SMTP is configured. Notifications for Custom alarms can override notifications from Global Custom or Default alarms.</p>
Actions	<p>Control buttons to:</p> <ul style="list-style-type: none"> +  Edit a row +  Insert a row +  Delete a row +  Drag-and-drop a row up or down +  Copy a row

4. Click **Apply Changes**.

Disable alarms (legacy system)

The alarms in the legacy alarm system are enabled by default, but you can disable alarms that are not required. You can also disable the legacy alarms after you have completely transitioned to the new alert system.



While the legacy alarm system continues to be supported, the alert system offers significant benefits and is easier to use.

Disable a Default alarm (legacy system)

You can disable one of the legacy Default alarms for the entire system.

What you'll need

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

About this task

Disabling an alarm for an attribute that currently has an alarm triggered does not clear the current alarm. The alarm will be disabled the next time the attribute crosses the alarm threshold, or you can clear the triggered alarm.



Do not disable any of the legacy alarms until you have completely transitioned to the new alert system. Otherwise, you might not detect an underlying problem until it has prevented a critical operation from completing.

Steps

1. Select **SUPPORT > Alarms (legacy) > Global alarms**.
2. Search for the Default alarm to disable.
 - a. In the Default Alarms section, select **Filter by > Attribute Code or Attribute Name**.
 - b. Type a search string.

Specify four characters or use wildcards (for example, A??? or AB*). Asterisks (*) represent multiple characters, and question marks (?) represent a single character.

- c. Click the arrow or press **Enter**.



Selecting **Disabled Defaults** displays a list of all currently disabled Default alarms.

3. From the search results table, click the Edit icon for the alarm you want to disable.



Global Custom Alarms (0 Result(s))

Enabled	Service	Attribute	Severity	Message	Operator	Value	Additional Recipients	Actions
<input type="checkbox"/>								

Default Alarms

Filter by Attribute Code

3 Result(s)

Enabled	Service	Attribute	Severity	Message	Operator	Value	Actions
<input checked="" type="checkbox"/>	SSM	UMEM (Available Memory)	Critical	Under 10000000	<=	10000000	
<input checked="" type="checkbox"/>	SSM	UMEM (Available Memory)	Major	Under 50000000	<=	50000000	
<input type="checkbox"/>	SSM	UMEM (Available Memory)	Minor	Under 100000000	<=	100000000	

Apply Changes

The **Enabled** check box for the selected alarm becomes active.

4. Unselect the **Enabled** check box.
5. Click **Apply Changes**.

The Default alarm is disabled.

Disable Global Custom alarms (legacy system)

You can disable a legacy Global Custom alarm for the entire system.

What you'll need

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

About this task

Disabling an alarm for an attribute that currently has an alarm triggered does not clear the current alarm. The alarm will be disabled the next time the attribute crosses the alarm threshold, or you can clear the triggered alarm.

Steps

1. Select **SUPPORT > Alarms (legacy) > Global alarms**.
2. In the Global Custom Alarms table, click **Edit** next to the alarm you want to disable.
3. Unselect the **Enabled** check box.



Global Custom Alarms (1 Result(s))

Enabled	Service	Attribute	Severity	Message	Operator	Value	Additional Recipients	Actions
<input type="checkbox"/>	All	RDTE (Tivoli Storage Manager State)	<input type="button" value="▼"/>	<input type="radio"/> Major	Offline	=	10	

Default Alarms

Enabled	Service	Attribute	Severity	Message	Operator	Value	Actions
Filter by: Disabled Defaults							

0 Result(s)

Enabled	Service	Attribute	Severity	Message	Operator	Value	Actions

4. Click **Apply Changes**.

The Global Custom alarm is disabled.

Clear triggered alarms (legacy system)

If a legacy alarm is triggered, you can clear it instead of acknowledging it.

What you'll need

- You must have the `Passwords.txt` file.

Disabling an alarm for an attribute that currently has an alarm triggered against it does not clear the alarm. The alarm will be disabled the next time the attribute changes. You can acknowledge the alarm or, if you want to immediately clear the alarm rather than wait for the attribute value to change (resulting in a change to the alarm state), you can clear the triggered alarm. You might find this helpful if you want to clear an alarm immediately against an attribute whose value does not change often (for example, state attributes).

1. Disable the alarm.

2. Log in to the primary Admin Node:

- Enter the following command: `ssh admin@primary_Admin_Node_IP`
- Enter the password listed in the `Passwords.txt` file.
- Enter the following command to switch to root: `su -`
- Enter the password listed in the `Passwords.txt` file.

When you are logged in as root, the prompt changes from `$` to `#`.

3. Restart the NMS service: `service nms restart`

4. Log out of the Admin Node: `exit`

The alarm is cleared.

Configure notifications for alarms (legacy system)

StorageGRID system can automatically send email and [SNMP notifications](#) when an alarm is triggered or a service state changes.

By default, alarm email notifications are not sent. For email notifications, you must configure the email server and specify the email recipients. For SNMP notifications, you must configure the SNMP agent.

Types of alarm notifications (legacy system)

When a legacy alarm is triggered, the StorageGRID system sends out two types of alarm notifications: severity level and service state.

Severity level notifications

An alarm email notification is sent when a legacy alarm is triggered at a selected severity level:

- Notice
- Minor
- Major
- Critical

A mailing list receives all notifications related to the alarm for the selected severity. A notification is also sent when the alarm leaves the alarm level — either by being resolved or by entering a different alarm severity level.

Service state notifications

A service state notification is sent when a service (for example, the LDR service or NMS service) enters the selected service state and when it leaves the selected service state. Service state notifications are sent when a service enters or leaves ones of the following service states:

- Unknown
- Administratively Down

A mailing list receives all notifications related to changes in the selected state.

Configure email server settings for alarms (legacy system)

If you want StorageGRID to send email notifications when a legacy alarm is triggered, you must specify the SMTP mail server settings. The StorageGRID system only sends email; it cannot receive email.

What you'll need

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

About this task

Use these settings to define the SMTP server used for legacy alarm email notifications and AutoSupport email messages. These settings are not used for alert notifications.



If you use SMTP as the protocol for AutoSupport messages, you might have already configured an SMTP mail server. The same SMTP server is used for alarm email notifications, so you can skip this procedure. See the [instructions for administering StorageGRID](#).

SMTP is the only protocol supported for sending email.

Steps

1. Select **SUPPORT > Alarms (legacy) > Legacy email setup**.
2. From the Email menu, select **Server**.

The Email Server page appears. This page is also used to configure the email server for AutoSupport messages.

Use these settings to define the email server used for alarm notifications and for AutoSupport messages. These settings are not used for alert notifications. See [Managing alerts and alarms](#) in the instructions for monitoring and troubleshooting StorageGRID.

The screenshot shows the 'Email Server' configuration page. At the top, there is a header with a triangle icon, the text 'Email Server', and the date 'Updated: 2016-03-17 11:11:59 PDT'. Below the header is a section titled 'E-mail Server (SMTP) Information' containing several input fields:

Mail Server	<input type="text"/>
Port	<input type="text"/>
Authentication	<input type="button" value="Off"/>
Authentication Credentials	<input type="text" value="Username: root"/> <input type="text" value="Password: *****"/>
From Address	<input type="text"/>
Test E-mail	To: <input type="text"/> <input type="checkbox"/> Send Test E-mail

At the bottom right of the form is a blue 'Apply Changes' button with a circular arrow icon.

3. Add the following SMTP mail server settings:

Item	Description
Mail Server	IP address of the SMTP mail server. You can enter a hostname rather than an IP address if you have previously configured DNS settings on the Admin Node.
Port	Port number to access the SMTP mail server.
Authentication	Allows for the authentication of the SMTP mail server. By default, authentication is Off.
Authentication Credentials	Username and password of the SMTP mail server. If Authentication is set to On, a username and password to access the SMTP mail server must be provided.

4. Under **From Address**, enter a valid email address that the SMTP server will recognize as the sending email address. This is the official email address from which the email message is sent.
5. Optionally, send a test email to confirm that your SMTP mail server settings are correct.
 - a. In the **Test E-mail > To** box, add one or more addresses that you can access.

You can enter a single email address or a comma-delimited list of email addresses. Because the NMS service does not confirm success or failure when a test email is sent, you must be able to check the test recipient's inbox.
 - b. Select **Send Test E-mail**.
6. Click **Apply Changes**.

The SMTP mail server settings are saved. If you entered information for a test email, that email is sent. Test emails are sent to the mail server immediately and are not sent through the notifications queue. In a system with multiple Admin Nodes, each Admin Node sends an email. Receipt of the test email confirms that your SMTP mail server settings are correct and that the NMS service is successfully connecting to the mail server. A connection problem between the NMS service and the mail server triggers the legacy MINS (NMS Notification Status) alarm at the Minor severity level.

Create alarm email templates (legacy system)

Email templates let you customize the header, footer, and subject line of a legacy alarm email notification. You can use email templates to send unique notifications that contain the same body text to different mailing lists.

What you'll need

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

About this task

Use these settings to define the email templates used for legacy alarm notifications. These settings are not used for alert notifications.

Different mailing lists might require different contact information. Templates do not include the body text of the email message.

Steps

1. Select **SUPPORT > Alarms (legacy) > Legacy email setup**.
2. From the Email menu, select **Templates**.
3. Click **Edit**  (or **Insert**  if this is not the first template).



Template (0 - 0 of 0)

Template Name	Subject Prefix	Header	Footer	Actions
Template One	Notifications	All Email Lists	From SGWS	

Show Records Per Page

« »

4. In the new row add the following:

Item	Description
Template Name	Unique name used to identify the template. Template names cannot be duplicated.
Subject Prefix	Optional. Prefix that will appear at the beginning of an email's subject line. Prefixes can be used to easily configure email filters and organize notifications.
Header	Optional. Header text that appears at the beginning of the email message body. Header text can be used to preface the content of the email message with information such as company name and address.
Footer	Optional. Footer text that appears at the end of the email message body. Footer text can be used to close the email message with reminder information such as a contact phone number or a link to a web site.

5. Click **Apply Changes**.

A new template for notifications is added.

Create mailing lists for alarm notifications (legacy system)

Mailing lists let you notify recipients when a legacy alarm is triggered or when a service state changes. You must create at least one mailing list before any alarm email notifications can be sent. To send a notification to a single recipient, create a mailing list with one email address.

What you'll need

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

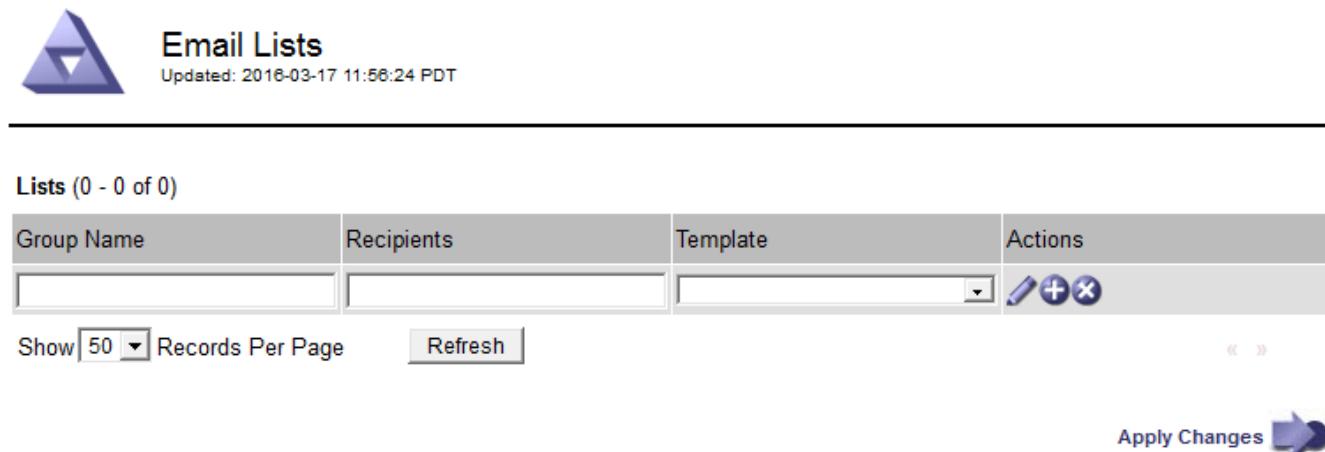
- If you want to specify an email template for the mailing list (custom header, footer, and subject line), you must have already created the template.

About this task

Use these settings to define the mailing lists used for legacy alarm email notifications. These settings are not used for alert notifications.

Steps

1. Select **SUPPORT > Alarms (legacy) > Legacy email setup**.
2. From the Email menu, select **Lists**.
3. Click **Edit**  (or *Insert*  if this is not the first mailing list).



4. In the new row, add the following:

Item	Description
Group Name	<p>Unique name used to identify the mailing list. Mailing list names cannot be duplicated.</p> <p>Note: If you change the name of a mailing list, the change is not propagated to the other locations that use the mailing list name. You must manually update all configured notifications to use the new mailing list name.</p>
Recipients	<p>Single email address, a previously configured mailing list, or a comma-delimited list of email addresses and mailing lists to which notifications will be sent.</p> <p>Note: If an email address belongs to multiple mailing lists, only one email notification is sent when a notification triggering event occurs.</p>
Template	Optionally, select an email template to add a unique header, footer, and subject line to notifications sent to all recipients of this mailing list.

5. Click **Apply Changes**.

A new mailing list is created.

Configure email notifications for alarms (legacy system)

In order to receive email notifications for the legacy alarm system, recipients must be a member of a mailing list and that list must be added to the Notifications page. Notifications are configured to send email to recipients only when an alarm with a specified severity level is triggered or when a service state changes. Thus, recipients only receive the notifications they need to receive.

What you'll need

- You must be signed in to the Grid Manager using a [supported web browser](#).
- You must have specific access permissions.
- You must have configured an email list.

About this task

Use these settings to configure notifications for legacy alarms. These settings are not used for alert notifications.

If an email address (or list) belongs to multiple mailing lists, only one email notification is sent when a notification triggering event occurs. For example, one group of administrators within your organization can be configured to receive notifications for all alarms regardless of severity. Another group might only require notifications for alarms with a severity of critical. You can belong to both lists. If a critical alarm is triggered, you receive only one notification.

Steps

1. Select **SUPPORT > Alarms (legacy) > Legacy email setup**.
2. From the Email menu, select **Notifications**.
3. Click ***Edit***  (or ***Insert***  if this is not the first notification).
4. Under E-mail List, select the mailing list.
5. Select one or more alarm severity levels and service states.
6. Click **Apply Changes**.

Notifications will be sent to the mailing list when alarms with the selected alarm severity level or service state are triggered or changed.

SUPPRESS ALARM NOTIFICATIONS FOR A MAILING LIST (LEGACY SYSTEM)

You can suppress alarm notifications for a mailing list when you no longer want the mailing list to receive notifications about alarms. For example, you might want to suppress notifications about legacy alarms after you have transitioned to using alert email notifications.

What you'll need

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

Use these settings to suppress email notifications for the legacy alarm system. These settings do not apply to alert email notifications.



While the legacy alarm system continues to be supported, the alert system offers significant benefits and is easier to use.

Steps

1. Select **SUPPORT > Alarms (legacy) > Legacy email setup**.
2. From the Email menu, select **Notifications**.
3. Click **Edit**  next to the mailing list for which you want to suppress notifications.
4. Under Suppress, select the check box next to the mailing list you want to suppress, or select **Suppress** at the top of the column to suppress all mailing lists.
5. Click **Apply Changes**.

Legacy alarm notifications are suppressed for the selected mailing lists.

Suppress email notifications system wide

You can block the StorageGRID system's ability to send email notifications for legacy alarms and event-triggered AutoSupport messages.

What you'll need

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

About this task

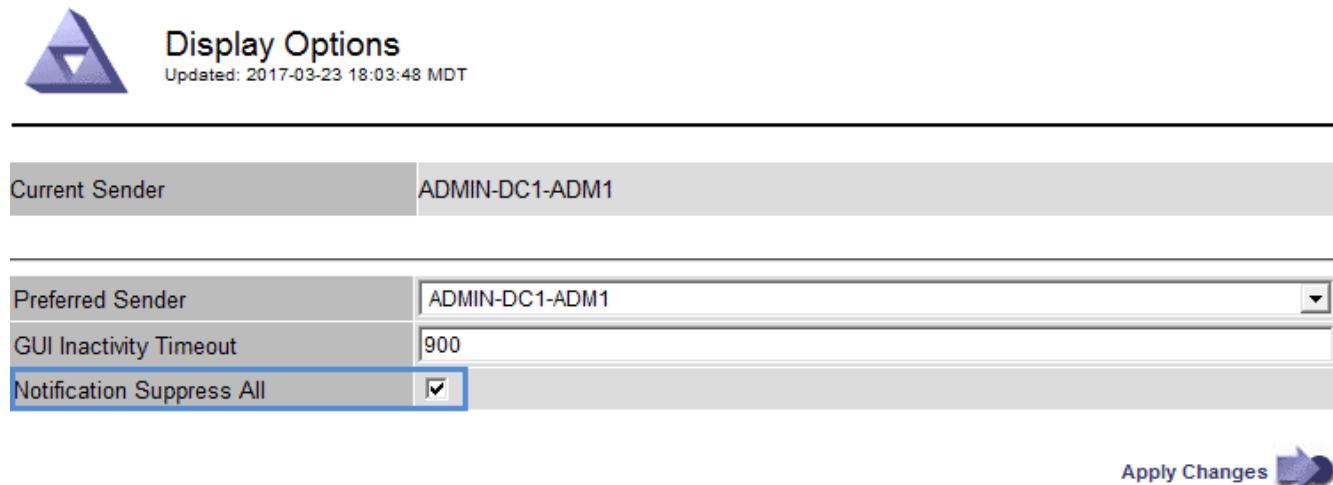
Use this option to suppress email notifications for legacy alarms and event-triggered AutoSupport messages.



This option does not suppress alert email notifications. It also does not suppress weekly or user-triggered AutoSupport messages.

Steps

1. Select **CONFIGURATION > System settings > Display options**.
2. From the Display Options menu, select **Options**.
3. Select **Notification Suppress All**.



The screenshot shows the 'Display Options' configuration page. At the top, it displays 'Updated: 2017-03-23 18:03:48 MDT'. Below this, there are two tabs: 'Current Sender' (selected) and 'ADMIN-DC1-ADM1'. The main area contains three configuration items:

Preferred Sender	ADMIN-DC1-ADM1
GUI Inactivity Timeout	900
Notification Suppress All	<input checked="" type="checkbox"/>

At the bottom right of the page is a blue 'Apply Changes' button with a circular arrow icon.

4. Click **Apply Changes**.

The Notifications page (**Configuration > Notifications**) displays the following message:



All e-mail notifications are now suppressed.

Notifications (0 - 0 of 0)

E-mail List	Suppress	Severity Levels			Service States			Actions
	<input checked="" type="checkbox"/>	Notice	Minor	Major	Critical	Unknown	Administratively Down	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Show Records Per Page

« »

Configure audit messages and log destinations

Audit messages and logs record system activities and security events, and are essential tools for monitoring and troubleshooting. You can adjust audit levels to increase or decrease the type and number of audit messages recorded. Optionally, you can define any HTTP request headers you want to include in client read and write audit messages. You can also configure an external syslog server and change the destination of audit information.

For more information on audit messages, see [Review audit logs](#).

What you'll need

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

About this task

All StorageGRID nodes generate audit messages and logs to track system activity and events. By default, audit information is sent to the audit log on Admin Nodes. You can adjust audit levels to increase or decrease the type and number of audit messages recorded in the audit log. Optionally, you can configure audit information to be sent to a remote syslog server or to be stored temporarily on the originating nodes for manual collection.

Change audit message levels in the audit log

You can set a different audit level for each of the following categories of messages in the audit log:

Audit category	Description
System	By default, this level is set to Normal. See System audit messages .
Storage	By default, this level is set to Error. See Object storage audit messages .

Audit category	Description
Management	By default, this level is set to Normal. See Management audit message .
Client Reads	By default, this level is set to Normal. See Client read audit messages .
Client Writes	By default, this level is set to Normal. See Client write audit messages .

 These defaults apply if you initially installed StorageGRID using version 10.3 or later. If you have upgraded from an earlier version of StorageGRID, the default for all categories is set to Normal.

 During upgrades, audit level configurations will not be effective immediately.

Steps

1. Select **CONFIGURATION > Monitoring > Audit and syslog server**.

Audit and syslog server

Audit messages and logs record system activities and security events and are an essential tool for monitoring and troubleshooting.

Audit levels

Adjust audit levels to increase or decrease the type and number of audit messages recorded.

System ?	Normal ▼
Storage ?	Error ▼
Management ?	Normal ▼
Client reads ?	Normal ▼
Client writes ?	Normal ▼

Audit protocol headers [?](#)

Optionally, define any HTTP request headers you want to include in client read and write audit messages.

Header name 1	<input type="text"/>
Add another header	

Use external syslog server

By default, audit messages are saved on Admin Nodes and logs are saved on the nodes where they were generated. If you want to save audit messages and a subset of logs externally, configure an external syslog server.

 If you want to use an external syslog server, you must configure it first.

[Configure external syslog server](#)

If you want to change these log locations, select a different option below.

Log type	Log location
Audit log ?	Admin Nodes
Security events ?	Local nodes
Application logs ?	Local nodes

Default (Admin Nodes/local nodes)

External syslog server

Admin Nodes and external syslog server

Local nodes only [?](#)

2. For each category of audit message, select an audit level from the drop-down list:

Audit level	Description
Off	No audit messages from the category are logged.

Audit level	Description
Error	Only error messages are logged—audit messages for which the result code was not "successful" (SUCS).
Normal	Standard transactional messages are logged—the messages listed in these instructions for the category.
Debug	Deprecated. This level behaves the same as the Normal audit level.

The messages included for any particular level include those that would be logged at the higher levels. For example, the Normal level includes all of the Error messages.

3. Optionally, under **Audit protocol headers**, define any HTTP request headers you want to include in client read and write audit messages. Use an asterisk (*) as a wildcard to match zero or more characters. Use the escape sequence (*) to match a literal asterisk.



Audit protocol headers apply to S3 and Swift requests only.

4. Select **Add another header** to create additional headers, if needed.

When HTTP headers are found in a request, they are included in the audit message under the field HTRH.



Audit protocol request headers are logged only if the audit level for **Client Reads** or **Client Writes** is not **Off**.

5. Select **Save**

A green banner displays indicating your configuration has been saved successfully.

Use an external syslog server

You can configure an external syslog server if you want to save audit information remotely.

- If you want to save audit information to an external syslog server, go to [Configure an external syslog server](#).
- If you are not using an external syslog server, go to [Select audit information destinations](#).

Select audit information destinations

You can specify where audit logs, security event logs, and application logs are sent.



Some destination are available only if you are using an external syslog server. See [Configure an external syslog server](#) to configure an external syslog server.



For more information on StorageGRID software logs, see [StorageGRID software logs](#).

1. On the Audit and syslog server page, select the destination for audit information from the listed options:

Option	Description
Default (Admin nodes/local nodes)	Audit messages are sent to the audit log (<code>audit.log</code>) on the Admin Node, and security event logs and application logs are stored on the nodes where they were generated (also referred to as "the local node").
External syslog server	Audit information is sent to an external syslog server and saved on the local node. The type of information sent depends upon how you configured the external syslog server. This option is enabled only after you have configured an external syslog server.
Admin Node and external syslog server	Audit messages are sent to the audit log (<code>audit.log</code>) on the Admin Node, and audit information is sent to the external syslog server and saved on the local node. The type of information sent depends upon how you configured the external syslog server. This option is enabled only after you have configured an external syslog server.
Local nodes only	<p>No audit information is sent to an Admin Node or remote syslog server. Audit information is saved only on the nodes that generated it.</p> <p>Note: StorageGRID periodically removes these local logs in a rotation to free up space. When the log file for a node reaches 1 GB, the existing file is saved, and a new log file is started. The rotation limit for the log is 21 files. When the 22nd version of the log file is created, the oldest log file is deleted. On average about 20 GB of log data is stored on each node.</p>



Audit information generated on every local node is stored in
`/var/local/log/localaudit.log`

2. Select **Save**.

A warning message appears:



Change the log destination?

3. Confirm that you want to change the destination for audit information by selecting **OK**.

A green banner appears notifying you that your audit configuration has been saved successfully.

New logs are sent to the destinations you selected. Existing logs remain in their current location.

Related information

[Considerations for external syslog server](#)

[Administer StorageGRID](#)

[Troubleshoot the external syslog server](#)

Use an external syslog server

Considerations for external syslog server

Use the following guidelines to estimate the size of the external syslog server you need.

What is an external syslog server?

An external syslog server is a server outside of StorageGRID you can use to collect system audit information in a single location. Using an external syslog server enables you to configure the destinations of your audit information so you can reduce network traffic on your Admin Nodes and manage the information more efficiently. The types of audit information you can send to the external syslog server include:

- Audit logs containing the audit messages generated during normal system operation
- Security-related events such as logins and escalations to root
- Application logs that might be requested if it is necessary to open a support case to troubleshoot an issue you have encountered

How to estimate the size of the external syslog server

Normally, your grid is sized to achieve a required throughput, defined in terms of S3 operations per second or bytes per second. For example, you might have a requirement that your grid handle 1,000 S3 operations per second, or 2,000 MB per second, of object ingestions and retrievals. You should size your external syslog server according to your grid's data requirements.

This section provides some heuristic formulas that help you estimate the rate and average size of log messages of various types that your external syslog server needs to be capable of handling, expressed in terms of the known or desired performance characteristics of the grid (S3 operations per second).

Use S3 operations per second in estimation formulas

If your grid was sized for a throughput expressed in bytes per second, you must convert this sizing into S3 operations per second to use the estimation formulas. To convert grid throughput, you must first determine your average object size, which you can do using the information in existing audit logs and metrics (if any), or by using your knowledge of the applications that will use StorageGRID. For example, if your grid was sized to achieve a throughput of 2,000 MB/second, and your average object size is 2 MB, then your grid was sized to be able to handle 1,000 S3 operations per second ($2,000 \text{ MB} / 2 \text{ MB}$).

 The formulas for external syslog server sizing in the following sections provide common-case estimates (rather than worst-case estimates). Depending on your configuration and workload, you might see a higher or lower rate of syslog messages or volume of syslog data than the formulas predict. The formulas are meant to be used as guidelines only.

Estimation formulas for audit logs

If you have no information about your S3 workload other than number of S3 operations per second your grid is expected to support, you can estimate the volume of audit logs your external syslog server will need to handle using the following formulas, under the assumption that you leave the Audit Levels set to the default values (all categories set to Normal, except Storage, which is set to Error):

Audit Log Rate = $2 \times$ S3 Operations Rate

Audit Log Average Size = 800 bytes

For example, if your grid is sized for 1,000 S3 operations per second, your external syslog server should be sized to support 2,000 syslog messages per second and should be able to receive (and typically store) audit log data at a rate of 1.6 MB per second.

If you know more about your workload, more accurate estimations are possible. For audit logs, the most important additional variables are the percentage of S3 operations that are PUTs (vs. GETS), and the average size, in bytes, of the following S3 fields (4-character abbreviations used in the table are audit log field names):

Code	Field	Description
SACC	S3 tenant account name (request sender)	The name of the tenant account for the user who sent the request. Empty for anonymous requests.
SBAC	S3 tenant account name (bucket owner)	The tenant account name for the bucket owner. Used to identify cross-account or anonymous access.
S3BK	S3 Bucket	The S3 bucket name.
S3KY	S3 Key	The S3 key name, not including the bucket name. Operations on buckets do not include this field.

Let's use P to represent the percentage of S3 operations that are PUTs, where $0 \leq P \leq 1$ (so for a 100% PUT workload, $P = 1$, and for a 100% GET workload, $P = 0$).

Let's use K to represent the average size of the sum of the S3 account names, S3 Bucket, and S3 Key. Suppose the S3 account name is always my-s3-account (13 bytes), buckets have fixed-length names like /my/application/bucket-12345 (28 bytes), and objects have fixed-length keys like 5733a5d7-f069-41ef-8fdbd-13247494c69c (36 bytes). Then the value of K is 90 (13+13+28+36).

If you can determine values for P and K, you can estimate the volume of audit logs your external syslog server will need to handle using the following formulas, under the assumption that you leave the Audit Levels set to the defaults (all categories set to Normal, except Storage, which is set to Error):

Audit Log Rate = $((2 \times P) + (1 - P)) \times$ S3 Operations Rate

Audit Log Average Size = $(570 + K)$ bytes

For example, if your grid is sized for 1,000 S3 operations per second, your workload is 50% PUTs, and your S3 account names, bucket names, and object names average 90 bytes, your external syslog server should be sized to support 1,500 syslog messages per second and should be able to receive (and typically store) audit log data at a rate of approximately 1 MB per second.

Estimation formulas for non-default audit levels

The formulas provided for audit logs assume the use of default audit level settings (all categories set to Normal, except Storage, which is set to Error). Detailed formulas for estimating the rate and average size of audit messages for non-default audit level settings are not available. However, the following table can be used to make a rough estimate of the rate; you can use the average size formula provided for audit logs, but be aware that it is likely to result in an over-estimate because the “extra” audit messages are, on average, smaller than the default audit messages.

Condition	Formula
Replication: Audit levels all set to Debug or Normal	Audit log rate = 8 x S3 operations Rate
Erasure coding: audit levels all set to Debug or Normal	Use same formula as for default settings

Estimation formulas for security events

Security events are not correlated with S3 operations and typically produce a negligible volume of logs and data. For these reasons, no estimation formulas are provided.

Estimation formulas for application logs

If you have no information about your S3 workload other than the number of S3 operations per second your grid is expected to support, you can estimate the volume of applications logs your external syslog server will need to handle using the following formulas:

```
Application Log Rate = 3.3 x S3 Operations Rate  
Application Log Average Size = 350 bytes
```

So, for example, if your grid is sized for 1,000 S3 operations per second, your external syslog server should be sized to support 3,300 application logs per second and be able to receive (and store) application log data at a rate of about 1.2 MB per second.

If you know more about your workload, more accurate estimations are possible. For application logs, the most important additional variables are the data protection strategy (replication vs. erasure coding), the percentage of S3 operations that are PUTs (vs. GETs/other), and the average size, in bytes, of the following S3 fields (4-character abbreviations used in table are audit log field names):

Code	Field	Description
SACC	S3 tenant account name (request sender)	The name of the tenant account for the user who sent the request. Empty for anonymous requests.
SBAC	S3 tenant account name (bucket owner)	The tenant account name for the bucket owner. Used to identify cross-account or anonymous access.

Code	Field	Description
S3BK	S3 Bucket	The S3 bucket name.
S3KY	S3 Key	The S3 key name, not including the bucket name. Operations on buckets do not include this field.

Example sizing estimations

This section explains example cases of how to use the estimation formulas for grids with the following methods of data protection:

- Replication
- Erasure Coding

If you use replication for data protection

Let P represent the percentage of S3 operations that are PUTs, where $0 \leq P \leq 1$ (so for a 100% PUT workload, $P = 1$, and for a 100% GET workload, $P = 0$).

Let K represent the average size of the sum of the S3 account names, S3 Bucket, and S3 Key. Suppose the S3 account name is always my-s3-account (13 bytes), buckets have fixed-length names like /my/application/bucket-12345 (28 bytes), and objects have fixed-length keys like 5733a5d7-f069-41ef-8fb9-13247494c69c (36 bytes). Then K has a value of 90 (13+13+28+36).

If you can determine values for P and K , you can estimate the volume of application logs your external syslog server will have to be able to handle using the following formulas.

```
Application Log Rate = ((1.1 x P) + (2.5 x (1 - P))) x S3 Operations Rate
Application Log Average Size = (P x (220 + K)) + ((1 - P) x (240 + (0.2 x K))) Bytes
```

So, for example, if your grid is sized for 1,000 S3 operations per second, your workload is 50% PUTs, and your S3 account names, bucket names, and object names average 90 bytes, your external syslog server should be sized to support 1800 application logs per second, and will be receiving (and typically storing) application data at a rate of 0.5 MB per second.

If you use erasure coding for data protection

Let P represent the percentage of S3 operations that are PUTs, where $0 \leq P \leq 1$ (so for a 100% PUT workload, $P = 1$, and for a 100% GET workload, $P = 0$).

Let K represent the average size of the sum of the S3 account names, S3 Bucket, and S3 Key. Suppose the S3 account name is always my-s3-account (13 bytes), buckets have fixed-length names like /my/application/bucket-12345 (28 bytes), and objects have fixed-length keys like 5733a5d7-f069-41ef-8fb9-13247494c69c (36 bytes). Then K has a value of 90 (13+13+28+36).

If you can determine values for P and K , you can estimate the volume of application logs your external syslog server will have to be able to handle using the following formulas.

```
Application Log Rate = ((3.2 x P) + (1.3 x (1 - P))) x S3 Operations Rate  
Application Log Average Size = (P x (240 + (0.4 x K))) + ((1 - P) x (185 + (0.9 x K))) Bytes
```

So, for example, if your grid is sized for 1,000 S3 operations per second, your workload is 50% PUTs, and your S3 account names, bucket names, and object names average 90 bytes, your external syslog server should be sized to support 2,250 application logs per second and should be able to receive and will be receive (and typically store) application data at a rate of 0.6 MB per second.

For more information on configuring audit message levels and an external syslog server, see the following:

- [Configure an external syslog server](#)
- [Configure audit messages and log destinations](#)

Configure an external syslog server

If you want to save audit logs, application logs, and security event logs to a location outside of your grid, use this procedure to configure an external syslog server.

What you'll need

- You are signed in to the Grid Manager using a [supported web browser](#).
- You have Maintenance or Root access permissions.
- You have a syslog server with the capacity to receive and store the log files. For more information, see [Considerations for external syslog server](#).
- You have the correct server and client certifications if you plan to use TLS or RELP/TLS.

About this task

If you want to send audit information to an external syslog server, you must configure the external server first.

Sending audit information to an external syslog server enables you to:

- Collect and manage audit information such as audit messages, application logs, and security events more efficiently
- Reduce network traffic on your Admin Nodes because audit information is transferred directly from the various Storage Nodes to the external syslog server, without having to go through an Admin Node



When logs are sent to an external syslog server, single logs greater than 8192 bytes are truncated at the end of the message to conform with common limitations in external syslog server implementations.



To maximize the options for full data recovery in the event of a failure of the external syslog server, up to 20GB of local logs of audit records (localaudit.log) are maintained on each node.



If the configuration options available in this procedure are not flexible enough to meet your requirements, additional configuration options can be applied using the private API audit-destinations endpoints. For example, it is possible to use different syslog servers for different groups of nodes.

Access the syslog server configuration wizard

Steps

1. Select **CONFIGURATION > Monitoring > Audit and syslog server**.

Audit and syslog server

Audit messages and logs record system activities and security events and are an essential tool for monitoring and troubleshooting.

Audit levels

Adjust audit levels to increase or decrease the type and number of audit messages recorded.

System ?	Normal ▼
Storage ?	Error ▼
Management ?	Normal ▼
Client reads ?	Normal ▼
Client writes ?	Normal ▼

Audit protocol headers [?](#)

Optionally, define any HTTP request headers you want to include in client read and write audit messages.

Header name 1	<input type="text"/>
Add another header	

Use external syslog server

By default, audit messages are saved on Admin Nodes and logs are saved on the nodes where they were generated. If you want to save audit messages and a subset of logs externally, configure an external syslog server.

 If you want to use an external syslog server, you must configure it first.

[Configure external syslog server](#)

If you want to change these log locations, select a different option below.

Log type	Log location
Audit log ?	Admin Nodes
Security events ?	Local nodes
Application logs ?	Local nodes

Default (Admin Nodes/local nodes)

External syslog server

Admin Nodes and external syslog server

Local nodes only [?](#)

- From the Audit and syslog server page, select **Configure external syslog server**. If you have previously configured an external syslog server, select **Edit external syslog server**.

Enter syslog info

Configure external syslog server

1 Enter syslog info

2 Manage syslog content

3 Send test messages

External syslog server configuration

Host ?

syslog.test.com

A valid FQDN or IP address.

Port ?

514

An integer between 1 and 65535.

Protocol ?

TCP

TLS

RELP/TCP

RELP/TLS

UDP

Server CA certificates ?

Browse

Client certificate ?

Browse

Client private key ?

Browse

Cancel

Continue

1. Enter a valid fully qualified domain name or an IPv4 or IPv6 address for the external syslog server in the **Host** field.
2. Enter the destination port on the external syslog server (must be an integer between 1 and 65535). The default port is 514.
3. Select the protocol used to send audit information to the external syslog server.

TLS or RELP/TLS is recommended. You must upload a server certificate to use either of these options.

Using certificates helps secure the connections between your grid and the external syslog server. For more information, see [Use StorageGRID security certificates](#).

All protocol options require support by, and configuration of, the external syslog server. You must choose an option that is compatible with the external syslog server.



Reliable Event Logging Protocol (RELP) extends the functionality of the syslog protocol to provide reliable delivery of event messages. Using RELP can help prevent the loss of audit information if your external syslog server has to restart.

4. Select **Continue**.

5. If you selected **TLS** or **RELP/TLS**, upload the following certificates:

- **Server CA certificates:** One or more trusted CA certificates for verifying the external syslog server (in PEM encoding). If omitted, the default Grid CA certificate will be used. The file you upload here might be a CA bundle.
- **Client certificate:** The client certificate for authentication to the external syslog server (in PEM encoding).
- **Client private key:** Private key for the client certificate (in PEM encoding).



If you use a client certificate you must also use a client private key. If you provide an encrypted private key, you must also provide the passphrase. There is no significant security benefit from using an encrypted private key because the key and passphrase must be stored; using an unencrypted private key, if available, is recommended for simplicity.

- a. Select **Browse** for the certificate or key you want to use.
- b. Select the certificate file or key file.
- c. Select **Open** to upload the file.

A green check appears next to the certificate or key file name, notifying you that it has been uploaded successfully.

6. Select **Continue**.

Manage syslog content

Configure external syslog server

Enter syslog info

Manage syslog content

Send test messages

Manage syslog content

Send audit logs [?](#)

Severity [?](#)

Informational (6) ▾

Facility [?](#)

local7 (23) ▾

Send security events [?](#)

Severity [?](#)

Passthrough ▾

Facility [?](#)

Passthrough ▾

Send application logs [?](#)

Severity [?](#)

Passthrough ▾

Facility [?](#)

Passthrough ▾

[Previous](#)

[Continue](#)

1. Select each type of audit information you want to send to the external syslog server.

- **Send audit logs:** StorageGRID events and system activities
- **Send security events:** Security events such as when an unauthorized user attempts to sign in or a user signs in as root
- **Send application logs:** Log files useful for troubleshooting including:
 - bycast-err.log
 - bycast.log
 - jaeger.log
 - nms.log (Admin Nodes only)
 - prometheus.log
 - raft.log
 - hagroups.log

2. Use the drop-down menus to select the severity and facility (type of message) for the category of audit information you want to send.

If you select **Passthrough** for severity and facility, the information sent to the remote syslog server will receive the same severity and facility as it did when logged locally onto the node. Setting facility and severity can help you aggregate the logs in customizable ways for easier analysis.



For more information on StorageGRID software logs, see [StorageGRID software logs](#).

- a. For **Severity**, select **Passthrough** if you want each message sent to the external syslog to have the same severity value as it does in the local syslog.

For audit logs, if you select **Passthrough** the severity is 'info.'

For security events, if you select **Passthrough**, the severity values are generated by the linux distribution on the nodes.

For application logs, if you select **Passthrough**, the severities vary between 'info' and 'notice,' depending on what the issue is. For example, adding an NTP server and configuring an HA group gives a value of 'info,' while intentionally stopping the ssm or rsm service gives a value of 'notice.'

- b. If you do not want to use the passthrough value, select a severity value between 0 and 7.

The selected value will be applied to all messages of this type. Information about different severities will be lost when you choose to override severity with a fixed value.

Severity	Description
0	Emergency: System is unusable
1	Alert: Action must be taken immediately
2	Critical: Critical conditions
3	Error: Error conditions
4	Warning: Warning conditions
5	Notice: Normal but significant condition
6	Informational: Informational messages
7	Debug: Debug-level messages

- c. For **Facility**, select **Passthrough** if you want each message sent to the external syslog to have the same facility value as it does in the local syslog.

For audit logs, if you select **Passthrough** the facility sent to the external syslog server is 'local7.'

For security events, if you select **Passthrough**, the facility values are generated by the linux distribution on the nodes.

For application logs, if you select **Passthrough**, the application logs sent to the external syslog server have the following facility values:

Application log	Passthrough value
broadcast.log	user or daemon
broadcast-err.log	user, daemon, local3, or local4
jaeger.log	local2
nms.log	local3
prometheus.log	local4
raft.log	local5
hagroups.log	local6

d. If you do not want to use the passthrough value, select the facility value between 0 and 23.

The selected value will be applied to all messages of this type. Information about different facilities will be lost when you choose to override facility with a fixed value.

Facility	Description
0	kern (kernel messages)
1	user (user-level messages)
2	mail
3	daemon (system daemons)
4	auth (security/authorization messages)
5	syslog (messages generated internally by syslogd)
6	lpr (line printer subsystem)
7	news (network news subsystem)
8	UUCP
9	cron (clock daemon)
10	security (security/authorization messages)
11	FTP

Facility	Description
12	NTP
13	logaudit (log audit)
14	logalert (log alert)
15	clock (clock daemon)
16	local0
17	local1
18	local2
19	local3
20	local4
21	local5
22	local6
23	local7

3. Select **Continue**.

Send test messages

Configure external syslog server

Enter syslog info

Manage syslog content

3 Send test messages

Send test messages from all nodes

 After updating the syslog server configuration, confirm that the external syslog server can receive test StorageGRID messages. If the test messages cannot be delivered and you use this configuration, you might lose important messages regarding StorageGRID events and activities.

Before using the syslog server configuration, confirm that all nodes can send messages to the external server. Select **Send test messages** and then check the syslog server. Make sure it receives a test message from each node in your grid. As required, correct any reported errors and try again.

Send test messages

[Previous](#)

Skip and finish

Before starting to use an external syslog server, you should request that all nodes in your grid send test messages to the external syslog server. You should use these test messages to help you validate your entire log collection infrastructure before you commit to sending data to the external syslog server.

 Do not use the external syslog server configuration until you confirm that the external syslog server received a test message from each node in your grid and that the message was processed as expected.

1. If you do not want to send test messages and you are certain your external syslog server is configured properly and can receive audit information from all the nodes in your grid, select **Skip and finish**.

A green banner appears indicating your configuration has been saved successfully.

2. Otherwise, select **Send test messages**.

Test results continuously appear on the page until you stop the test. While the test is in progress, your audit messages continue to be sent to your previously configured destinations.

3. If you receive any errors, correct them and select **Send test messages** again. See [Troubleshooting the external syslog server](#) to help you resolve any errors.
3. Wait until you see a green banner indicating all nodes have passed testing.
4. Check your syslog server to determine if test messages are being received and processed as expected.



If you are using UDP, check your entire log collection infrastructure. The UDP protocol does not allow for as rigorous error detection as the other protocols.

5. Select **Stop and finish**.

You are returned to the **Audit and syslog server** page. A green banner appears notifying you that your syslog server configuration has been saved successfully.



Your StorageGRID audit information is not sent to the external syslog server until you select a destination that includes the external syslog server.

Select audit information destinations

You can specify where security event logs, application logs, and audit message logs are sent.



For more information on StorageGRID software logs, see [StorageGRID software logs](#).

1. On the Audit and syslog server page, select the destination for audit information from the listed options:

Option	Description
Default (Admin nodes/local nodes)	Audit messages are sent to the audit log (<code>audit.log</code>) on the Admin Node, and security event logs and application logs are stored on the nodes where they were generated (also referred to as "the local node").
External syslog server	Audit information is sent to an external syslog server and saved on the local node. The type of information sent depends upon how you configured the external syslog server. This option is enabled only after you have configured an external syslog server.
Admin Node and external syslog server	Audit messages are sent to the audit log (<code>audit.log</code>) on the Admin Node, and audit information is sent to the external syslog server and saved on the local node. The type of information sent depends upon how you configured the external syslog server. This option is enabled only after you have configured an external syslog server.
Local nodes only	No audit information is sent to an Admin Node or remote syslog server. Audit information is saved only on the nodes that generated it. Note: StorageGRID periodically removes these local logs in a rotation to free up space. When the log file for a node reaches 1 GB, the existing file is saved, and a new log file is started. The rotation limit for the log is 21 files. When the 22nd version of the log file is created, the oldest log file is deleted. On average about 20 GB of log data is stored on each node.



Audit information generated on every local node is stored in `/var/local/log/localaudit.log`

2. Select **Save**. Then, select OK to accept the change to the log destination.
3. If you selected either **External syslog server** or **Admin Nodes and external syslog server** as the destination for audit information, an additional warning appears. Review the warning text.



You must confirm that the external syslog server can receive test StorageGRID messages.

4. Confirm that you want to change the destination for audit information by selecting **OK**.

A green banner appears notifying you that your audit configuration has been saved successfully.

New logs are sent to the destinations you selected. Existing logs remain in their current location.

Related information

[Audit message overview](#)

[Configure audit messages and log destinations](#)

[System audit messages](#)

[Object storage audit messages](#)

[Management audit message](#)

[Client read audit messages](#)

[Administer StorageGRID](#)

Use SNMP monitoring

If you want to monitor StorageGRID using the Simple Network Management Protocol (SNMP), you must configure the SNMP agent that is included with StorageGRID.

- [Configure the SNMP agent](#)
- [Update the SNMP agent](#)

Capabilities

Each StorageGRID node runs an SNMP agent, or daemon, that provides a management information base (MIB). The StorageGRID MIB contains table and notification definitions for alerts and alarms. The MIB also contains system description information such as platform and model number for each node. Each StorageGRID node also supports a subset of MIB-II objects.

Initially, SNMP is disabled on all nodes. When you configure the SNMP agent, all StorageGRID nodes receive the same configuration.

The StorageGRID SNMP agent supports all three versions of the SNMP protocol. It provides read-only MIB access for queries, and it can send two types of event-driven notifications to a management system:

- **Traps** are notifications sent by the SNMP agent that do not require acknowledgment by the management system. Traps serve to notify the management system that something has happened within StorageGRID, such as an alert being triggered.

Traps are supported in all three versions of SNMP.

- **Informs** are similar to traps, but they require acknowledgment by the management system. If the SNMP agent does not receive an acknowledgment within a certain amount of time, it resends the inform until an acknowledgment is received or the maximum retry value has been reached.

Informs are supported in SNMPv2c and SNMPv3.

Trap and inform notifications are sent in the following cases:

- A default or custom alert is triggered at any severity level. To suppress SNMP notifications for an alert, you must configure a silence for the alert. Alert notifications are sent by whichever Admin Node is configured to be the preferred sender.

Each alert is mapped to one of three trap types based on the severity level of the alert: activeMinorAlert, activeMajorAlert, and activeCriticalAlert. For descriptions of the alerts that can trigger these traps, see the [Alerts reference](#).

- Certain alarms (legacy system) are triggered at specified severity levels or higher.



SNMP notifications are not sent for every alarm or every alarm severity.

SNMP version support

The table provides a high-level summary of what is supported for each SNMP version.

	SNMPv1	SNMPv2c	SNMPv3
Queries	Read-only MIB queries	Read-only MIB queries	Read-only MIB queries
Query authentication	Community string	Community string	User-based Security Model (USM) user
Notifications	Traps only	Traps and informs	Traps and informs
Notification authentication	Default trap community or a custom community string for each trap destination	Default trap community or a custom community string for each trap destination	USM user for each trap destination

Limitations

- StorageGRID supports read-only MIB access. Read-write access is not supported.
- All nodes in the grid receive the same configuration.
- SNMPv3: StorageGRID does not support the Transport Support Mode (TSM).
- SNMPv3: The only authentication protocol supported is SHA (HMAC-SHA-96).
- SNMPv3: The only privacy protocol supported is AES.

Access the MIB

You can access the MIB definition file at the following location on any StorageGRID node:

/usr/share/snmp/mibs/NETAPP-STORAGEGRID-MIB.txt

Related information

- [Alerts reference](#)

- Alarms reference (legacy system)
- Alarms that generate SNMP notifications (legacy system)
- Silence alert notifications

Configure the SNMP agent

You can configure the StorageGRID SNMP agent if you want to use a third-party SNMP management system for read-only MIB access and notifications.

What you'll need

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

About this task

The StorageGRID SNMP agent supports all three versions of the SNMP protocol. You can configure the agent for one or more versions.

Steps

1. Select **CONFIGURATION > Monitoring > SNMP agent**.

The SNMP Agent page appears.

SNMP Agent

You can configure SNMP for read-only MIB access and notifications. SNMPv1, SNMPv2c, SNMPv3 are supported. For SNMPv3, only User Security Model (USM) authentication is supported. All nodes in the grid share the same SNMP configuration.



2. To enable the SNMP agent on all grid nodes, select the **Enable SNMP** check box.

The fields for configuring an SNMP agent appear.

SNMP Agent

You can configure SNMP for read-only MIB access and notifications. SNMPv1, SNMPv2c, SNMPv3 are supported. For SNMPv3, only User Security Model (USM) authentication is supported. All nodes in the grid share the same SNMP configuration.

The screenshot shows the 'SNMP Agent' configuration page. It includes fields for 'Enable SNMP' (checked), 'System Contact' (empty input field), 'System Location' (empty input field), 'Enable SNMP Agent Notifications' (checked), and 'Enable Authentication Traps' (unchecked). Below these are sections for 'Community Strings' and 'Other Configurations'. The 'Community Strings' section contains fields for 'Default Trap Community' (empty input field) and 'Read-Only Community' (empty input field). The 'Other Configurations' section has tabs for 'Agent Addresses (0)', 'USM Users (0)', and 'Trap Destinations (0)'. Under 'Agent Addresses', there are buttons for '+ Create', 'Edit', and 'Remove', and tabs for 'Internet Protocol', 'Transport Protocol', 'StorageGRID Network', and 'Port'. A message 'No results found.' is displayed. A blue 'Save' button is located at the bottom right.

Enable SNMP

System Contact

System Location

Enable SNMP Agent Notifications

Enable Authentication Traps

Community Strings

Default Trap Community

Read-Only Community

String 1 +

Other Configurations

Agent Addresses (0) USM Users (0) Trap Destinations (0)

+ Create Edit Remove

Internet Protocol Transport Protocol StorageGRID Network Port

No results found.

Save

3. In the **System Contact** field, enter the value you want StorageGRID to provide in SNMP messages for sysContact.

The System Contact typically is an email address. The value you provide applies to all nodes in the StorageGRID system. **System Contact** can be a maximum of 255 characters.

4. In the **System Location** field, enter the value you want StorageGRID to provide in SNMP messages for sysLocation.

The System Location can be any information that is useful for identifying where your StorageGRID system is located. For example, you might use the street address of a facility. The value you provide applies to all nodes in the StorageGRID system. **System Location** can be a maximum of 255 characters.

5. Keep the **Enable SNMP Agent Notifications** check box selected if you want the StorageGRID SNMP agent to send trap and inform notifications.

If this check box is unselected, the SNMP agent supports read-only MIB access, but it does not send any SNMP notifications.

6. Select the **Enable Authentication Traps** check box if you want the StorageGRID SNMP agent to send an authentication trap if it receives an improperly authenticated protocol message.

7. If you use SNMPv1 or SNMPv2c, complete the Community Strings section.

The fields in this section are used for community-based authentication in SNMPv1 or SNMPv2c. These fields do not apply to SNMPv3.

- a. In the **Default Trap Community** field, optionally enter the default community string you want to use for trap destinations.

As required, you can provide a different (“custom”) community string when you [define a specific trap destination](#).

Default Trap Community can be a maximum of 32 characters and cannot contain whitespace characters.

- b. For **Read-Only Community**, enter one or more community strings to allow read-only MIB access on IPv4 and IPv6 agent addresses. Click the plus sign  to add multiple strings.

When the management system queries the StorageGRID MIB, it sends a community string. If the community string matches one of the values specified here, the SNMP agent sends a response to the management system.

Each community string can be a maximum of 32 characters and cannot contain whitespace characters. Up to five strings are allowed.



To ensure the security of your StorageGRID system, do not use “public” as the community string. If you do not enter a community string, the SNMP agent uses the grid ID of your StorageGRID system as the community string.

8. Optionally, select the Agent Addresses tab in the Other Configurations section.

Use this tab to specify one or more “listening addresses.” These are the StorageGRID addresses on which the SNMP agent can receive queries. Each agent address includes an internet protocol, a transport protocol, a StorageGRID network, and optionally a port.

If you do not configure an agent address, the default listening address is UDP port 161 on all StorageGRID networks.

- a. Click **Create**.

The Create Agent Address dialog box appears.

Create Agent Address

Internet Protocol IPv4 IPv6

Transport Protocol UDP TCP

StorageGRID Network

Port

b. For **Internet Protocol**, select whether this address will use IPv4 or IPv6.

By default, SNMP uses IPv4.

c. For **Transport Protocol**, select whether this address will use UDP or TCP.

By default, SNMP uses UDP.

d. In the **StorageGRID Network** field, select which StorageGRID network the query will be received on.

- Grid, Admin, and Client Networks: StorageGRID should listen for SNMP queries on all three networks.
- Grid Network
- Admin Network
- Client Network



To ensure that client communications with StorageGRID remain secure, you should not create an agent address for the Client Network.

e. In the **Port** field, optionally enter the port number that the SNMP agent should listen on.

The default UDP port for an SNMP agent is 161, but you can enter any unused port number.



When you save the SNMP agent, StorageGRID automatically opens the agent address ports on the internal firewall. You must ensure that any external firewalls allow access to these ports.

f. Click **Create**.

The agent address is created and added to the table.

Other Configurations

Agent Addresses (2)	USM Users (2)	Trap Destinations (2)
---------------------	---------------	-----------------------

USM Users (2)

	Internet Protocol	Transport Protocol	StorageGRID Network	Port
<input type="radio"/>	IPv4	UDP	Grid Network	161
<input checked="" type="radio"/>	IPv4	UDP	Admin Network	161

9. If you are using SNMPv3, select the USM Users tab in the Other Configurations section.

Use this tab to define the USM users who are authorized to query the MIB or to receive traps and informs.



This step does not apply if you are only using SNMPv1 or SNMPv2c.

- a. Click **Create**.

The Create USM User dialog box appears.

Create USM User

Username

Read-Only MIB Access

Authoritative Engine ID

Security Level authPriv authNoPriv

Authentication

Protocol SHA

Password

Confirm Password

Privacy

Protocol AES

Password

Confirm Password

- b. Enter a unique **Username** for this USM user.

Usernames have a maximum of 32 characters and cannot contain whitespace characters. The username cannot be changed after the user is created.

- c. Select the **Read-Only MIB Access** check box if this user should have read-only access to the MIB.

If you select **Read-Only MIB Access**, the **Authoritative Engine ID** field is disabled.



USM users who have read-only MIB access cannot have engine IDs.

- d. If this user will be used in an inform destination, enter the **Authoritative Engine ID** for this user.



SNMPv3 inform destinations must have users with engine IDs. SNMPv3 trap destination cannot have users with engine IDs.

The authoritative engine ID can be from 5 to 32 bytes in hexadecimal.

e. Select a security level for the USM user.

- **authPriv**: This user communicates with authentication and privacy (encryption). You must specify an authentication protocol and password and a privacy protocol and password.
- **authNoPriv**: This user communicates with authentication and without privacy (no encryption). You must specify an authentication protocol and password.

f. Enter and confirm the password this user will use for authentication.



The only authentication protocol supported is SHA (HMAC-SHA-96).

g. If you selected **authPriv**, enter and confirm the password this user will use for privacy.



The only privacy protocol supported is AES.

h. Click **Create**.

The USM user is created and added to the table.

Other Configurations

Agent Addresses (2)

USM Users (3)

Trap Destinations (2)

+ Create **Edit** **Remove**

	Username	Read-Only MIB Access	Security Level	Authoritative Engine ID
<input type="radio"/>	user2	✓	authNoPriv	
<input type="radio"/>	user1		authNoPriv	B3A73C2F3D6
<input checked="" type="radio"/>	user3		authPriv	59D39E801256

10. In the Other Configurations section, select the Trap Destinations tab.

The Trap Destinations tab allows you to define one or more destinations for StorageGRID trap or inform notifications. When you enable the SNMP agent and click **Save**, StorageGRID starts sending notifications to each defined destination. Notifications are sent when alerts and alarms are triggered. Standard notifications are also sent for the supported MIB-II entities (for example, ifDown and coldStart).

a. Click **Create**.

The Create Trap Destination dialog box appears.

Create Trap Destination

Version SNMPv1 SNMPv2C SNMPv3

Type Trap

Host

Port 162

Protocol UDP TCP

Community String Use the default trap community: No default found
(Specify the default on the SNMP Agent page.) Use a custom community string

Custom Community String

Cancel **Create**

b. In the **Version** field, select which SNMP version will be used for this notification.

c. Complete the form, based on which version you selected

Version	Specify this information
SNMPv1	<p>Note: For SNMPv1, the SNMP agent can only send traps. Informs are not supported.</p> <ol style="list-style-type: none">In the Host field, enter an IPv4 or IPv6 address (or FQDN) to receive the trap.For Port, use the default (162), unless you must use another value. (162 is the standard port for SNMP traps.)For Protocol, use the default (UDP). TCP is also supported. (UDP is the standard SNMP trap protocol.)Use the default trap community, if one was specified on the SNMP Agent page, or enter a custom community string for this trap destination. <p>The custom community string can be a maximum of 32 characters and cannot contain whitespace.</p>

Version	Specify this information
SNMPv2c	<ul style="list-style-type: none"> i. Select whether the destination will be used for traps or informs. ii. In the Host field, enter an IPv4 or IPv6 address (or FQDN) to receive the trap. iii. For Port, use the default (162), unless you must use another value. (162 is the standard port for SNMP traps.) iv. For Protocol, use the default (UDP). TCP is also supported. (UDP is the standard SNMP trap protocol.) v. Use the default trap community, if one was specified on the SNMP Agent page, or enter a custom community string for this trap destination. <p>The custom community string can be a maximum of 32 characters and cannot contain whitespace.</p>
SNMPv3	<ul style="list-style-type: none"> i. Select whether the destination will be used for traps or informs. ii. In the Host field, enter an IPv4 or IPv6 address (or FQDN) to receive the trap. iii. For Port, use the default (162), unless you must use another value. (162 is the standard port for SNMP traps.) iv. For Protocol, use the default (UDP). TCP is also supported. (UDP is the standard SNMP trap protocol.) v. Select the USM user that will be used for authentication. <ul style="list-style-type: none"> ◦ If you selected Trap, only USM users without authoritative engine IDs are shown. ◦ If you selected Inform, only USM users with authoritative engine IDs are shown.

d. Click **Create**.

The trap destination is created and added to the table.

Other Configurations

Agent Addresses (1)	USM Users (2)	Trap Destinations (2)
+ Create Edit Remove		

Version	Type	Host	Port	Protocol	Community/USM User
SNMPv3	Trap	local		UDP	User: Read only user
SNMPv3	Inform	10.10.10.10	162	UDP	User: Inform user

- When you have completed the SNMP agent configuration, click **Save**

The new SNMP agent configuration becomes active.

Related information

[Silence alert notifications](#)

Update the SNMP agent

You might want to disable SNMP notifications, update community strings, or add or remove agent addresses, USM users, and trap destinations.

What you'll need

- You must be signed in to the Grid Manager using a [supported web browser](#).
- You must have the Root Access permission.

About this task

Whenever you update the [SNMP agent configuration](#), be aware that you must click **Save** at the bottom on the SNMP Agent page to commit any changes you have made on each tab.

Steps

- Select **CONFIGURATION > Monitoring > SNMP agent**.

The SNMP Agent page appears.

- If you want to disable the SNMP agent on all grid nodes, unselect the **Enable SNMP** check box, and click **Save**.

The SNMP agent is disabled for all grid nodes. If you later re-enable the agent, any previous SNMP configuration settings are retained.

- Optionally, update the values you entered for **System Contact** and **System Location**.
- Optionally, unselect the **Enable SNMP Agent Notifications** check box if you no longer want the StorageGRID SNMP agent to send trap and inform notifications.

When this check box is unselected, the SNMP agent supports read-only MIB access, but it does not send any SNMP notifications.

- Optionally, unselect the **Enable Authentication Traps** check box if you no longer want the StorageGRID

SNMP agent to send an authentication trap when it receives an improperly authenticated protocol message.

6. If you use SNMPv1 or SNMPv2c, optionally update the Community Strings section.

The fields in this section are used for community-based authentication in SNMPv1 or SNMPv2c. These fields do not apply to SNMPv3.



If you want to remove the default community string, you must first ensure that all trap destinations use a custom community string.

7. If you want to update agent addresses, select the Agent Addresses tab in the Other Configurations section.

Other Configurations

Internet Protocol	Transport Protocol	StorageGRID Network	Port
IPv4	UDP	Grid Network	161
IPv4	UDP	Admin Network	161

Use this tab to specify one or more “listening addresses.” These are the StorageGRID addresses on which the SNMP agent can receive queries. Each agent address includes an internet protocol, a transport protocol, a StorageGRID network, and a port.

- To add an agent address, click **Create**. Then, refer to the step for agent addresses in the instructions for configuring the SNMP agent.
 - To edit an agent address, select the radio button for the address, and click **Edit**. Then, refer to the step for agent addresses in the instructions for configuring the SNMP agent.
 - To remove an agent address, select the radio button for the address, and click **Remove**. Then, click **OK** to confirm that you want to remove this address.
 - To commit your changes, click **Save** at the bottom of the SNMP Agent page.
8. If you want to update USM users, select the USM Users tab in the Other Configurations section.

Other Configurations

USM Users (3)				
+ Create Edit Remove				
Username	Read-Only MIB Access	Security Level	Authoritative Engine ID	
<input type="radio"/> user2	<input checked="" type="checkbox"/>	authNoPriv		
<input type="radio"/> user1	<input type="checkbox"/>	authNoPriv	B3A73C2F3D6	
<input checked="" type="radio"/> user3	<input type="checkbox"/>	authPriv	59D39E801256	

Use this tab to define the USM users who are authorized to query the MIB or to receive traps and informs.

- a. To add a USM user, click **Create**. Then, refer to the step for USM users in the instructions for configuring the SNMP agent.
- b. To edit a USM user, select the radio button for the user, and click **Edit**. Then, refer to the step for USM users in the instructions for configuring the SNMP agent.

The username for an existing USM user cannot be changed. If you need to change a username, you must remove the user and create a new one.



If you add or remove a user's authoritative engine ID and that user is currently selected for a destination, you must edit or remove the destination, as described in step [SNMP trap destination](#). Otherwise, a validation error occurs when you save the SNMP agent configuration.

- c. To remove a USM user, select the radio button for the user, and click **Remove**. Then, click **OK** to confirm that you want to remove this user.



If the user you removed is currently selected for a trap destination, you must edit or remove the destination, as described in step [SNMP trap destination](#). Otherwise, a validation error occurs when you save the SNMP agent configuration.



422: Unprocessable Entity

Validation failed. Please check the values you entered for errors.

Undefined trap destination usmUser 'user1'

OK

- d. To commit your changes, click **Save** at the bottom of the SNMP Agent page.

9. If you want to update trap destinations, select the Trap Destinations tab in the Other Configurations section.

Other Configurations

Version	Type	Host	Port	Protocol	Community/USM User
SNMPv3	Trap	local		UDP	User: Read only user
SNMPv3	Inform	10.10.10.10	162	UDP	User: Inform user

The Trap Destinations tab allows you to define one or more destinations for StorageGRID trap or inform notifications. When you enable the SNMP agent and click **Save**, StorageGRID starts sending notifications to each defined destination. Notifications are sent when alerts and alarms are triggered. Standard notifications are also sent for the supported MIB-II entities (for example, ifDown and coldStart).

- a. To add a trap destination, click **Create**. Then, refer to the step for trap destinations in the instructions for configuring the SNMP agent.
 - b. To edit a trap destination, select the radio button for the user, and click **Edit**. Then, refer to the step for trap destinations in the instructions for configuring the SNMP agent.
 - c. To remove a trap destination, select the radio button for the destination, and click **Remove**. Then, click **OK** to confirm that you want to remove this destination.
 - d. To commit your changes, click **Save** at the bottom of the SNMP Agent page.
10. When you have updated the SNMP agent configuration, click **Save**.

Collect additional StorageGRID data

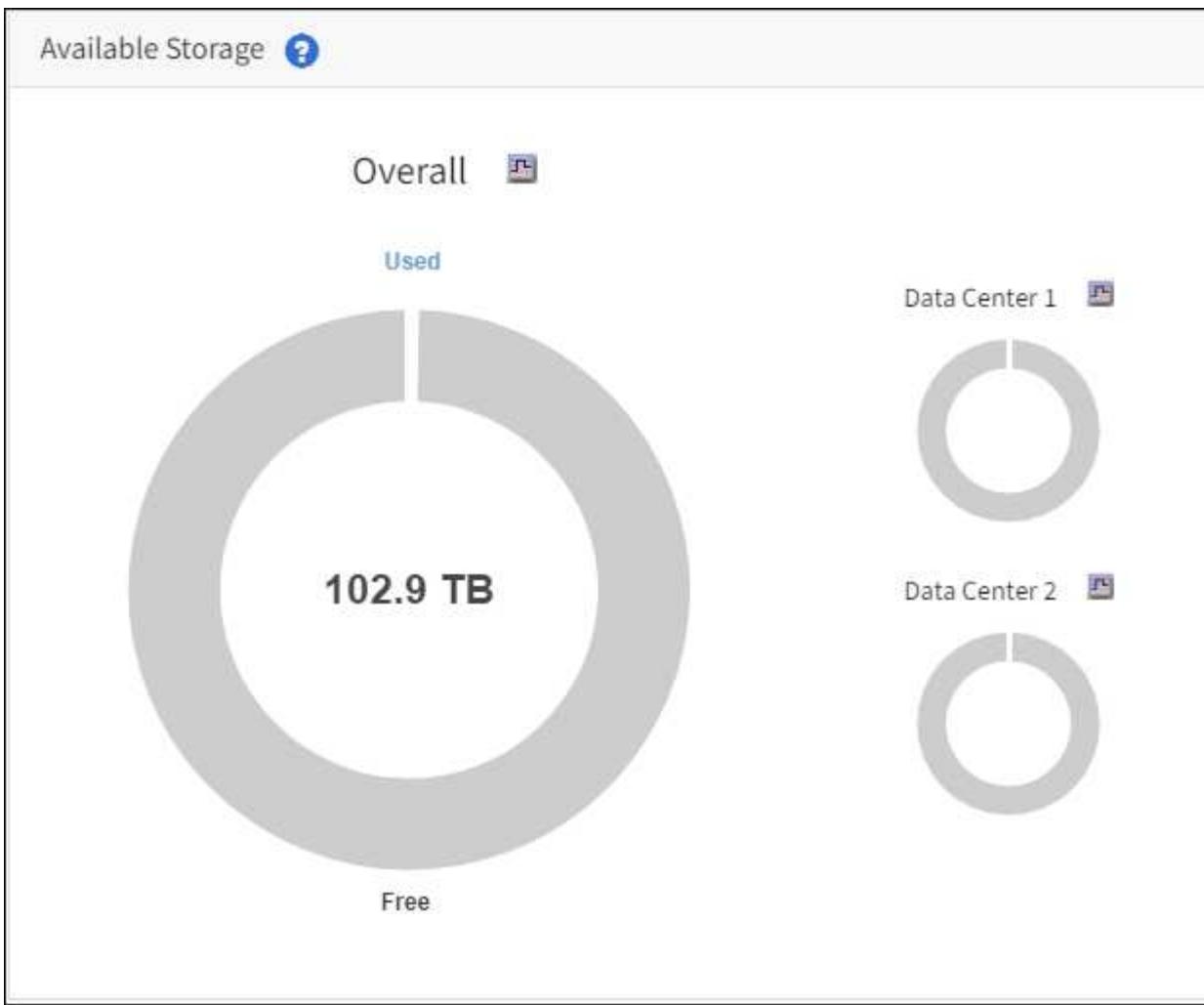
Use charts and graphs

You can use charts and reports to monitor the state of the StorageGRID system and troubleshoot problems. The types of charts and reports available in the Grid Manager include donut charts (on the Dashboard only), graphs, and text reports.

Types of charts

Charts and graphs summarize the values of specific StorageGRID metrics and attributes.

The Grid Manager Dashboard includes donut charts to summarize available storage for the grid and each site.



The Storage usage panel on the Tenant Manager Dashboard displays the following:

- A list of the largest buckets (S3) or containers (Swift) for the tenant
- A bar chart that represents the relative sizes of the largest buckets or containers
- The total amount of space used and, if a quota is set, the amount and percentage of space remaining

Dashboard

16 Buckets
[View buckets](#)

2 Platform services endpoints
[View endpoints](#)

0 Groups
[View groups](#)

1 User
[View users](#)

Storage usage [?](#)

6.5 TB of 7.2 TB used

0.7 TB (10.1%) remaining



Bucket name	Space used	Number of objects
Bucket-15	969.2 GB	913,425
Bucket-04	937.2 GB	576,806
Bucket-13	815.2 GB	957,389
Bucket-06	812.5 GB	193,843
Bucket-10	473.9 GB	583,245
Bucket-03	403.2 GB	981,226
Bucket-07	362.5 GB	420,726
Bucket-05	294.4 GB	785,190
8 other buckets	1.4 TB	3,007,036

Total objects

8,418,886
objects

Tenant details [?](#)

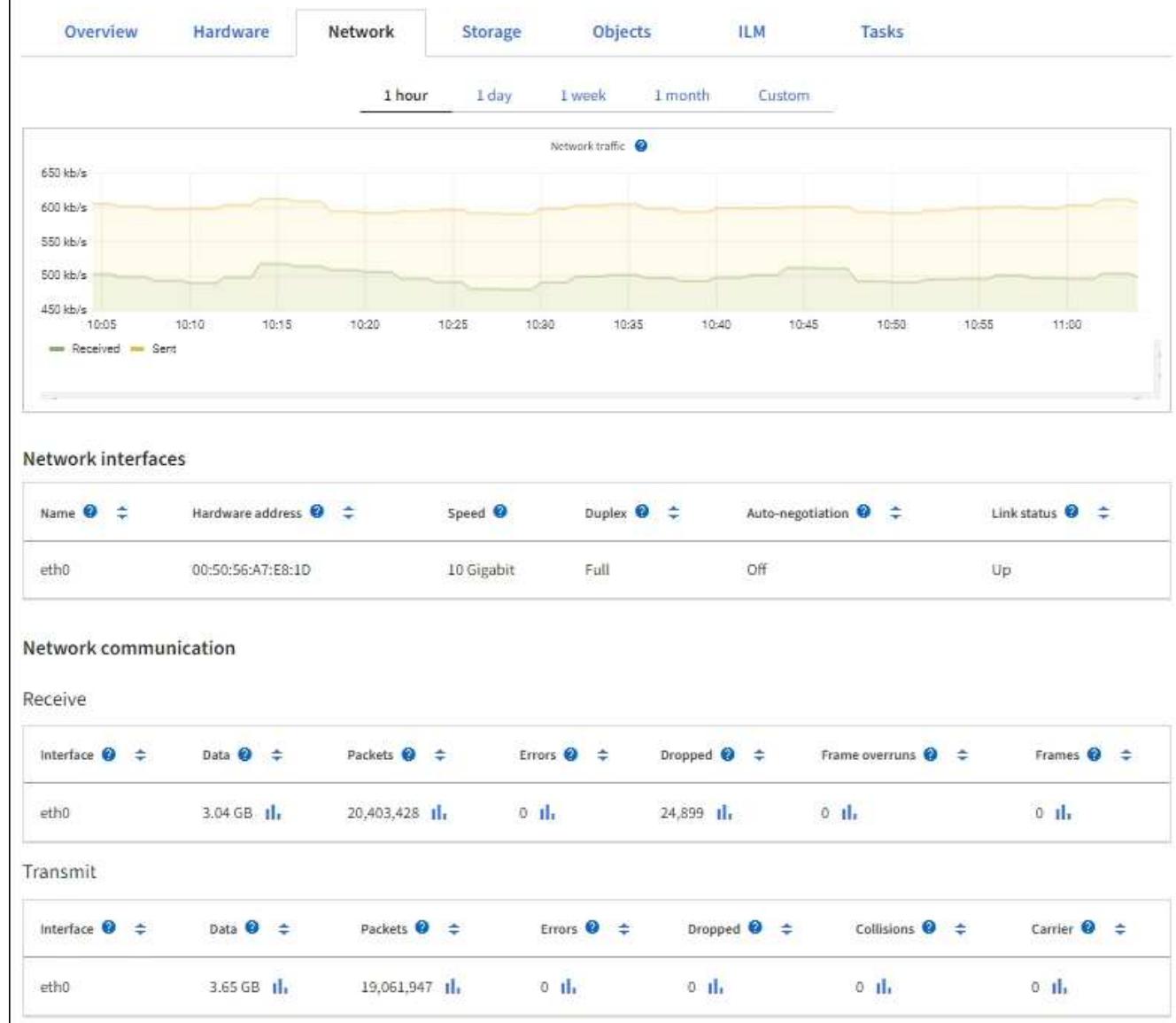
Name: Tenant02
ID: 3341 1240 0546 8283 2208
 Platform services enabled
 Can use own identity source
 S3 Select enabled

In addition, graphs that show how StorageGRID metrics and attributes change over time are available from the Nodes page and from the **SUPPORT > Tools > Grid topology** page.

There are four types of graphs:

- **Grafana charts:** Shown on the Nodes page, Grafana charts are used to plot the values of Prometheus metrics over time. For example, the **NODES > Network** tab for a Storage Node includes a Grafana chart for network traffic.

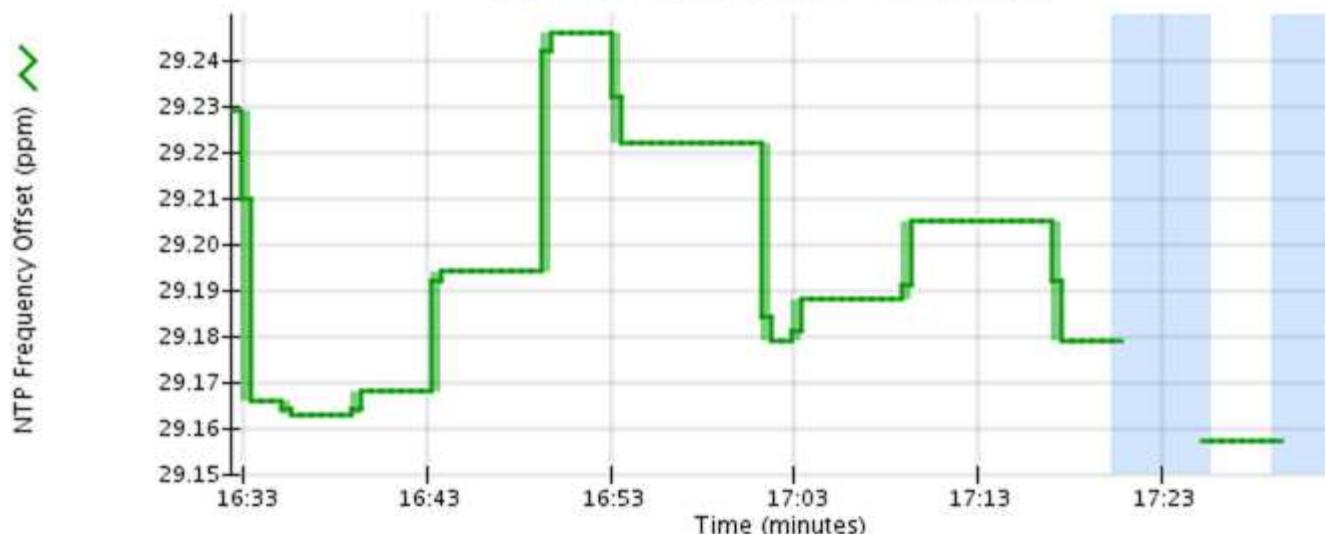
DC1-S2 (Storage Node)



Grafana charts are also included on the pre-constructed dashboards available from the **SUPPORT > Tools > Metrics** page.

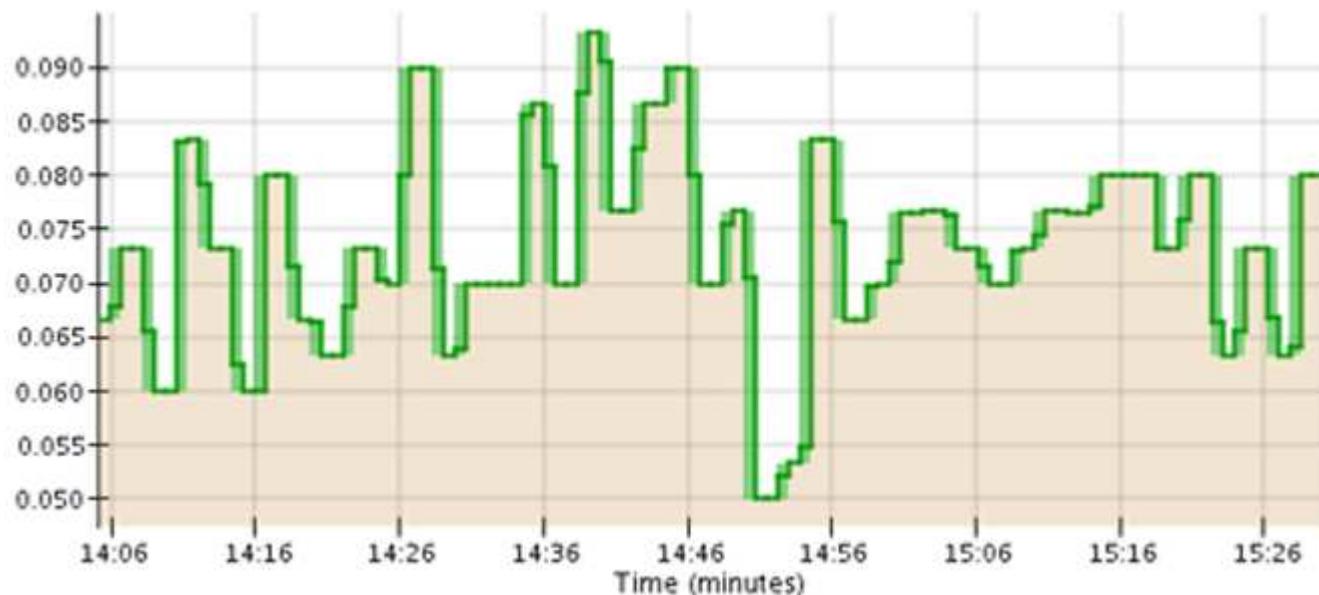
- **Line graphs:** Available from the Nodes page and from the **SUPPORT > Tools > Grid topology** page (select the chart icon  after a data value), line graphs are used to plot the values of StorageGRID attributes that have a unit value (such as NTP Frequency Offset, in ppm). The changes in the value are plotted in regular data intervals (bins) over time.

NTP Frequency Offset (ppm) vs Time
2010-07-18 16:32:15 PDT to 2010-07-18 17:32:15 PDT

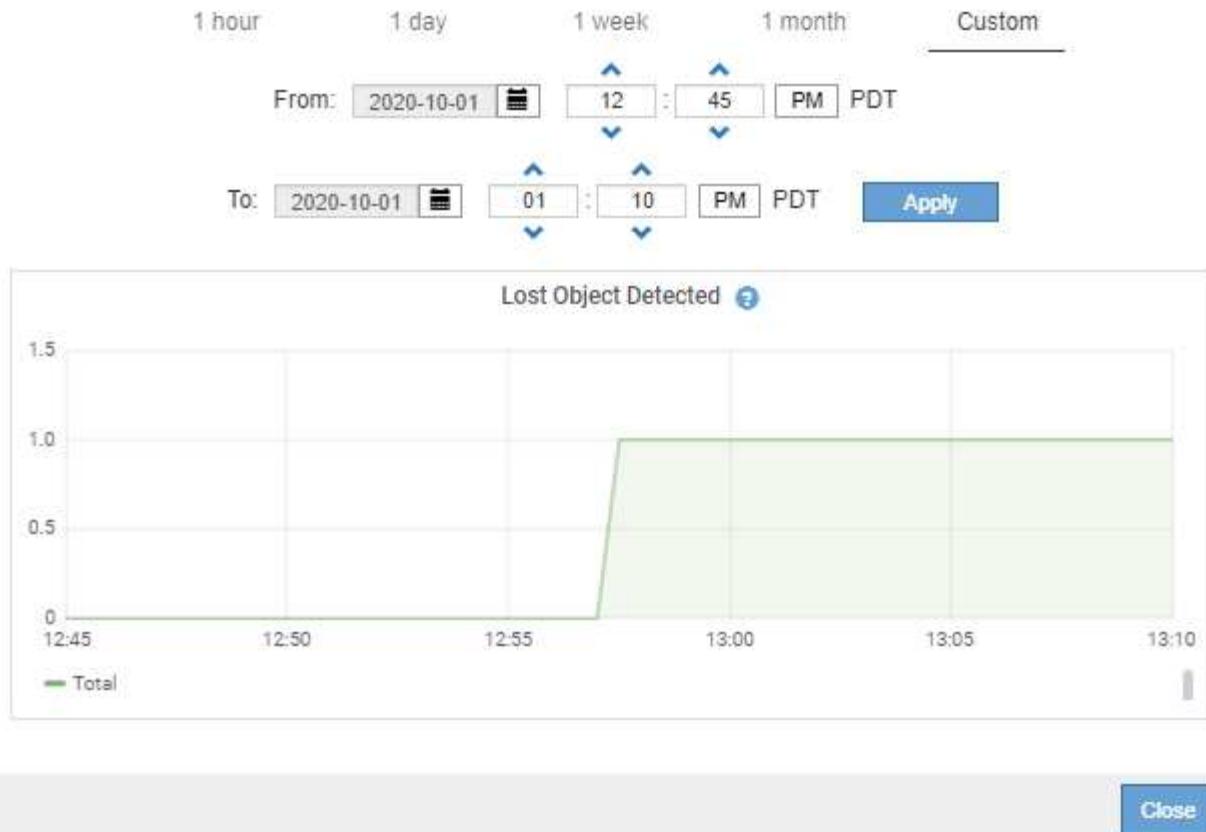


- **Area graphs:** Available from the Nodes page and from the **SUPPORT > Tools > Grid topology** page (select the chart icon after a data value), area graphs are used to plot volumetric attribute quantities, such as object counts or service load values. Area graphs are similar to line graphs, but include a light brown shading below the line. The changes in the value are plotted in regular data intervals (bins) over time.

Service Load @@ vs Time
2010-07-19 14:05:02 PDT to 2010-07-19 15:30:02 PDT



- Some graphs are denoted with a different type of chart icon and have a different format:

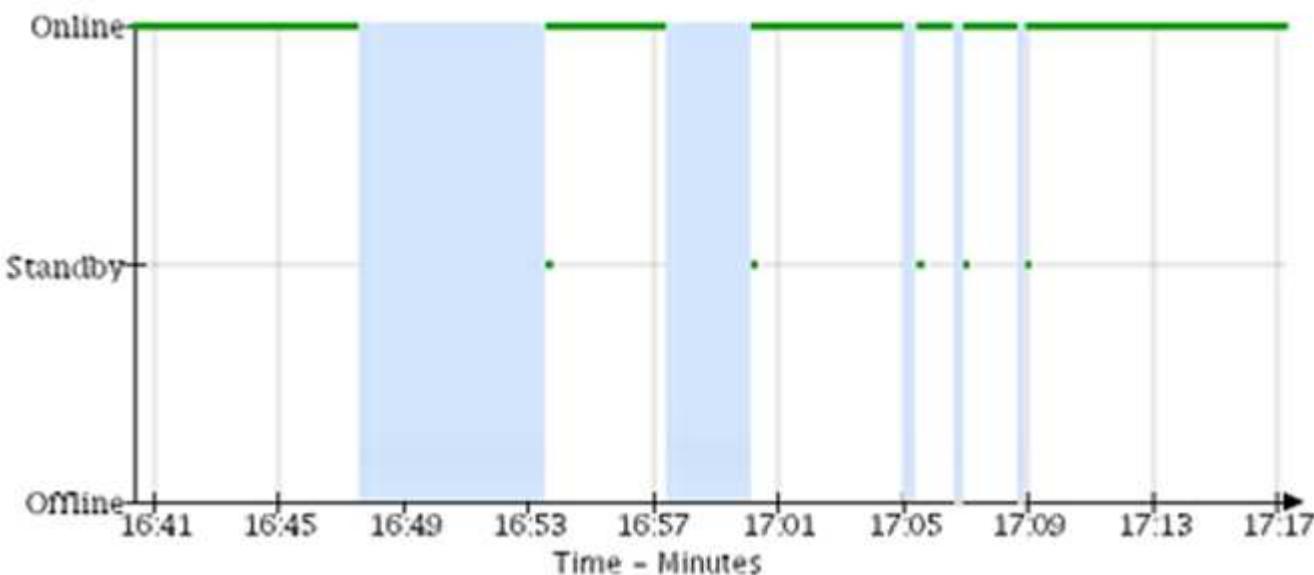


Close

- **State graph:** Available from the SUPPORT > Tools > Grid topology page (select the chart icon after a data value), state graphs are used to plot attribute values that represent distinct states such as a service state that can be online, standby, or offline. State graphs are similar to line graphs, but the transition is discontinuous; that is, the value jumps from one state value to another.

LDR State vs Time

2004-07-09 16:40:23 to 2004-07-09 17:17:11



Related information

[View the Nodes page](#)

[View the Grid Topology tree](#)

[Review support metrics](#)

Chart legend

The lines and colors used to draw charts have specific meaning.

Sample	Meaning
	Reported attribute values are plotted using dark green lines.
	Light green shading around dark green lines indicates that the actual values in that time range vary and have been “binned” for faster plotting. The dark line represents the weighted average. The range in light green indicates the maximum and minimum values within the bin. Light brown shading is used for area graphs to indicate volumetric data.
	Blank areas (no data plotted) indicate that the attribute values were unavailable. The background can be blue, gray, or a mixture of gray and blue, depending on the state of the service reporting the attribute.
	Light blue shading indicates that some or all of the attribute values at that time were indeterminate; the attribute was not reporting values because the service was in an unknown state.
	Gray shading indicates that some or all of the attribute values at that time were not known because the service reporting the attributes was administratively down.
	A mixture of gray and blue shading indicates that some of the attribute values at the time were indeterminate (because the service was in an unknown state), while others were not known because the service reporting the attributes was administratively down.

Display charts and graphs

The Nodes page contains the charts and graphs you should access regularly to monitor attributes such as storage capacity and throughput. In some cases, especially when working with technical support, you can use the **SUPPORT > Tools > Grid topology** page to access additional charts.

What you'll need

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

Steps

1. Select **NODES**. Then, select a node, a site, or the entire grid.
2. Select the tab for which you want to view information.

Some tabs include one or more Grafana charts, which are used to plot the values of Prometheus metrics over time. For example, the **NODES > Hardware** tab for a node includes two Grafana charts.

DC3-S3 (Storage Node)

X

Overview

Hardware

Network

Storage

Objects

ILM

Tasks

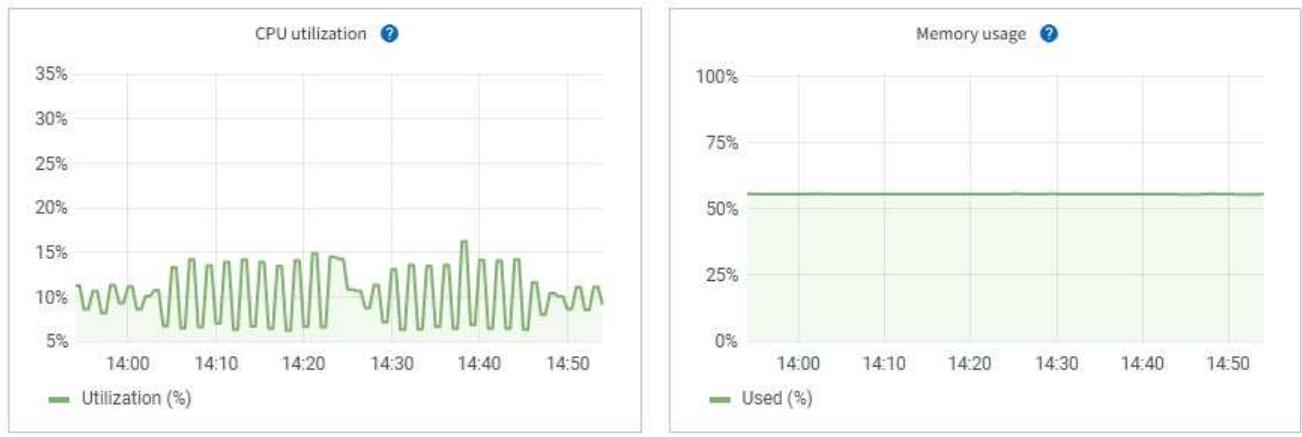
1 hour

1 day

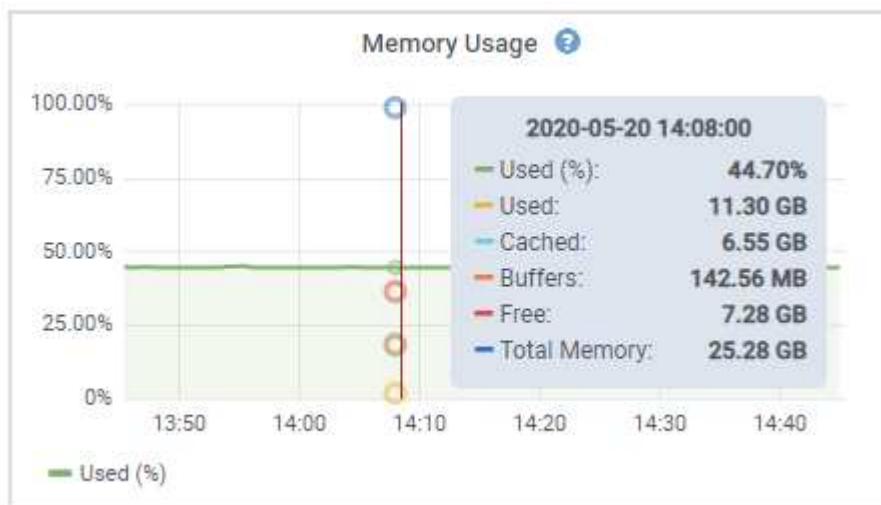
1 week

1 month

Custom



3. Optionally, hover your cursor over the chart to see more detailed values for a particular point in time.

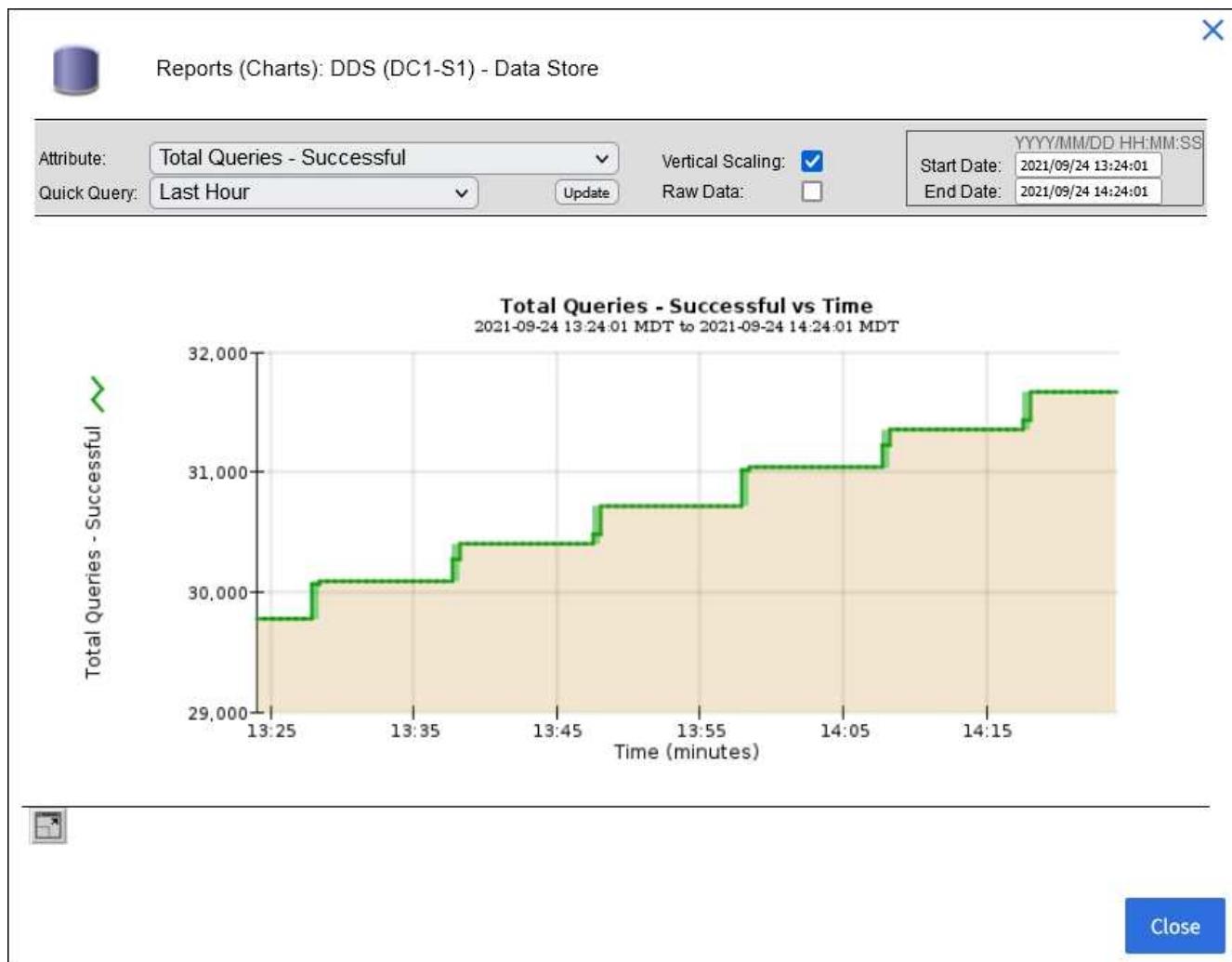


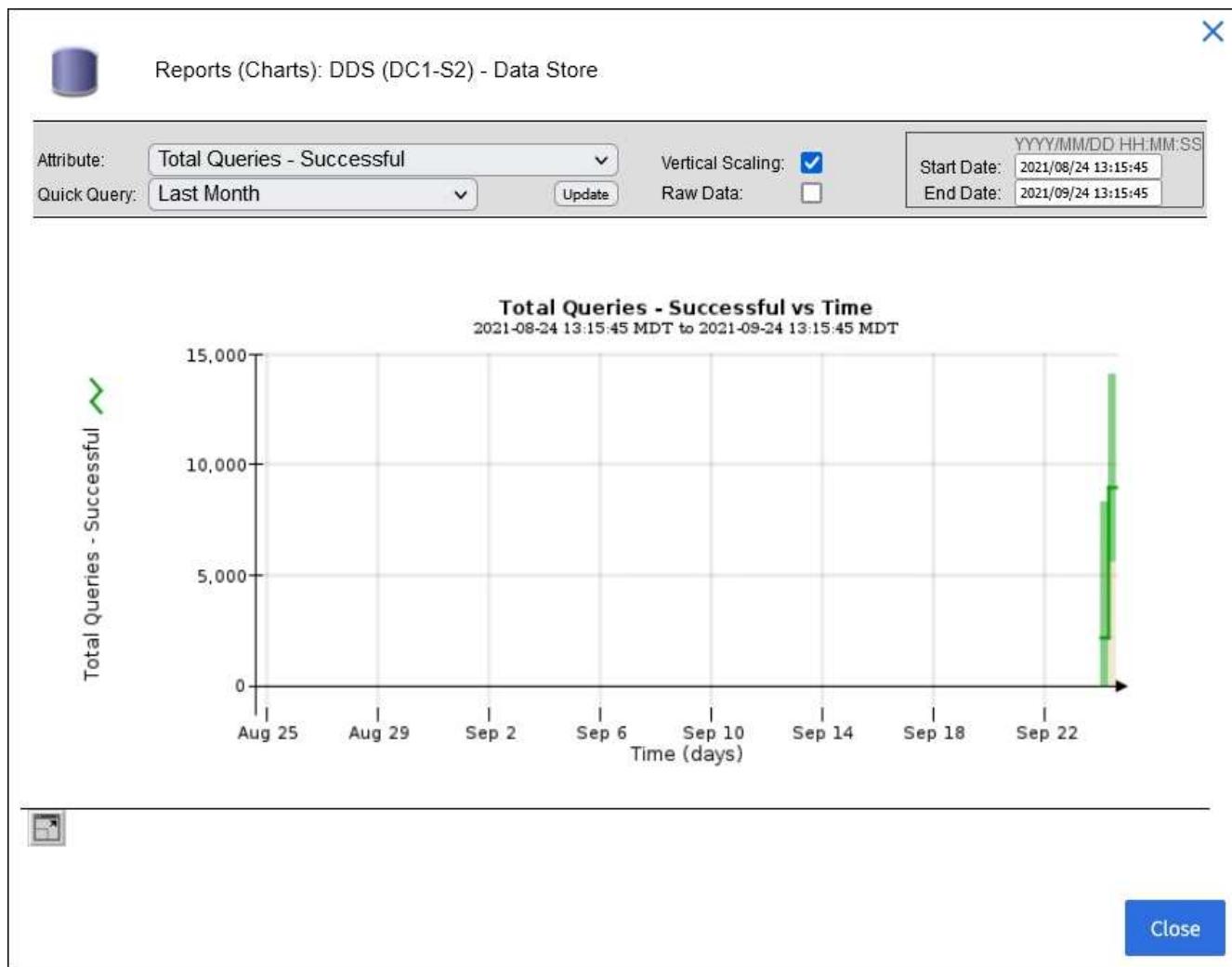
4. As required, you can often display a chart for a specific attribute or metric. From the table on the Nodes page, select the chart icon  to the right of the attribute name.



Charts are not available for all metrics and attributes.

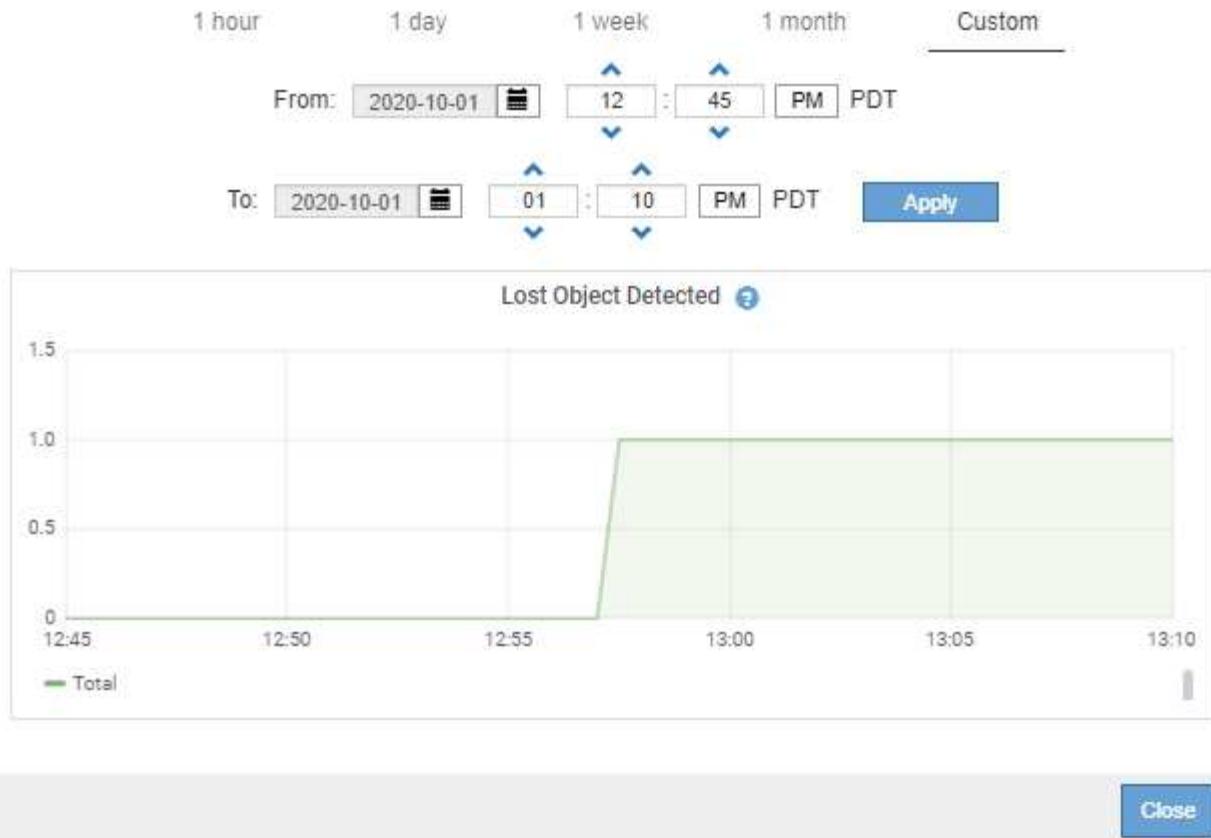
Example 1: From the Objects tab for a Storage Node, you can select the chart icon  to see the total number of successful metadata store queries for the Storage Node.





Example 2: From the Objects tab for a Storage Node, you can select the chart icon to see the Grafana graph of the count of lost objects detected over time.

Object Counts	
Total Objects	1
Lost Objects	1
S3 Buckets and Swift Containers	1



5. To display charts for attributes that are not shown on the Node page, select **SUPPORT > Tools > Grid topology**.
6. Select **grid node > component or service > Overview > Main**.

The screenshot shows the Grid Manager's main navigation bar with tabs for Overview, Alarms, Reports, and Configuration. The Overview tab is selected. Below the navigation bar, there's a sub-navigation bar with Main selected. The main content area has a title "Overview: SSM (DC1-ADM1) - Resources" with a timestamp "Updated: 2018-05-07 16:29:52 MDT". To the left of the title is an icon of three cylinders. The content is divided into sections: Computational Resources, Memory, and Processors. Each section contains tables with data and small chart icons.

Computational Resources

Service Restarts:	1	
Service Runtime:	6 days	
Service Uptime:	6 days	
Service CPU Seconds:	10666 s	
Service Load:	0.266 %	

Memory

Installed Memory:	8.38 GB	
Available Memory:	2.9 GB	

Processors

Processor Number	Vendor	Type	Cache
1	GenuineIntel	Intel(R) Xeon(R) CPU E5-2630 0 @ 2.30GHz	15 MiB
2	GenuineIntel	Intel(R) Xeon(R) CPU E5-2630 0 @ 2.30GHz	15 MiB
3	GenuineIntel	Intel(R) Xeon(R) CPU E5-2630 0 @ 2.30GHz	15 MiB
4	GenuineIntel	Intel(R) Xeon(R) CPU E5-2630 0 @ 2.30GHz	15 MiB
5	GenuineIntel	Intel(R) Xeon(R) CPU E5-2630 0 @ 2.30GHz	15 MiB
6	GenuineIntel	Intel(R) Xeon(R) CPU E5-2630 0 @ 2.30GHz	15 MiB
7	GenuineIntel	Intel(R) Xeon(R) CPU E5-2630 0 @ 2.30GHz	15 MiB
8	GenuineIntel	Intel(R) Xeon(R) CPU E5-2630 0 @ 2.30GHz	15 MiB

- Select the chart icon next to the attribute.

The display automatically changes to the **Reports > Charts** page. The chart displays the attribute's data over the past day.

Generate charts

Charts display a graphical representation of attribute data values. You can report on a data center site, grid node, component, or service.

What you'll need

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

Steps

- Select **SUPPORT > Tools > Grid topology**.
- Select **grid node > component or service > Reports > Charts**.
- Select the attribute to report on from the **Attribute** drop-down list.
- To force the Y-axis to start at zero, deselect the **Vertical Scaling** check box.
- To show values at full precision, select the **Raw Data** check box, or to round values to a maximum of three

decimal places (for example, for attributes reported as percentages), deselect the **Raw Data** check box.

6. Select the time period to report on from the **Quick Query** drop-down list.

Select the Custom Query option to select a specific time range.

The chart appears after a few moments. Allow several minutes for tabulation of long time ranges.

7. If you selected Custom Query, customize the time period for the chart by entering the **Start Date** and **End Date**.

Use the format *YYYY/MM/DDHH:MM:SS* in local time. Leading zeros are required to match the format. For example, 2017/4/6 7:30:00 fails validation. The correct format is: 2017/04/06 07:30:00.

8. Select **Update**.

A chart is generated after a few seconds. Allow several minutes for tabulation of long time ranges. Depending on the length of time set for the query, either a raw text report or aggregate text report is displayed.

Use text reports

Text reports display a textual representation of attribute data values that have been processed by the NMS service. There are two types of reports generated depending on the time period you are reporting on: raw text reports for periods less than a week, and aggregate text reports for time periods greater than a week.

Raw text reports

A raw text report displays details about the selected attribute:

- Time Received: Local date and time that a sample value of an attribute's data was processed by the NMS service.
- Sample Time: Local date and time that an attribute value was sampled or changed at the source.
- Value: Attribute value at sample time.

Text Results for Services: Load - System Logging

2010-07-18 15:58:39 PDT To 2010-07-19 15:58:39 PDT

Time Received	Sample Time	Value
2010-07-19 15:58:09	2010-07-19 15:58:09	0.016 %
2010-07-19 15:56:06	2010-07-19 15:56:06	0.024 %
2010-07-19 15:54:02	2010-07-19 15:54:02	0.033 %
2010-07-19 15:52:00	2010-07-19 15:52:00	0.016 %
2010-07-19 15:49:57	2010-07-19 15:49:57	0.008 %
2010-07-19 15:47:54	2010-07-19 15:47:54	0.024 %
2010-07-19 15:45:50	2010-07-19 15:45:50	0.016 %
2010-07-19 15:43:47	2010-07-19 15:43:47	0.024 %
2010-07-19 15:41:43	2010-07-19 15:41:43	0.032 %
2010-07-19 15:39:40	2010-07-19 15:39:40	0.024 %
2010-07-19 15:37:37	2010-07-19 15:37:37	0.008 %
2010-07-19 15:35:34	2010-07-19 15:35:34	0.016 %
2010-07-19 15:33:31	2010-07-19 15:33:31	0.024 %
2010-07-19 15:31:27	2010-07-19 15:31:27	0.032 %
2010-07-19 15:29:24	2010-07-19 15:29:24	0.032 %
2010-07-19 15:27:21	2010-07-19 15:27:21	0.049 %
2010-07-19 15:25:18	2010-07-19 15:25:18	0.024 %
2010-07-19 15:21:12	2010-07-19 15:21:12	0.016 %
2010-07-19 15:19:09	2010-07-19 15:19:09	0.008 %
2010-07-19 15:17:07	2010-07-19 15:17:07	0.016 %

Aggregate text reports

An aggregate text report displays data over a longer period of time (usually a week) than a raw text report. Each entry is the result of summarizing multiple attribute values (an aggregate of attribute values) by the NMS service over time into a single entry with average, maximum, and minimum values that are derived from the aggregation.

Each entry displays the following information:

- Aggregate Time: Last local date and time that the NMS service aggregated (collected) a set of changed attribute values.
- Average Value: The average of the attribute's value over the aggregated time period.
- Minimum Value: The minimum value over the aggregated time period.
- Maximum Value: The maximum value over the aggregated time period.

Text Results for Attribute Send to Relay Rate

2010-07-11 16:02:46 PDT To 2010-07-19 16:02:46 PDT

Aggregate Time	Average Value	Minimum Value	Maximum Value
2010-07-19 15:59:52	0.271072196 Messages/s	0.266649743 Messages/s	0.274983464 Messages/s
2010-07-19 15:53:52	0.275585378 Messages/s	0.266562352 Messages/s	0.283302736 Messages/s
2010-07-19 15:49:52	0.279315709 Messages/s	0.233318712 Messages/s	0.333313579 Messages/s
2010-07-19 15:43:52	0.28181323 Messages/s	0.241651024 Messages/s	0.374976601 Messages/s
2010-07-19 15:39:52	0.284233141 Messages/s	0.249982001 Messages/s	0.324971987 Messages/s
2010-07-19 15:33:52	0.325752083 Messages/s	0.266641993 Messages/s	0.358306197 Messages/s
2010-07-19 15:29:52	0.278531507 Messages/s	0.274984766 Messages/s	0.283320999 Messages/s
2010-07-19 15:23:52	0.281437642 Messages/s	0.274981961 Messages/s	0.291577735 Messages/s
2010-07-19 15:17:52	0.261563307 Messages/s	0.258318006 Messages/s	0.266655787 Messages/s
2010-07-19 15:13:52	0.265159147 Messages/s	0.258318557 Messages/s	0.26663986 Messages/s

Generate text reports

Text reports display a textual representation of attribute data values that have been processed by the NMS service. You can report on a data center site, grid node, component, or service.

What you'll need

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

About this task

For attribute data that is expected to be continuously changing, this attribute data is sampled by the NMS service (at the source) at regular intervals. For attribute data that changes infrequently (for example, data based on events such as state or status changes), an attribute value is sent to the NMS service when the value changes.

The type of report displayed depends on the configured time period. By default, aggregate text reports are generated for time periods longer than one week.

Gray text indicates the service was administratively down during the time it was sampled. Blue text indicates the service was in an unknown state.

Steps

1. Select **SUPPORT > Tools > Grid topology**.
2. Select **grid node > component or service > Reports > Text**.
3. Select the attribute to report on from the **Attribute** drop-down list.
4. Select the number of results per page from the **Results per Page** drop-down list.
5. To round values to a maximum of three decimal places (for example, for attributes reported as percentages), unselect the **Raw Data** check box.
6. Select the time period to report on from the **Quick Query** drop-down list.

Select the Custom Query option to select a specific time range.

The report appears after a few moments. Allow several minutes for tabulation of long time ranges.

7. If you selected Custom Query, you need to customize the time period to report on by entering the **Start Date** and **End Date**.

Use the format YYYY/MM/DDHH:MM:SS in local time. Leading zeros are required to match the format. For example, 2017/4/6 7:30:00 fails validation. The correct format is: 2017/04/06 07:30:00.

8. Click **Update**.

A text report is generated after a few moments. Allow several minutes for tabulation of long time ranges. Depending on the length of time set for the query, either a raw text report or aggregate text report is displayed.

Export text reports

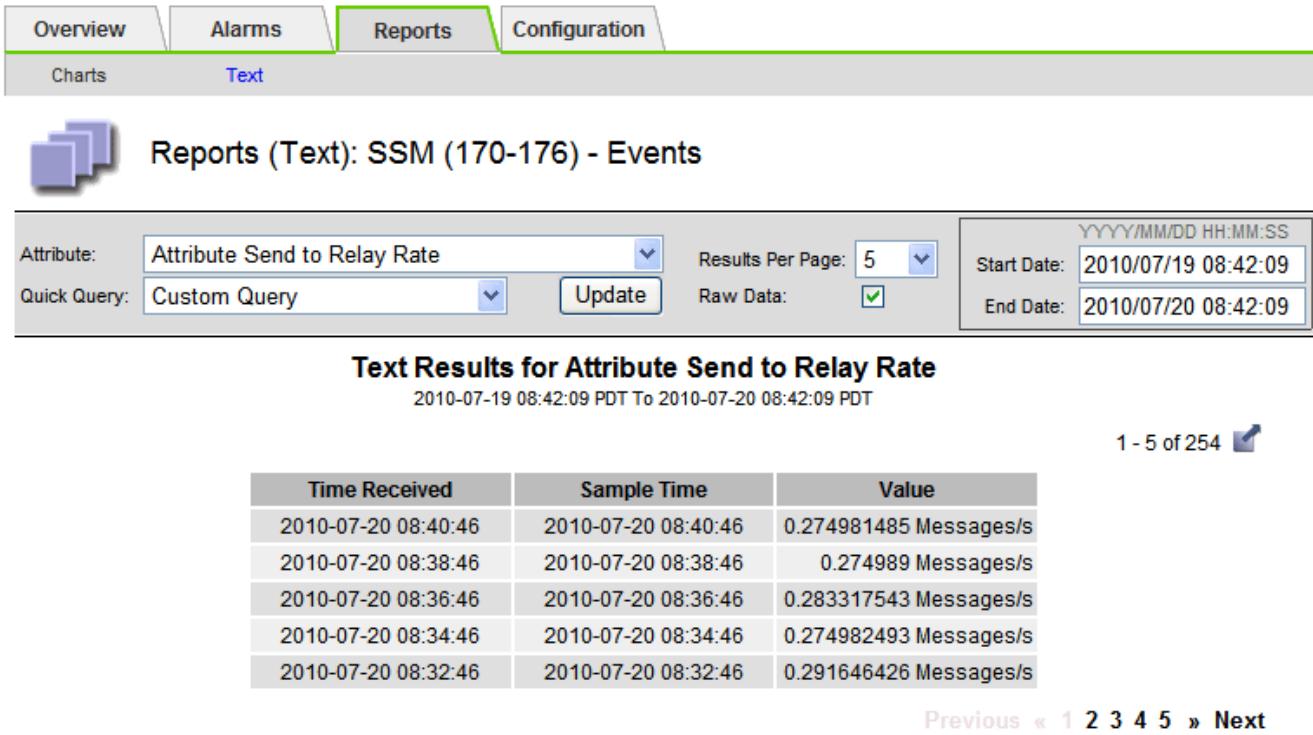
Exported text reports open a new browser tab, which enables you to select and copy the data.

About this task

The copied data can then be saved into a new document (for example, a spreadsheet) and used to analyze the performance of the StorageGRID system.

Steps

1. Select **SUPPORT > Tools > Grid topology**.
2. Create a text report.
3. Click *Export* .



The screenshot shows the StorageGRID interface with the 'Reports' tab selected. In the 'Text' sub-tab, there's a search bar for 'Attribute' (set to 'Attribute Send to Relay Rate') and 'Quick Query' (set to 'Custom Query'). Below these are date range inputs for 'Start Date' (2010/07/19 08:42:09) and 'End Date' (2010/07/20 08:42:09), with a 'Results Per Page' dropdown set to 5 and a 'Raw Data' checkbox checked. The main area displays a table titled 'Text Results for Attribute Send to Relay Rate' with data from July 19, 2010, to July 20, 2010. The table has columns for Time Received, Sample Time, and Value. The last five rows of data are:

Time Received	Sample Time	Value
2010-07-20 08:40:46	2010-07-20 08:40:46	0.274981485 Messages/s
2010-07-20 08:38:46	2010-07-20 08:38:46	0.274989 Messages/s
2010-07-20 08:36:46	2010-07-20 08:36:46	0.283317543 Messages/s
2010-07-20 08:34:46	2010-07-20 08:34:46	0.274982493 Messages/s
2010-07-20 08:32:46	2010-07-20 08:32:46	0.291646426 Messages/s

Pagination controls at the bottom right show '1 - 5 of 254' and navigation links 'Previous' and 'Next'.

The Export Text Report window opens displaying the report.

Grid ID: 000 000

OID: 2.16.124.113590.2.1.400019.1.1.1.16996732.200

Node Path: Site/170-176/SSM/Events

Attribute: Attribute Send to Relay Rate (ABSR)

Query Start Date: 2010-07-19 08:42:09 PDT

Query End Date: 2010-07-20 08:42:09 PDT

Time Received,Time Received (Epoch),Sample Time,Sample Time (Epoch),Value,Type

Time Received	Time Received (Epoch)	Sample Time	Sample Time (Epoch)	Value	Type
2010-07-20 08:40:46	1279640446559000	2010-07-20 08:40:46	1279640446537209	0.274981485	Messages/s,U
2010-07-20 08:38:46	1279640326561000	2010-07-20 08:38:46	1279640326529124	0.274989	Messages/s,U
2010-07-20 08:36:46	1279640206556000	2010-07-20 08:36:46	1279640206524330	0.283317543	Messages/s,U
2010-07-20 08:34:46	1279640086540000	2010-07-20 08:34:46	1279640086517645	0.274982493	Messages/s,U
2010-07-20 08:32:46	1279639966543000	2010-07-20 08:32:46	1279639966510022	0.291646426	Messages/s,U
2010-07-20 08:30:46	1279639846561000	2010-07-20 08:30:46	1279639846501672	0.308315369	Messages/s,U
2010-07-20 08:28:46	1279639726527000	2010-07-20 08:28:46	1279639726494673	0.291657509	Messages/s,U
2010-07-20 08:26:46	1279639606526000	2010-07-20 08:26:46	1279639606490890	0.266627739	Messages/s,U
2010-07-20 08:24:46	1279639486495000	2010-07-20 08:24:46	1279639486473368	0.258318523	Messages/s,U
2010-07-20 08:22:46	1279639366480000	2010-07-20 08:22:46	1279639366466497	0.274985902	Messages/s,U
2010-07-20 08:20:46	1279639246469000	2010-07-20 08:20:46	1279639246460346	0.283253871	Messages/s,U
2010-07-20 08:18:46	1279639126469000	2010-07-20 08:18:46	1279639126426669	0.274982804	Messages/s,U
2010-07-20 08:16:46	1279639006437000	2010-07-20 08:16:46	1279639006419168	0.283315503	Messages/s,U

4. Select and copy the contents of the Export Text Report window.

This data can now be pasted into a third-party document such as a spreadsheet.

Monitor PUT and GET performance

You can monitor the performance of certain operations, such as object store and retrieve, to help identify changes that might require further investigation.

About this task

To monitor PUT and GET performance, you can run S3 and Swift commands directly from a workstation or by using the open-source S3tester application. Using these methods allows you to assess performance independently of factors that are external to StorageGRID, such as issues with a client application or issues with an external network.

When performing tests of PUT and GET operations, use the following guidelines:

- Use object sizes comparable to the objects that you typically ingest into your grid.
- Perform operations against both local and remote sites.

Messages in the [audit log](#) indicate the total time required to run certain operations. For example, to determine the total processing time for an S3 GET request, you can review the value of the TIME attribute in the SGET audit message. You can also find the TIME attribute in the audit messages for the following operations:

- **S3:** DELETE, GET, HEAD, Metadata Updated, POST, PUT
- **Swift:** DELETE, GET, HEAD, PUT

When analyzing results, look at the average time required to satisfy a request, as well as the overall throughput that you can achieve. Repeat the same tests regularly and record the results, so that you can identify trends that may require investigation.

- You can [download S3tester from github](#).

Monitor object verification operations

The StorageGRID system can verify the integrity of object data on Storage Nodes, checking for both corrupt and missing objects.

What you'll need

- You must be signed in to the Grid Manager using a [supported web browser](#).
- You must have the Maintenance or Root Access permission.

About this task

Two [verification processes](#) work together to ensure data integrity:

- **Background verification** runs automatically, continuously checking the correctness of object data.

Background verification automatically and continuously checks all Storage Nodes to determine if there are corrupt copies of replicated and erasure-coded object data. If problems are found, the StorageGRID system automatically attempts to replace the corrupt object data from copies stored elsewhere in the system. Background verification does not run on Archive Nodes or on objects in a Cloud Storage Pool.



The **Unidentified corrupt object detected** alert is triggered if the system detects a corrupt object that cannot be corrected automatically.

- **Object existence check** can be triggered by a user to more quickly verify the existence (although not the correctness) of object data.

Object existence check verifies whether all expected replicated copies of objects and erasure-coded fragments exist on a Storage Node. Object existence check provides a way to verify the integrity of storage devices, especially if a recent hardware issue could have affected data integrity.

You should review the results from background verifications and object existence checks regularly. Investigate any instances of corrupt or missing object data immediately to determine the root cause.

Steps

1. Review the results from background verifications:
 - a. Select **NODES > Storage Node > Objects**.
 - b. Check the verification results:
 - To check replicated object data verification, look at the attributes in the Verification section.

Verification

Status:	No errors
Percent complete:	0.00%
Average stat time:	0.00 microseconds
Objects verified:	0
Object verification rate:	0.00 objects / second
Data verified:	0 bytes
Data verification rate:	0.00 bytes / second
Missing objects:	0
Corrupt objects:	0
Corrupt objects unidentified:	0
Quarantined objects:	0

- To check erasure-coded fragment verification, select **Storage Node > ILM** and look at the attributes in the Erasure coding verification section.

Erasure coding verification

Status:	Idle
Next scheduled:	2021-10-08 10:45:19 MDT
Fragments verified:	0
Data verified:	0 bytes
Corrupt copies:	0
Corrupt fragments:	0
Missing fragments:	0

Select the question mark next to an attribute's name to display help text.

- Review the results from object existence check jobs:
 - Select **MAINTENANCE > Object existence check > Job history**.
 - Scan the Missing object copies detected column. If any jobs resulted in 100 or more missing object copies and the **Objects lost alert** has been triggered, contact technical support.

Object existence check

Perform an object existence check if you suspect storage volumes have been damaged or are corrupt. You can verify objects defined by your ILM policy, still exist on the volumes.

The screenshot shows a user interface for performing an object existence check. At the top, there are two tabs: "Active job" (which is selected) and "Job history". Below the tabs is a toolbar with "Delete" and "Search..." buttons, and a magnifying glass icon. The main area is a table with the following columns: a checkbox column, "Job ID" (with a question mark icon), "Status" (with a dropdown arrow), "Nodes (volumes)" (with a question mark icon), and a status message column. The table contains five rows of data:

<input type="checkbox"/>	Job ID ?	Status ▼	Nodes (volumes) ?	Missing object copies detected ?
<input type="checkbox"/>	15816859223101303015	Completed	DC2-S1 (3 volumes)	0
<input type="checkbox"/>	12538643155010477372	Completed	DC1-S3 (1 volume)	0
<input type="checkbox"/>	5490044849774982476	Completed	DC1-S2 (1 volume)	0
<input type="checkbox"/>	3395284277055907678	Completed	DC1-S1 (3 volumes) DC1-S2 (3 volumes) DC1-S3 (3 volumes) and 7 more	0

Monitor events

You can monitor events that are detected by a grid node, including custom events that you have created to track events that are logged to the syslog server. The Last Event message shown in the Grid Manager provides more information about the most recent event.

Event messages are also listed in the `/var/local/log/bycast-err.log` log file. See the [Log files reference](#).

The SMTT (Total events) alarm can be repeatedly triggered by issues such as network problems, power outages or upgrades. This section has information on investigating events so that you can better understand why these alarms have occurred. If an event occurred because of a known issue, it is safe to reset the event counters.

Steps

1. Review the system events for each grid node:
 - a. Select **SUPPORT > Tools > Grid topology**.
 - b. Select **site > grid node > SSM > Events > Overview > Main**.
2. Generate a list of previous event messages to help isolate issues that occurred in the past:

- a. Select **SUPPORT > Tools > Grid topology**.
- b. Select **site > grid node > SSM > Events > Reports**.
- c. Select **Text**.

The **Last Event** attribute is not shown in the [charts view](#). To view it:

- d. Change **Attribute** to **Last Event**.
- e. Optionally, select a time period for **Quick Query**.
- f. Select **Update**.

Time Received	Sample Time	Value
2009-04-15 15:24:22	2009-04-15 15:24:22	hdc: task_no_data_intr: status=0x51 (DriveReady SeekComplete Error)
2009-04-15 15:24:11	2009-04-15 15:23:39	hdc: task_no_data_intr: status=0x51 (DriveReady SeekComplete Error)

Create custom syslog events

Custom events allow you to track all kernel, daemon, error and critical level user events logged to the syslog server. A custom event can be useful for monitoring the occurrence of system log messages (and thus network security events and hardware faults).

About this task

Consider creating custom events to monitor recurring problems. The following considerations apply to custom events.

- After a custom event is created, every occurrence of it is monitored.
- To create a custom event based on keywords in the `/var/local/log/messages` files, the logs in those files must be:
 - Generated by the kernel
 - Generated by daemon or user program at the error or critical level

Note: Not all entries in the `/var/local/log/messages` files will be matched unless they satisfy the requirements stated above.

Steps

1. Select **SUPPORT > Alarms (legacy) > Custom events**.
2. Click **Edit** (or **Insert** if this is not the first event).

3. Enter a custom event string, for example, shutdown

The screenshot shows a web-based interface titled "Events" with a timestamp "Updated: 2021-10-22 11:15:34 MDT". A navigation bar at the top includes a grid icon, the title "Events", and a date/time stamp. Below this is a section titled "Custom Events (1 - 1 of 1)". A table displays one row with the event name "shutdown". To the right of the table are several action icons: a pencil, a plus sign, a minus sign, a delete symbol, and a refresh symbol. At the bottom left are buttons for "Show 10 ▾ Records Per Page" and "Refresh". At the bottom right are buttons for "Previous", "1", "Next", and "Apply Changes" with a blue arrow icon.

Event	Actions
shutdown	

Show 10 ▾ Records Per Page Refresh Previous 1 Next Apply Changes

4. Select **Apply Changes**.
5. Select **SUPPORT > Tools > Grid topology**.
6. Select **grid node > SSM > Events**.
7. Locate the entry for Custom Events in the Events table, and monitor the value for **Count**.

If the count increases, a custom event you are monitoring is being triggered on that grid node.

Overview Alarms Reports Configuration

Main



Overview: SSM (DC1-ADM1) - Events

Updated: 2021-10-22 11:19:18 MDT

System Events

Log Monitor State:	Connected	
Total Events:	0	
Last Event:	No Events	
Description	Count	
Abnormal Software Events	0	
Account Service Events	0	
Cassandra Errors	0	
Cassandra Heap Out Of Memory Errors	0	
Chunk Service Events	0	
Custom Events	0	
Data-Mover Service Events	0	
File System Errors	0	
Forced Termination Events	0	
Grid Node Errors	0	
Hotfix Installation Failure Events	0	
I/O Errors	0	
IDE Errors	0	
Identity Service Events	0	
Kernel Errors	0	
Kernel Memory Allocation Failure	0	
Keystone Service Events	0	
Network Receive Errors	0	
Network Transmit Errors	0	
Out Of Memory Errors	0	
Replicated State Machine Service Events	0	
SCSI Errors	0	

Reset the count of custom events to zero

If you want to reset the counter only for custom events, you must use the Grid Topology page in the Support menu.

About this task

Resetting a counter causes the alarm to be triggered by the next event. In contrast, when you acknowledge an alarm, that alarm is only re-triggered if the next threshold level is reached.

1. Select **SUPPORT > Tools > Grid topology**.
2. Select **grid node > SSM > Events > Configuration > Main**.
3. Select the **Reset** check box for Custom Events.

Description	Count	Reset
Abnormal Software Events	0	<input type="checkbox"/>
Account Service Events	0	<input type="checkbox"/>
Cassandra Errors	0	<input type="checkbox"/>
Cassandra Heap Out Of Memory Errors	0	<input type="checkbox"/>
Custom Events	0	<input checked="" type="checkbox"/>
File System Errors	0	<input type="checkbox"/>
Forced Termination Events	0	<input type="checkbox"/>

4. Select **Apply Changes**.

Review audit messages

Audit messages can help you get a better understanding of the detailed operations of your StorageGRID system. You can use audit logs to troubleshoot issues and to evaluate performance.

During normal system operation, all StorageGRID services generate audit messages, as follows:

- System audit messages are related to the auditing system itself, grid node states, system-wide task activity, and service backup operations.
- Object storage audit messages are related to the storage and management of objects within StorageGRID, including object storage and retrievals, grid-node to grid-node transfers, and verifications.
- Client read and write audit messages are logged when an S3 or Swift client application makes a request to create, modify, or retrieve an object.
- Management audit messages log user requests to the Management API.

Each Admin Node stores audit messages in text files. The audit share contains the active file (audit.log) as well as compressed audit logs from previous days. Each node in the grid also stores a copy of the audit information generated on the node.

For easy access to audit logs, you can configure client access to the audit share for both NFS and CIFS (CIFS is deprecated). You can also access audit log files directly from the command line of the Admin Node.

Optionally, you can change the destination of audit logs and send audit information to an external syslog server. Local logs of audit records continue to be generated and stored when an external syslog server is configured. See [Configure audit messages and log destinations](#).

For details on the audit log file, the format of audit messages, the types of audit messages, and the tools available to analyze audit messages, see the instructions for audit messages. To learn how to configure audit

client access, see the instructions for administering StorageGRID.

Related information

[Review audit logs](#)

[Administer StorageGRID](#)

Collect log files and system data

You can use the Grid Manager to retrieve log files and system data (including configuration data) for your StorageGRID system.

What you'll need

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

About this task

You can use the Grid Manager to gather [log files](#), system data, and configuration data from any grid node for the time period that you select. Data is collected and archived in a .tar.gz file that you can then download to your local computer.

Optionally, you can change the destination of audit logs and send audit information to an external syslog server. Local logs of audit records continue to be generated and stored when an external syslog server is configured. See [Configure audit messages and log destinations](#).

Steps

1. Select **SUPPORT > Tools > Logs**.

The screenshot shows a user interface for collecting logs from a StorageGRID system. On the left, a tree view lists nodes under 'StorageGRID' (StorageGRID, DC1, DC2) and further down (DC1-ADM1, DC1-G1, DC1-S1, DC1-S2, DC1-S3, DC1-S4, DC2-ADM1, DC2-G1, DC2-S1, DC2-S2, DC2-S3, DC2-S4). To the right, there are several configuration fields:

- Log Start Time:** Set to 2021-12-03 06:31 AM MST.
- Log End Time:** Set to 2021-12-03 10:31 AM MST.
- Log Types:** Options include Application Logs (checked), Audit Logs, Network Trace, and Prometheus Database.
- Notes:** An empty text area for notes.
- Provisioning Passphrase:** A yellowed-out text area containing '*****'.

A large blue button at the bottom right is labeled 'Collect Logs'.

2. Select the grid nodes for which you want to collect log files.

As required, you can collect log files for the entire grid or an entire data center site.

3. Select a **Start Time** and **End Time** to set the time range of the data to be included in the log files.

If you select a very long time period or collect logs from all nodes in a large grid, the log archive could become too large to be stored on a node, or too large to be collected to the primary Admin Node for download. If this occurs, you must restart log collection with a smaller set of data.

4. Select the types of logs you want to collect.

- **Application Logs:** Application-specific logs that technical support uses most frequently for troubleshooting. The logs collected are a subset of the available application logs.
- **Audit Logs:** Logs containing the audit messages generated during normal system operation.
- **Network Trace:** Logs used for network debugging.
- **Prometheus Database:** Time series metrics from the services on all nodes.

5. Optionally, enter notes about the log files you are gathering in the **Notes** text box.

You can use these notes to give technical support information about the problem that prompted you to collect the log files. Your notes are added to a file called `info.txt`, along with other information about the log file collection. The `info.txt` file is saved in the log file archive package.

6. Enter the provisioning passphrase for your StorageGRID system in the **Provisioning Passphrase** text box.

7. Select **Collect Logs**.

When you submit a new request, the previous collection of log files is deleted.

You can use the Logs page to monitor the progress of log file collection for each grid node.

If you receive an error message about log size, try collecting logs for a shorter time period or for fewer nodes.

8. Select **Download** when log file collection is complete.

The **.tar.gz** file contains all log files from all grid nodes where log collection was successful. Inside the combined **.tar.gz** file, there is one log file archive for each grid node.

After you finish

You can re-download the log file archive package later if you need to.

Optionally, you can select **Delete** to remove the log file archive package and free up disk space. The current log file archive package is automatically removed the next time you collect log files.

Manually trigger an AutoSupport message

To assist technical support in troubleshooting issues with your StorageGRID system, you can manually trigger an AutoSupport message to be sent.

What you'll need

- You must be signed in to the Grid Manager using a [supported web browser](#).
- You must have the Root Access or Other Grid Configuration permission.

Steps

1. Select **SUPPORT > Tools > AutoSupport**.

The AutoSupport page appears with the **Settings** tab selected.

2. Select **Send User-Triggered AutoSupport**.

StorageGRID attempts to send an AutoSupport message to technical support. If the attempt is successful, the **Most Recent Result** and **Last Successful Time** values on the **Results** tab are updated. If there is a problem, the **Most Recent Result** value updates to "Failed," and StorageGRID does not try to send the AutoSupport message again.



After sending an User-triggered AutoSupport message, refresh the AutoSupport page in your browser after 1 minute to access the most recent results.

Related information

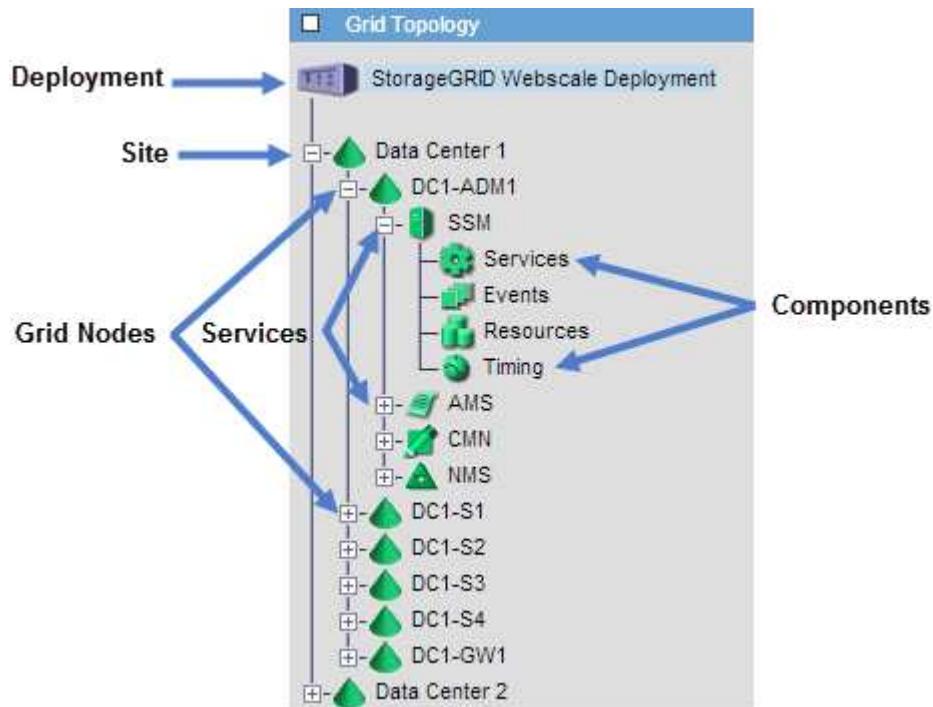
[Configure email server settings for alarms \(legacy system\)](#)

View the Grid Topology tree

The Grid Topology tree provides access to detailed information about StorageGRID system elements, including sites, grid nodes, services, and components. In most cases,

you only need to access the Grid Topology tree when instructed in the documentation or when working with technical support.

To access the Grid Topology tree, select **SUPPORT > Tools > Grid topology**.



To expand or collapse the Grid Topology tree, click **[+]** or **[−]** at the site, node, or service level. To expand or collapse all items in the entire site or in each node, hold down the **<Ctrl>** key and click.

Review support metrics

When troubleshooting an issue, you can work with technical support to review detailed metrics and charts for your StorageGRID system.

What you'll need

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

About this task

The Metrics page allows you to access the Prometheus and Grafana user interfaces. Prometheus is open-source software for collecting metrics. Grafana is open-source software for metrics visualization.



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](#).

Steps

1. As directed by technical support, select **SUPPORT > Tools > Metrics**.

An example of the Metrics page is shown here:

Metrics

Access charts and metrics to help troubleshoot issues.

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

Prometheus

Prometheus is an open-source toolkit for collecting metrics. The Prometheus interface allows you to query the current values of metrics and to view charts of the values over time.

Access the Prometheus UI using the link below. You must be signed in to the Grid Manager.

- <https://gridmanager.yourcompany.com/metrics/graph>

Grafana

Grafana is open-source software for metrics visualization. The Grafana interface provides pre-constructed dashboards that contain graphs of important metric values over time.

Access the Grafana dashboards using the links below. You must be signed in to the Grid Manager.

ADE	Grid	S3 - Node
Account Service Overview	ILM	S3 Overview
Alertmanager	Identity Service Overview	S3 Select
Audit Overview	Ingests	Site
Cassandra Cluster Overview	Node	Support
Cassandra Network Overview	Node (Internal Use)	Traces
Cassandra Node Overview	OSL - AsyncIO	Traffic Classification Policy
Cloud Storage Pool Overview	Platform Services Commits	Usage Processing
EC - ADE	Platform Services Overview	Virtual Memory (vmstat)
EC - Chunk Service	Platform Services Processing	
EC Overview	Replicated Read Path Overview	

2. To query the current values of StorageGRID metrics and to view graphs of the values over time, click the link in the Prometheus section.

The Prometheus interface appears. You can use this interface to execute queries on the available StorageGRID metrics and to graph StorageGRID metrics over time.

Enable query history

Expression (press Shift+Enter for newlines)

Execute

- insert metric at cursor - ▾

Graph

Console

Element

Value

no data

Remove Graph

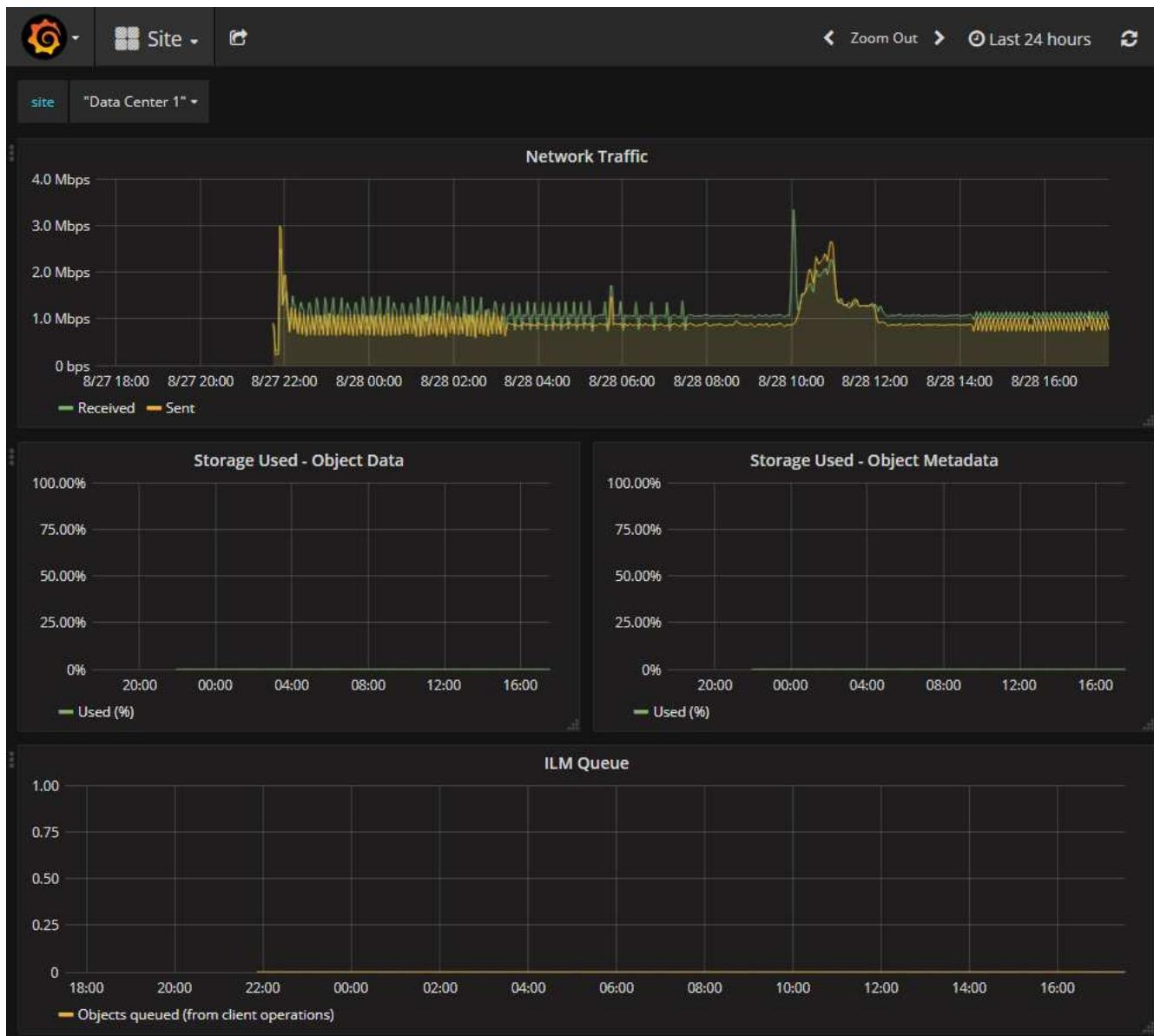
Add Graph



Metrics that include *private* in their names are intended for internal use only and are subject to change between StorageGRID releases without notice.

3. To access pre-constructed dashboards containing graphs of StorageGRID metrics over time, click the links in the Grafana section.

The Grafana interface for the link you selected appears.



Run diagnostics

When troubleshooting an issue, you can work with technical support to run diagnostics on your StorageGRID system and review the results.

- [Review support metrics](#)
- [Commonly used Prometheus metrics](#)

What you'll need

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

About this task

The Diagnostics page performs a set of diagnostic checks on the current state of the grid. Each diagnostic check can have one of three statuses:

- **Normal:** All values are within the normal range.
- **Attention:** One or more of the values are outside of the normal range.
- **Caution:** One or more of the values are significantly outside of the normal range.

Diagnostic statuses are independent of current alerts and might not indicate operational issues with the grid. For example, a diagnostic check might show Caution status even if no alert has been triggered.

Steps

1. Select **SUPPORT > Tools > Diagnostics**.

The Diagnostics page appears and lists the results for each diagnostic check. The results are sorted by severity (Caution, Attention, and then Normal). Within each severity, the results are sorted alphabetically.

In this example, all diagnostics have a Normal status.

The screenshot shows the 'Diagnostics' page with the following content:

Diagnostics

This page performs a set of diagnostic checks on the current state of the grid. A diagnostic check can have one of three statuses:

- Normal:** All values are within the normal range.
- Attention:** One or more of the values are outside of the normal range.
- Caution:** One or more of the values are significantly outside of the normal range.

Diagnostic statuses are independent of current alerts and might not indicate operational issues with the grid. For example, a diagnostic check might show Caution status even if no alert has been triggered.

Run Diagnostics

Cassandra blocked task queue too large	
Cassandra commit log latency	
Cassandra commit log queue depth	
Cassandra compaction queue too large	

2. To learn more about a specific diagnostic, click anywhere in the row.

Details about the diagnostic and its current results appear. The following details are listed:

- **Status:** The current status of this diagnostic: Normal, Attention, or Caution.
- **Prometheus query:** If used for the diagnostic, the Prometheus expression that was used to generate the status values. (A Prometheus expression is not used for all diagnostics.)
- **Thresholds:** If available for the diagnostic, the system-defined thresholds for each abnormal diagnostic status. (Threshold values are not used for all diagnostics.)



You cannot change these thresholds.

- **Status values:** A table showing the status and the value of the diagnostic throughout the StorageGRID system. In this example, the current CPU utilization for every node in a StorageGRID system is shown. All node values are below the Attention and Caution thresholds, so the overall status of the diagnostic

is Normal.

[CPU utilization](#)

Checks the current CPU utilization on each node.

To view charts of CPU utilization and other per-node metrics, access the [Node Grafana dashboard](#).

Status Normal

Prometheus query `sum by (instance) (sum by (instance, mode) (irate(node_cpu_seconds_total{mode!="idle"}[5m])) / count by (instance, mode)(node_cpu_seconds_total{mode!="idle"})`

[View in Prometheus](#)

Thresholds Attention >= 75%
 Caution >= 95%

Status	Instance	CPU Utilization
	DC1-ADM1	2.598%
	DC1-ARC1	0.937%
	DC1-G1	2.119%
	DC1-S1	8.708%
	DC1-S2	8.142%
	DC1-S3	9.669%
	DC2-ADM1	2.515%
	DC2-ARC1	1.152%
	DC2-S1	8.204%
	DC2-S2	5.000%
	DC2-S3	10.469%

3. **Optional:** To see Grafana charts related to this diagnostic, click the [Grafana dashboard](#) link.

This link is not displayed for all diagnostics.

The related Grafana dashboard appears. In this example, the Node dashboard appears showing CPU Utilization over time for this node as well as other Grafana charts for the node.



You can also access the pre-constructed Grafana dashboards from the Grafana section of the [SUPPORT > Tools > Metrics](#) page.



4. **Optional:** To see a chart of the Prometheus expression over time, click **View in Prometheus**.

A Prometheus graph of the expression used in the diagnostic appears.

Enable query history

```
sum by (instance) (sum by (instance, mode) (rate(node_cpu_seconds_total{mode!="idle"}[5m])) / count by (instance, mode))
```

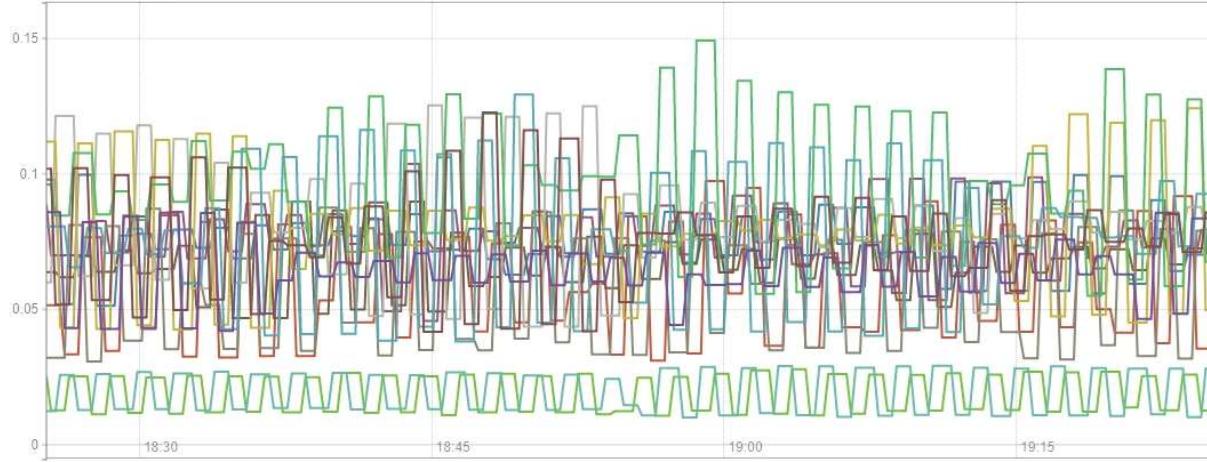
Load time: 547ms
Resolution: 14s
Total time series: 13

Execute

- insert metric at cursor -

Graph

Console

- 1h + ◀ Until ▶ Res. (s) stacked


- {instance="DC3-S3"}
- {instance="DC3-S2"}
- {instance="DC3-S1"}
- {instance="DC2-S3"}
- {instance="DC2-S2"}
- {instance="DC2-S1"}
- {instance="DC2-ADM1"}
- {instance="DC1-S3"}
- {instance="DC1-S2"}
- {instance="DC1-S1"}
- {instance="DC1-G1"}
- {instance="DC1-ARC1"}
- {instance="DC1-ADM1"}

Remove Graph

Add Graph

Create custom monitoring applications

You can build custom monitoring applications and dashboards using the StorageGRID metrics available from the Grid Management API.

If you want to monitor metrics that are not displayed on an existing page of the Grid Manager, or if you want to create custom dashboards for StorageGRID, you can use the Grid Management API to query StorageGRID metrics.

You can also access Prometheus metrics directly with an external monitoring tool, such as Grafana. Using an external tool requires that you upload or generate an administrative client certificate to allow StorageGRID to authenticate the tool for security. See the [instructions for administering StorageGRID](#).

To view the metrics API operations, including the complete list of the metrics that are available, go to the Grid Manager. From the top of the page, select the help icon and select **API Documentation > metrics**.

GET	<code>/grid/metric-labels/{label}/values</code>	Lists the values for a metric label	
GET	<code>/grid/metric-names</code>	Lists all available metric names	
GET	<code>/grid/metric-query</code>	Performs an instant metric query at a single point in time	
GET	<code>/grid/metric-query-range</code>	Performs a metric query over a range of time	

The details of how to implement a custom monitoring application are beyond the scope of this documentation.

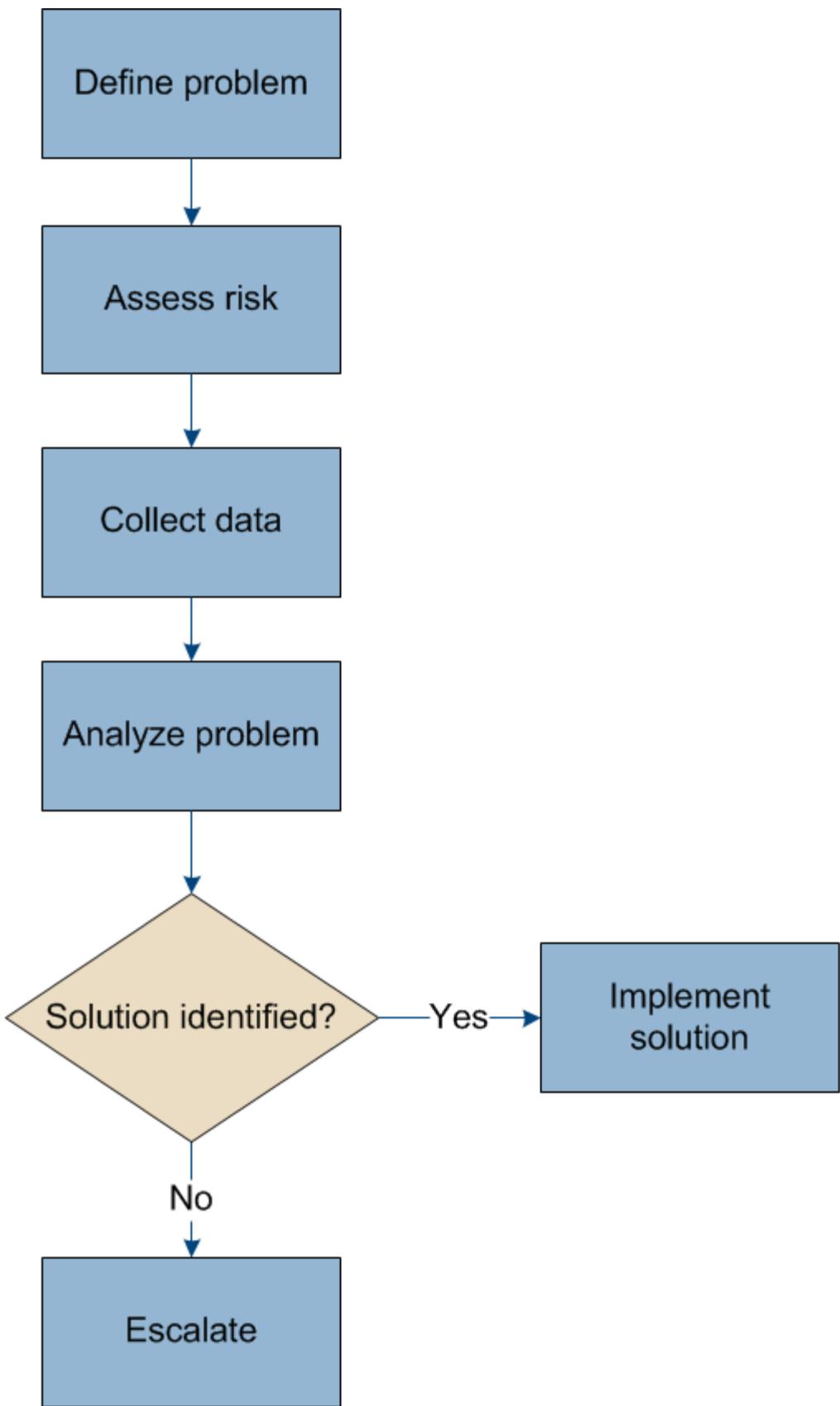
Troubleshoot a StorageGRID system

Troubleshoot a StorageGRID system

If you encounter a problem when using a StorageGRID system, refer to the tips and guidelines in this section for help in determining and resolving the issue.

Overview of problem determination

If you encounter a problem when [administering a StorageGRID system](#), you can use the process outlined in this figure to identify and analyze the issue. In many cases, you can resolve problems on your own; however, you might need to escalate some issues to technical support.



Define the problem

The first step to solving a problem is to define the problem clearly.

This table provides examples of the types of information that you might collect to define a problem:

Question	Sample response
What is the StorageGRID system doing or not doing? What are its symptoms?	Client applications are reporting that objects cannot be ingested into StorageGRID.
When did the problem start?	Object ingest was first denied at about 14:50 on January 8, 2020.
How did you first notice the problem?	Notified by client application. Also received alert email notifications.
Does the problem happen consistently, or only sometimes?	Problem is ongoing.
If the problem happens regularly, what steps cause it to occur	Problem happens every time a client tries to ingest an object.
If the problem happens intermittently, when does it occur? Record the times of each incident that you are aware of.	Problem is not intermittent.
Have you seen this problem before? How often have you had this problem in the past?	This is the first time I have seen this issue.

Assess the risk and impact on the system

After you have defined the problem, assess its risk and impact on the StorageGRID system. For example, the presence of critical alerts does not necessarily mean that the system is not delivering core services.

This table summarizes the impact the example problem is having on system operations:

Question	Sample response
Can the StorageGRID system ingest content?	No.
Can client applications retrieve content?	Some objects can be retrieved and others cannot.
Is data at risk?	No.
Is the ability to conduct business severely affected?	Yes, because client applications cannot store objects to the StorageGRID system and data cannot be retrieved consistently.

Collect data

After you have defined the problem and have assessed its risk and impact, collect data for analysis. The type of data that is most useful to collect depends upon the nature of the problem.

Type of data to collect	Why collect this dat	Instructions
Create timeline of recent changes	Changes to your StorageGRID system, its configuration, or its environment can cause new behavior.	<ul style="list-style-type: none"> Create a timeline of recent changes
Review alerts and alarms	<p>Alerts and alarms can help you quickly determine the root cause of a problem by providing important clues as to the underlying issues that might be causing it.</p> <p>Review the list of current alerts and alarms to see if StorageGRID has identified the root cause of a problem for you.</p> <p>Review alerts and alarms triggered in the past for additional insights.</p>	<ul style="list-style-type: none"> View current alerts View legacy alarms View resolved alerts Review historical alarms and alarm frequency (legacy system)
Monitor events	Events include any system error or fault events for a node, including errors such as network errors. Monitor events to learn more about issues or to help with troubleshooting.	<ul style="list-style-type: none"> Monitor events
Identify trends using charts and text reports	Trends can provide valuable clues about when issues first appeared, and can help you understand how quickly things are changing.	<ul style="list-style-type: none"> Use charts and graphs Use text reports
Establish baselines	Collect information about the normal levels of various operational values. These baseline values, and deviations from these baselines, can provide valuable clues.	<ul style="list-style-type: none"> Establish baselines
Perform ingest and retrieval tests	To troubleshoot performance issues with ingest and retrieval, use a workstation to store and retrieve objects. Compare results against those seen when using the client application.	<ul style="list-style-type: none"> Monitor PUT and GET performance
Review audit messages	Review audit messages to follow StorageGRID operations in detail. The details in audit messages can be useful for troubleshooting many types of issues, including performance issues.	<ul style="list-style-type: none"> Review audit messages
Check object locations and storage integrity	If you are having storage problems, verify that objects are being placed where you expect. Check the integrity of object data on a Storage Node.	<ul style="list-style-type: none"> Monitor object verification operations Confirm object data locations Verify object integrity

Type of data to collect	Why collect this data	Instructions
Collect data for technical support	Technical support might ask you to collect data or review specific information to help troubleshoot issues.	<ul style="list-style-type: none"> • Collect log files and system data • Manually trigger an AutoSupport message • Review support metrics

Create a timeline of recent changes

When a problem occurs, you should consider what has changed recently and when those changes occurred.

- Changes to your StorageGRID system, its configuration, or its environment can cause new behavior.
- A timeline of changes can help you identify which changes might be responsible for an issue, and how each change might have affected its development.

Create a table of recent changes to your system that includes information about when each change occurred and any relevant details about the change, such information about what else was happening while the change was in progress:

Time of change	Type of change	Details
For example:	<ul style="list-style-type: none"> • When did you start the node recovery? • When did the software upgrade complete? • Did you interrupt the process? 	<p>What happened? What did you do?</p> <p>Document any relevant details about the change. For example:</p> <ul style="list-style-type: none"> • Details of the network changes. • Which hotfix was installed. • How client workloads changed. <p>Make sure to note if more than one change was happening at the same time. For example, was this change made while an upgrade was in progress?</p>

Examples of significant recent changes

Here are some examples of potentially significant changes:

- Was the StorageGRID system recently installed, expanded, or recovered?
- Has the system been upgraded recently? Was a hotfix applied?
- Has any hardware been repaired or changed recently?
- Has the ILM policy been updated?
- Has the client workload changed?
- Has the client application or its behavior changed?
- Have you changed load balancers, or added or removed a high availability group of Admin Nodes or Gateway Nodes?

- Have any tasks been started that might take a long time to complete? Examples include:
 - Recovery of a failed Storage Node
 - Storage Node decommissioning
- Have any changes been made to user authentication, such as adding a tenant or changing LDAP configuration?
- Is data migration taking place?
- Were platform services recently enabled or changed?
- Was compliance enabled recently?
- Have Cloud Storage Pools been added or removed?
- Have any changes been made to storage compression or encryption?
- Have there been any changes to the network infrastructure? For example, VLANs, routers, or DNS.
- Have any changes been made to NTP sources?
- Have any changes been made to the Grid, Admin, or Client Network interfaces?
- Have any configuration changes been made to the Archive Node?
- Have any other changes been made to the StorageGRID system or its environment?

Establish baselines

You can establish baselines for your system by recording the normal levels of various operational values. In the future, you can compare current values to these baselines to help detect and resolve abnormal values.

Property	Value	How to obtain
Average storage consumption	GB consumed/day Percent consumed/day	Go to the Grid Manager. On the Nodes page, select the entire grid or a site and go to the Storage tab. On the Storage Used - Object Data chart, find a period where the line is fairly stable. Hover your cursor over the chart to estimate how much storage is consumed each day You can collect this information for the entire system or for a specific data center.

Property	Value	How to obtain
Average metadata consumption	GB consumed/day Percent consumed/day	Go to the Grid Manager. On the Nodes page, select the entire grid or a site and go to the Storage tab. On the Storage Used - Object Metadata chart, find a period where the line is fairly stable. Hover your cursor over the chart to estimate how much metadata storage is consumed each day. You can collect this information for the entire system or for a specific data center.
Rate of S3/Swift operations	Operations/second	Go to the Dashboard in the Grid Manager. In the Protocol Operations section, view the values for S3 rate and the Swift rate. To see ingest and retrieval rates and counts for a specific site or node, select NODES > site or Storage Node > Objects . Hover your cursor over the Ingest and Retrieve chart for S3 or Swift.
Failed S3/Swift operations	Operations	Select SUPPORT > Tools > Grid topology . On the Overview tab in the API Operations section, view the value for S3 Operations - Failed or Swift Operations - Failed.
ILM evaluation rate	Objects/second	From the Nodes page, select grid > ILM . On the ILM Queue chart, find a period where the line is fairly stable. Hover your cursor over the chart to estimate a baseline value for Evaluation rate for your system.
ILM scan rate	Objects/second	Select NODES > grid > ILM . On the ILM Queue chart, find a period where the line is fairly stable. Hover your cursor over the chart to estimate a baseline value for Scan rate for your system.

Property	Value	How to obtain
Objects queued from client operations	Objects/second	Select NODES > grid > ILM . On the ILM Queue chart, find a period where the line is fairly stable. Hover your cursor over the chart to estimate a baseline value for Objects queued (from client operations) for your system.
Average query latency	Milliseconds	Select NODES > Storage Node > Objects . In the Queries table, view the value for Average Latency.

Analyze data

Use the information that you collect to determine the cause of the problem and potential solutions.

The analysis is problem-dependent, but in general:

- Locate points of failure and bottlenecks using the alarms.
- Reconstruct the problem history using the alarm history and charts.
- Use charts to find anomalies and compare the problem situation with normal operation.

Escalation information checklist

If you cannot resolve the problem on your own, contact technical support. Before contacting technical support, gather the information listed in the following table to facilitate problem resolution.

Item	Notes
Problem statement	What are the problem symptoms? When did the problem start? Does it happen consistently or intermittently? If intermittently, what times has it occurred? Define the problem
Impact assessment	What is the severity of the problem? What is the impact to the client application? <ul style="list-style-type: none"> • Has the client connected successfully before? • Can the client ingest, retrieve, and delete data?
StorageGRID System ID	Select MAINTENANCE > System > License . The StorageGRID System ID is shown as part of the current license.

	Item	Notes
	Software version	From the top of the Grid Manager, select the help icon and select About to see the StorageGRID version.
	Customization	Summarize how your StorageGRID system is configured. For example, list the following: <ul style="list-style-type: none"> • Does the grid use storage compression, storage encryption, or compliance? • Does ILM make replicated or erasure coded objects? Does ILM ensure site redundancy? Do ILM rules use the Strict, Balanced, or Dual Commit ingest behaviors?
	Log files and system data	<p>Collect log files and system data for your system. Select SUPPORT > Tools > Logs.</p> <p>You can collect logs for the entire grid, or for selected nodes.</p> <p>If you are collecting logs only for selected nodes, be sure to include at least one Storage Node that has the ADC service. (The first three Storage Nodes at a site include the ADC service.)</p> <p>Collect log files and system data</p>
	Baseline information	<p>Collect baseline information regarding ingest operations, retrieval operations, and storage consumption.</p> <p>Establish baselines</p>
	Timeline of recent changes	<p>Create a timeline that summarizes any recent changes to the system or its environment.</p> <p>Create a timeline of recent changes</p>
	History of efforts to diagnose the issue	If you have taken steps to diagnose or troubleshoot the issue yourself, make sure to record the steps you took and the outcome.

Troubleshoot object and storage issues

Confirm object data locations

Depending on the problem, you might want to confirm where object data is being stored. For example, you might want to verify that the ILM policy is performing as expected and object data is being stored where intended.

What you'll need

- You must have an object identifier, which can be one of:
 - **UUID:** The object's Universally Unique Identifier. Enter the UUID in all uppercase.
 - **CBID:** The object's unique identifier within StorageGRID . You can obtain an object's CBID from the audit log. Enter the CBID in all uppercase.
 - **S3 bucket and object key:** When an object is ingested through the S3 interface, the client application uses a bucket and object key combination to store and identify the object.
 - **Swift container and object name:** When an object is ingested through the Swift interface, the client application uses a container and object name combination to store and identify the object.

Steps

1. Select **ILM > Object metadata lookup**.
2. Type the object's identifier in the **Identifier** field.

You can enter a UUID, CBID, S3 bucket/object-key, or Swift container/object-name.

3. If you want to look up a specific version of the object, enter the version ID (optional).

Object Metadata Lookup

Enter the identifier for any object stored in the grid to view its metadata.

Identifier	source/testobject
Version ID (optional)	MEJGMkMyQzgtNEY5OC0xMUU3LTkzMEdYtRDkyNTAwQkY5!

Look Up

4. Select **Look Up**.

The object metadata lookup results appear. This page lists the following types of information:

- System metadata, including the object ID (UUID), the version ID (optional), the object name, the name of the container, the tenant account name or ID, the logical size of the object, the date and time the object was first created, and the date and time the object was last modified.
- Any custom user metadata key-value pairs associated with the object.
- For S3 objects, any object tag key-value pairs associated with the object.
- For replicated object copies, the current storage location of each copy.
- For erasure-coded object copies, the current storage location of each fragment.
- For object copies in a Cloud Storage Pool, the location of the object, including the name of the external bucket and the object's unique identifier.
- For segmented objects and multipart objects, a list of object segments including segment identifiers and data sizes. For objects with more than 100 segments, only the first 100 segments are shown.

- All object metadata in the unprocessed, internal storage format. This raw metadata includes internal system metadata that is not guaranteed to persist from release to release.

The following example shows the object metadata lookup results for an S3 test object that is stored as two replicated copies.

System Metadata

Object ID	A12E96FF-B13F-4905-9E9E-45373F6E7DA8
Name	testobject
Container	source
Account	t-1582139188
Size	5.24 MB
Creation Time	2020-02-19 12:15:59 PST
Modified Time	2020-02-19 12:15:59 PST

Replicated Copies

Node	Disk Path
99-97	/var/local/rangedb/2/p/06/0B/00nM8H\$ TFbnQQ CV2E
99-99	/var/local/rangedb/1/p/12/0A/00nM8H\$ TFboW28 CXG%

Raw Metadata

```
{
  "TYPE": "CTNT",
  "CHND": "A12E96FF-B13F-4905-9E9E-45373F6E7DA8",
  "NAME": "testobject",
  "CBID": "0x8823DE7EC7C10416",
  "PHID": "FEA0AE51-534A-11EA-9FCD-31FF00C36056",
  "PPTH": "source",
  "META": {
    "BASE": {
      "PAWS": "2",
      "PAWS": "2"
    }
  }
}
```

Related information

[Manage objects with ILM](#)

[Use S3](#)

[Use Swift](#)

Object store (storage volume) failures

The underlying storage on a Storage Node is divided into object stores. Object stores are also known as storage volumes.

You can view object store information for each Storage Node. Object stores are shown at the bottom of the **NODES > Storage Node > Storage** page.

Disk devices

Name	World Wide Name	I/O load	Read rate	Write rate
sdc(8:16,sdb)	N/A	0.05%	0 bytes/s	4 KB/s
sde(8:48,sdd)	N/A	0.00%	0 bytes/s	82 bytes/s
sdf(8:64,sde)	N/A	0.00%	0 bytes/s	82 bytes/s
sdg(8:80,sdf)	N/A	0.00%	0 bytes/s	82 bytes/s
sdd(8:32,sdc)	N/A	0.00%	0 bytes/s	82 bytes/s
croot(8:1,sda1)	N/A	0.04%	0 bytes/s	4 KB/s
cvloc(8:2,sda2)	N/A	0.95%	0 bytes/s	52 KB/s

Volumes

Mount point	Device	Status	Size	Available	Write cache status
/	croot	Online	21.00 GB	14.73 GB	Unknown
/var/local	cvloc	Online	85.86 GB	80.94 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
/var/local/rangedb/3	sdf	Online	107.32 GB	107.18 GB	Enabled
/var/local/rangedb/4	sdg	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	1.55 MB	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
0003	107.32 GB	107.18 GB	0 bytes	0 bytes	0.00%	No Errors
0004	107.32 GB	107.18 GB	0 bytes	0 bytes	0.00%	No Errors

To see more details about each Storage Node, follow these steps:

1. Select **SUPPORT > Tools > Grid topology**.
2. Select **site > Storage Node > LDR > Storage > Overview > Main**.

The screenshot shows the 'Overview: LDR (DC1-S1) - Storage' page. At the top, it displays storage state information: Storage State - Desired: Online, Storage State - Current: Online, and Storage Status: No Errors. Below this, there's a utilization section with metrics like Total Space (322 GB), Total Usable Space (311 GB), and Total Usable Space (Percent) (96.534 %). The replication section shows Block Reads (0), Block Writes (0), Objects Retrieved (0), Objects Committed (0), Objects Deleted (0), and Delete Service State (Enabled). The final section, Object Store Volumes, lists three volumes with their respective details: ID, Total, Available, Replicated Data, EC Data, Stored (%), and Health.

ID	Total	Available	Replicated Data	EC Data	Stored (%)	Health
0000	107 GB	96.4 GB	994 KB	0 B	0.001 %	No Errors
0001	107 GB	107 GB	0 B	0 B	0 %	No Errors
0002	107 GB	107 GB	0 B	0 B	0 %	No Errors

Depending on the nature of the failure, faults with a storage volume might be reflected in an alarm on the storage status or on the health of an object store. If a storage volume fails, you should repair the failed storage volume to restore the Storage Node to full functionality as soon as possible. If necessary, you can go to the **Configuration** tab and place the Storage Node in a read-only state so that the StorageGRID system can use it for data retrieval while you prepare for a full recovery of the server.

Related information

[Recover and maintain](#)

Verify object integrity

The StorageGRID system verifies the integrity of object data on Storage Nodes, checking for both corrupt and missing objects.

There are two verification processes: background verification and object existence check (formerly called foreground verification). They work together to ensure data integrity. Background verification runs automatically, and continuously checks the correctness of object data. Object existence check can be triggered by a user to more quickly verify the existence (although not the correctness) of objects.

What is background verification?

The background verification process automatically and continuously checks Storage Nodes for corrupt copies of object data, and automatically attempts to repair any issues that it finds.

Background verification checks the integrity of replicated objects and erasure-coded objects, as follows:

- **Replicated objects:** If the background verification process finds a replicated object that is corrupt, the corrupt copy is removed from its location and quarantined elsewhere on the Storage Node. Then, a new uncorrupted copy is generated and placed to satisfy the active ILM policy. The new copy might not be placed on the Storage Node that was used for the original copy.



Corrupt object data is quarantined rather than deleted from the system, so that it can still be accessed. For more information on accessing quarantined object data, contact technical support.

- **Erasure-coded objects:** If the background verification process detects that a fragment of an erasure-coded object is corrupt, StorageGRID automatically attempts to rebuild the missing fragment in place on the same Storage Node, using the remaining data and parity fragments. If the corrupted fragment cannot be rebuilt, an attempt is made to retrieve another copy of the object. If retrieval is successful, an ILM evaluation is performed to create a replacement copy of the erasure-coded object.

The background verification process checks objects on Storage Nodes only. It does not check objects on Archive Nodes or in a Cloud Storage Pool. Objects must be older than four days to qualify for background verification.

Background verification runs at a continuous rate that is designed not to interfere with ordinary system activities. Background verification cannot be stopped. However you can increase the background verification rate to more quickly verify the contents of a Storage Node if you suspect a problem.

Alerts and alarms (legacy) related to background verification

If the system detects a corrupt object that it cannot correct automatically (because the corruption prevents the object from being identified), the **Unidentified corrupt object detected** alert is triggered.

If background verification cannot replace a corrupted object because it cannot locate another copy, the **Objects lost** alert is triggered.

Change the background verification rate

You can change the rate at which background verification checks replicated object data on a Storage Node if you have concerns about data integrity.

What you'll need

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

About this task

You can change the Verification Rate for background verification on a Storage Node:

- Adaptive: Default setting. The task is designed to verify at a maximum of 4 MB/s or 10 objects/s (whichever is exceeded first).
- High: Storage verification proceeds quickly, at a rate that can slow ordinary system activities.

Use the High verification rate only when you suspect that a hardware or software fault might have corrupted object data. After the High priority background verification completes, the Verification Rate automatically resets to Adaptive.

Steps

1. Select **SUPPORT > Tools > Grid topology**.
2. Select **Storage Node > LDR > Verification**.
3. Select **Configuration > Main**.
4. Go to **LDR > Verification > Configuration > Main**.
5. Under Background Verification, select **Verification Rate > High** or **Verification Rate > Adaptive**.

The screenshot shows the 'Configuration' tab selected in the top navigation bar. Below it, the 'Main' section is active. The main content area displays the 'Configuration: LDR ([REDACTED]) - Verification' page. A pie chart icon is on the left. The 'Verification Rate' dropdown is set to 'Adaptive' and is highlighted with a green border. Other options in the dropdown are 'High' and 'Low'. There are also 'Reset Missing Objects Count' and 'Reset Corrupt Objects Count' checkboxes. The 'Quarantined Objects' section contains a 'Delete Quarantined Objects' checkbox and an 'Apply Changes' button with a blue arrow icon.



Setting the Verification Rate to High triggers the VPRI (Verification Rate) legacy alarm at the Notice level.

6. Click **Apply Changes**.
7. Monitor the results of background verification for replicated objects.
 - a. Go to **NODES > Storage Node > Objects**.
 - b. In the Verification section, monitor the values for **Corrupt Objects** and **Corrupt Objects Unidentified**.

If background verification finds corrupt replicated object data, the **Corrupt Objects** metric is incremented, and StorageGRID attempts to extract the object identifier from the data, as follows:

- If the object identifier can be extracted, StorageGRID automatically creates a new copy of the object data. The new copy can be made anywhere in the StorageGRID system that satisfies the active ILM policy.
- If the object identifier cannot be extracted (because it has been corrupted), the **Corrupt Objects Unidentified** metric is incremented, and the **Unidentified corrupt object detected** alert is

- triggered.
- c. If corrupt replicated object data is found, contact technical support to determine the root cause of the corruption.
8. Monitor the results of background verification for erasure-coded objects.
- If background verification finds corrupt fragments of erasure-coded object data, the Corrupt Fragments Detected attribute is incremented. StorageGRID recovers by rebuilding the corrupt fragment in place on the same Storage Node.
- a. Select **SUPPORT > Tools > Grid topology**.
 - b. Select **Storage Node > LDR > Erasure Coding**.
 - c. In the Verification Results table, monitor the Corrupt Fragments Detected (ECCD) attribute.
9. After corrupt objects have been automatically restored by the StorageGRID system, reset the count of corrupt objects.
 - a. Select **SUPPORT > Tools > Grid topology**.
 - b. Select **Storage Node > LDR > Verification > Configuration**.
 - c. Select **Reset Corrupt Object Count**.
 - d. Click **Apply Changes**.
 10. If you are confident that quarantined objects are not required, you can delete them.



If the **Objects lost** alert or the LOST (Lost Objects) legacy alarm was triggered, technical support might want to access quarantined objects to help debug the underlying issue or to attempt data recovery.

- a. Select **SUPPORT > Tools > Grid topology**.
- b. Select **Storage Node > LDR > Verification > Configuration**.
- c. Select **Delete Quarantined Objects**.
- d. Select **Apply Changes**.

What is object existence check?

Object existence check verifies whether all expected replicated copies of objects and erasure-coded fragments exist on a Storage Node. Object existence check does not verify the object data itself (background verification does that); instead, it provides a way to verify the integrity of storage devices, especially if a recent hardware issue could have affected data integrity.

Unlike background verification, which occurs automatically, you must manually start an object existence check job.

Object existence check reads the metadata for every object stored in StorageGRID and verifies the existence of both replicated object copies and erasure-coded object fragments. Any missing data is handled as follows:

- **Replicated copies:** If a copy of replicated object data is missing, StorageGRID automatically attempts to replace the copy from a copy stored elsewhere in the system. The Storage Node runs an existing copy through an ILM evaluation, which will determine that the current ILM policy is no longer being met for this object because another copy is missing. A new copy is generated and placed to satisfy the system's active ILM policy. This new copy might not be placed in the same location where the missing copy was stored.
- **Erasure-coded fragments:** If a fragment of an erasure-coded object is missing, StorageGRID

automatically attempts to rebuild the missing fragment in place on the same Storage Node using the remaining fragments. If the missing fragment cannot be rebuilt (because too many fragments have been lost), ILM attempts to find another copy of the object, which it can use to generate a new erasure-coded fragment.

Run object existence check

You create and run one object existence check job at a time. When you create a job, you select the Storage Nodes and volumes you want to verify. You also select the consistency control for the job.

What you'll need

- You are signed in to the Grid Manager using a [supported web browser](#).
- You have the Maintenance or Root Access permission.
- You have ensured that the Storage Nodes you want to check are online. Select **NODES** to view the table of nodes. Ensure that no alert icons appear next to the node name for the nodes you want to check.
- You have ensured that the following procedures are **not** running on the nodes you want to check:
 - Grid expansion to add a Storage Node
 - Storage Node decommission
 - Recovery of a failed storage volume
 - Recovery of a Storage Node with a failed system drive
 - EC rebalance
 - Appliance node clone

Object existence check does not provide useful information while these procedures are in progress.

About this task

An object existence check job can take days or weeks to complete, depending on the number of objects in the grid, the selected storage nodes and volumes, and the selected consistency control. You can run only one job at a time, but you can select multiple Storage Nodes and volumes at the same time.

Steps

1. Select **MAINTENANCE > Tasks > Object existence check**.
2. Select **Create job**. The Create an object existence check job wizard appears.
3. Select the nodes containing the volumes you want to verify. To select all online nodes, select the **Node name** check box in the column header.

You can search by node name or site.

You cannot select nodes that are not connected to the grid.
4. Select **Continue**.
5. Select one or more volumes for each node in the list. You can search for volumes using the storage volume number or node name.

To select all volumes for each node you selected, select the **Storage volume** check box in the column header.

6. Select **Continue**.

7. Select the consistency control for the job.

The consistency control determines how many copies of object metadata are used for the object existence check.

- **Strong-site**: Two copies of metadata at a single site.
- **Strong-global**: Two copies of metadata at each site.
- **All** (default): All three copies of metadata at each site.

For more information about consistency control, see the descriptions in the wizard.

8. Select **Continue**.

9. Review and verify your selections. You can select **Previous** to go to a previous step in the wizard to update your selections.

An Object existence check job is generated and runs until one of the following occurs:

- The job completes.
- You pause or cancel the job. You can resume a job that you have paused, but you cannot resume a job that you have canceled.
- The job stalls. The **Object existence check has stalled** alert is triggered. Follow the corrective actions specified for the alert.
- The job fails. The **Object existence check has failed** alert is triggered. Follow the corrective actions specified for the alert.
- A “Service unavailable” or an “Internal server error” message appears. After one minute, refresh the page to continue monitoring the job.



As needed, you can navigate away from the Object existence check page and return to continue monitoring the job.

10. As the job runs, view the **Active job** tab and note the value of Missing object copies detected.

This value represents the total number of missing copies of replicated objects and erasure-coded objects with one or more missing fragments.

If the number of Missing object copies detected is greater than 100, there might be an issue with the Storage Node's storage.

Object existence check

Perform an object existence check if you suspect some storage volumes have been damaged or are corrupt and you want to verify that objects still exist on these volumes.

If you have questions about running object existence check, contact technical support.

The screenshot shows the 'Job history' tab selected in the top navigation bar. The job status is 'Accepted' with ID 2334602652907829302. A message box highlights 'Missing object copies detected 0'. The progress bar is at 0%. The interface includes 'Pause' and 'Cancel' buttons. Below the table, there are 'Volumes' and 'Details' tabs, with 'Volumes' currently selected. The table lists storage volumes across three nodes:

Selected node	Selected storage volumes	Site
DC1-S1	0, 1, 2	Data Center 1
DC1-S2	0, 1, 2	Data Center 1
DC1-S3	0, 1, 2	Data Center 1

11. After the job has completed, take any additional required actions:

- If Missing object copies detected is zero, then no issues were found. No action is required.
- If Missing object copies detected is greater than zero and the **Objects lost** alert has not been triggered, then all missing copies were repaired by the system. Verify that any hardware issues have been corrected to prevent future damage to object copies.
- If Missing object copies detected is greater than zero and the **Objects lost** alert has been triggered, then data integrity could be affected. Contact technical support.
- You can investigate lost object copies by using grep to extract the LLST audit messages: `grep LLST audit_file_name`.

This procedure is similar to the one for [investigating lost objects](#), although for object copies you search for LLST instead of OLST.

12. If you selected the strong-site or strong-global consistency control for the job, wait approximately three weeks for metadata consistency and then rerun the job on the same volumes again.

When StorageGRID has had time to achieve metadata consistency for the nodes and volumes included in the job, rerunning the job could clear erroneously reported missing object copies or cause additional object copies to be checked if they were missed.

- Select **MAINTENANCE > Object existence check > Job history**.
- Determine which jobs are ready to be rerun:
 - Look at the **End time** column to determine which jobs were run more than three weeks ago.

- ii. For those jobs, scan the Consistency control column for strong-site or strong-global.
- c. Select the check box for each job you want to rerun, then select **Rerun**.

Object existence check

Perform an object existence check if you suspect some storage volumes have been damaged or are corrupt and you want to verify that objects still exist on these volumes.

If you have questions about running object existence check, contact technical support.

Active job		Job history				
<input type="button" value="Delete"/>	<input checked="" type="button" value="Rerun"/>	Search by Job ID/ node name/ consistency control/ start time <input type="text"/> <input type="button" value=""/>				
		Displaying 4 results				
Job ID	Status	Nodes (volumes)	Missing object copies detected	Consistency control	Start time	End time
2334602652907829302	Completed	DC1-S1 (3 volumes) DC1-S2 (3 volumes) DC1-S3 (3 volumes) and 7 more	0	All	2021-11-10 14:43:02 MST (3 weeks ago)	
11725651898848823235 (Rerun job)	Completed	DC1-S2 (2 volumes) DC1-S3 (2 volumes) DC1-S4 (2 volumes) and 4 more	0	Strong-site	2021-11-10 14:42:10 MST (17 minutes ago)	

- d. In the Rerun jobs wizard, review the selected nodes and volumes and the consistency control.
- e. When you are ready to rerun the jobs, select **Rerun**.

The Active job tab appears. All the jobs you selected are rerun as one job at a consistency control of strong-site. A **Related jobs** field in the Details section lists the job IDs for the original jobs.

After you finish

If you still have concerns about data integrity, go to **SUPPORT > Tools > Grid topology > site > Storage Node > LDR > Verification > Configuration > Main** and increase the Background Verification Rate. Background verification checks the correctness of all stored object data and repairs any issues that it finds. Finding and repairing potential issues as quickly as possible reduces the risk of data loss.

Troubleshoot lost and missing object data

Objects can be retrieved for several reasons, including read requests from a client application, background verifications of replicated object data, ILM re-evaluations, and the restoration of object data during the recovery of a Storage Node.

The StorageGRID system uses location information in an object's metadata to determine from which location to retrieve the object. If a copy of the object is not found in the expected location, the system attempts to retrieve another copy of the object from elsewhere in the system, assuming that the ILM policy contains a rule to make two or more copies of the object.

If this retrieval is successful, the StorageGRID system replaces the missing copy of the object. Otherwise, the

Objects lost alert is triggered, as follows:

- For replicated copies, if another copy cannot be retrieved, the object is considered lost, and the alert is triggered.
- For erasure coded copies, if a copy cannot be retrieved from the expected location, the Corrupt Copies Detected (ECOR) attribute is incremented by one before an attempt is made to retrieve a copy from another location. If no other copy is found, the alert is triggered.

You should investigate all **Objects lost** alerts immediately to determine the root cause of the loss and to determine if the object might still exist in an offline, or otherwise currently unavailable, Storage Node or Archive Node.

In the case where object data without copies is lost, there is no recovery solution. However, you must reset the Lost objects counter to prevent known lost objects from masking any new lost objects.

Related information

[Investigate lost objects](#)

[Reset lost and missing object counts](#)

[Investigate lost objects](#)

When the **Objects lost** alert is triggered, you must investigate immediately. Collect information about the affected objects and contact technical support.

What you'll need

- You must be signed in to the Grid Manager using a [supported web browser](#).
- You must have specific access permissions.
- You must have the `Passwords.txt` file.

About this task

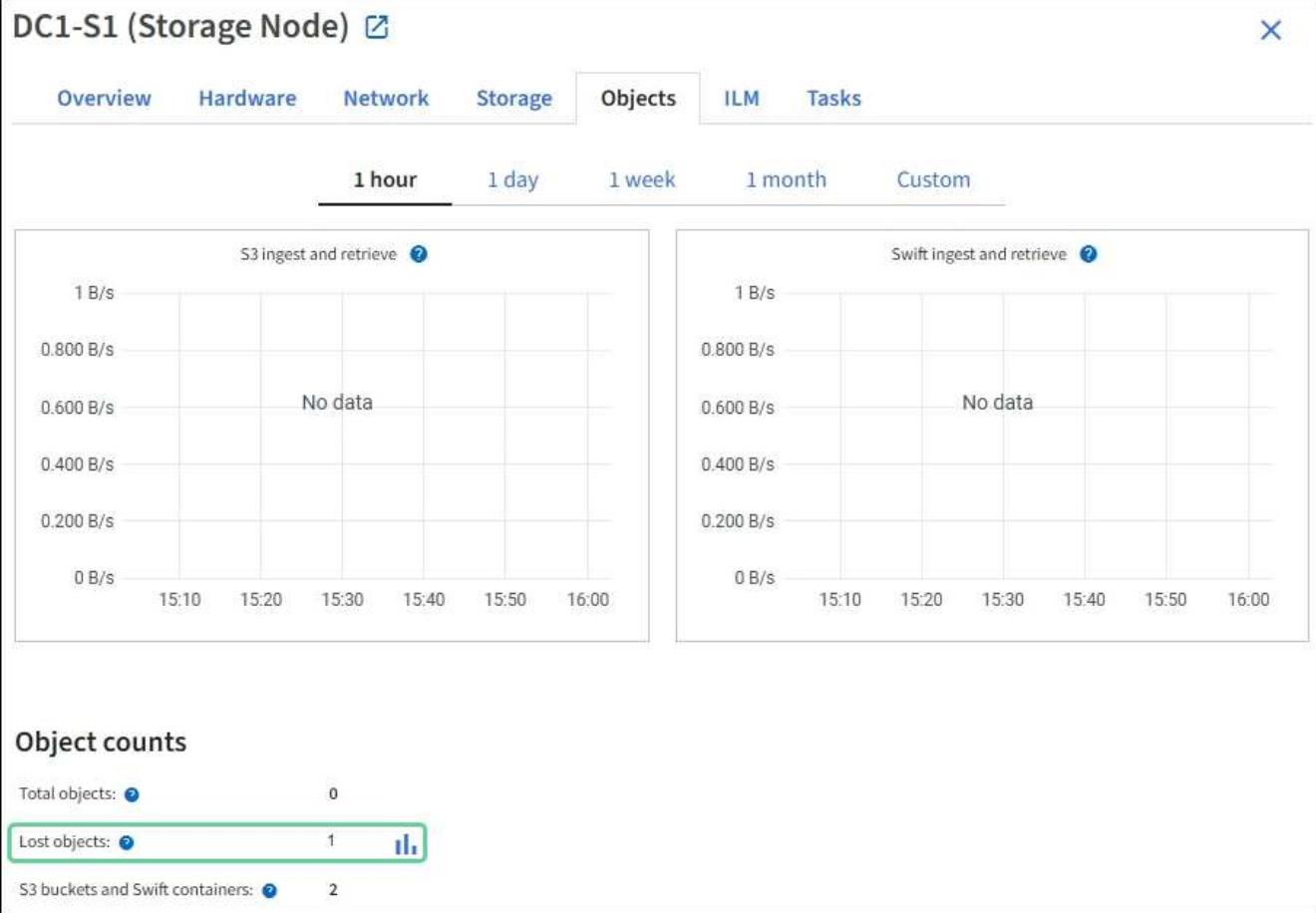
The **Objects lost** alert indicates that StorageGRID believes that there are no copies of an object in the grid. Data might have been permanently lost.

Investigate lost object alerts immediately. You might need to take action to prevent further data loss. In some cases, you might be able to restore a lost object if you take prompt action.

Steps

1. Select **NODES**.
2. Select **Storage Node > Objects**.
3. Review the number of Lost objects shown in the Object counts table.

This number indicates the total number of objects this grid node detects as missing from the entire StorageGRID system. The value is the sum of the Lost objects counters of the Data store component within the LDR and DDS services.



4. From an Admin Node, access the audit log to determine the unique identifier (UUID) of the object that triggered the **Objects lost** alert:
 - a. Log in to the grid node:
 - i. Enter the following command: `ssh admin@grid_node_IP`
 - ii. Enter the password listed in the `Passwords.txt` file.
 - iii. Enter the following command to switch to root: `su -`
 - iv. Enter the password listed in the `Passwords.txt` file. When you are logged in as root, the prompt changes from `$` to `#`.
 - b. Change to the directory where the audit logs are located. Enter: `cd /var/local/audit/export/`
 - c. Use grep to extract the Object Lost (OLST) audit messages. Enter: `grep OLST audit_file_name`
 - d. Note the UUID value included in the message.

```
>Admin: # grep OLST audit.log
2020-02-12T19:18:54.780426
[AUDT:[CBID(UI64):0x38186FE53E3C49A5] [UUID(CSTR):926026C4-00A4-449B-
AC72-BCCA72DD1311]
[PATH(CSTR):"source/cats"] [NOID(UI32):12288733] [VOLI(UI64):3222345986
] [RSLT(FC32):NONE] [AVER(UI32):10]
[ATIM(UI64):1581535134780426] [ATYP(FC32):OLST] [ANID(UI32):12448208] [A
MID(FC32):ILMX] [ATID(UI64):7729403978647354233]]
```

5. Use the ObjectByUUID command to find the object by its identifier (UUID), and then determine if data is at risk.

- Telnet to localhost 1402 to access the LDR console.
- Enter: /proc/OBRP/ObjectByUUID UUID_value

In this first example, the object with UUID 926026C4-00A4-449B-AC72-BCCA72DD1311 has two locations listed.

```
ade 12448208: /proc/OBRP > ObjectByUUID 926026C4-00A4-449B-AC72-
BCCA72DD1311

{
    "TYPE(Object Type)": "Data object",
    "CHND(Content handle)": "926026C4-00A4-449B-AC72-BCCA72DD1311",
    "NAME": "cats",
    "CBID": "0x38186FE53E3C49A5",
    "PHND(Parent handle, UUID)": "221CABD0-4D9D-11EA-89C3-
ACBB00BB82DD",
    "PPTH(Parent path)": "source",
    "META": {
        "BASE(Protocol metadata)": {
            "PAWS(S3 protocol version)": "2",
            "ACCT(S3 account ID)": "44084621669730638018",
            "*ctp(HTTP content MIME type)": "binary/octet-stream"
        },
        "BYCB(System metadata)": {
            "CSIZ(Plaintext object size)": "5242880",
            "SHSH(Supplementary Plaintext hash)": "MD5D
0xBAC2A2617C1DFF7E959A76731E6EAF5E",
            "BSIZ(Content block size)": "5252084",
            "CVER(Content block version)": "196612",
            "CTME(Object store begin timestamp)": "2020-02-
12T19:16:10.983000",
            "MTME(Object store modified timestamp)": "2020-02-
12T19:16:10.983000",
        }
    }
}
```

```

    "ITME": "1581534970983000"
},
"CMSSM": {
    "LATM(Object last access time)": "2020-02-
12T19:16:10.983000"
},
"AWS3": {
    "LOCC": "us-east-1"
}
},
"CLCO\ (Locations\)": \[
\{
    "Location Type": "CLDI\ (Location online\)",
    "NOID\ (Node ID\)": "12448208",
    "VOLI\ (Volume ID\)": "3222345473",
    "Object File Path":
"/var/local/rangedb/1/p/17/11/00rH0%DkRt78Il1a\#3udu",
    "LTIM\ (Location timestamp\)": "2020-02-
12T19:36:17.880569"
\},
\{
    "Location Type": "CLDI\ (Location online\)",
    "NOID\ (Node ID\)": "12288733",
    "VOLI\ (Volume ID\)": "3222345984",
    "Object File Path":
"/var/local/rangedb/0/p/19/11/00rH0%DkRt78Rrb\#3s;L",
    "LTIM\ (Location timestamp\)": "2020-02-
12T19:36:17.934425"
}
]
}

```

In the second example, the object with UUID 926026C4-00A4-449B-AC72-BCCA72DD1311 has no locations listed.

```

ade 12448208: / > /proc/OBRP/ObjectByUUID 926026C4-00A4-449B-AC72-
BCCA72DD1311

{
    "TYPE(Object Type)": "Data object",
    "CHND(Content handle)": "926026C4-00A4-449B-AC72-BCCA72DD1311",
    "NAME": "cats",
    "CBID": "0x38186FE53E3C49A5",
    "PHND(Parent handle, UUID)": "221CABD0-4D9D-11EA-89C3-
ACBB00BB82DD",
    "PPTH(Parent path)": "source",
    "META": {
        "BASE(Protocol metadata)": {
            "PAWS(S3 protocol version)": "2",
            "ACCT(S3 account ID)": "44084621669730638018",
            "*ctp(HTTP content MIME type)": "binary/octet-stream"
        },
        "BYCB(System metadata)": {
            "CSIZ(Plaintext object size)": "5242880",
            "SHSH(Supplementary Plaintext hash)": "MD5D
0xBAC2A2617C1DFF7E959A76731E6EAF5E",
            "BSIZ(Content block size)": "5252084",
            "CVER(Content block version)": "196612",
            "CTME(Object store begin timestamp)": "2020-02-
12T19:16:10.983000",
            "MTME(Object store modified timestamp)": "2020-02-
12T19:16:10.983000",
            "ITME": "1581534970983000"
        },
        "CMSSM": {
            "LATM(Object last access time)": "2020-02-
12T19:16:10.983000"
        },
        "AWS3": {
            "LOCC": "us-east-1"
        }
    }
}

```

- c. Review the output of /proc/OBRP/ObjectByUUID, and take the appropriate action:

Metadata	Conclusion
No object found ("ERROR": "")	<p>If the object is not found, the message "ERROR": "" is returned.</p> <p>If the object is not found, you can reset the count of Objects lost to clear the alert. The lack of an object indicates that the object was intentionally deleted.</p>
Locations > 0	<p>If there are locations listed in the output, the Objects lost alert might be a false positive.</p> <p>Confirm that the objects exist. Use the Node ID and filepath listed in the output to confirm that the object file is in the listed location.</p> <p>(The procedure for searching for potentially lost objects explains how to use the Node ID to find the correct Storage Node.)</p> <p>If the objects exist, you can reset the count of Objects lost to clear the alert.</p>
Locations = 0	<p>If there are no locations listed in the output, the object is potentially missing. You can try to search for and restore the object yourself, or you can contact technical support.</p> <p>Technical support might ask you to determine if there is a storage recovery procedure in progress. That is, has a <i>repair-data</i> command been issued on any Storage Node, and is the recovery still in progress? See the information about restoring object data to a storage volume.</p>

Related information

[Review audit logs](#)

Search for and restore potentially lost objects

It might be possible to find and restore objects that have triggered a Lost Objects (LOST) alarm and a **Object lost** alert and that you have identified as potentially lost.

What you'll need

- You must have the UUID of any lost object, as identified in “Investigating lost objects.”
- You must have the `Passwords.txt` file.

About this task

You can follow this procedure to look for replicated copies of the lost object elsewhere in the grid. In most cases, the lost object will not be found. However, in some cases, you might be able to find and restore a lost replicated object if you take prompt action.



Contact technical support for assistance with this procedure.

Steps

1. From an Admin Node, search the audit logs for possible object locations:
 - a. Log in to the grid node:
 - i. Enter the following command: `ssh admin@grid_node_IP`
 - ii. Enter the password listed in the `Passwords.txt` file.
 - iii. Enter the following command to switch to root: `su -`
 - iv. Enter the password listed in the `Passwords.txt` file. When you are logged in as root, the prompt changes from \$ to #.
 - b. Change to the directory where the audit logs are located: `cd /var/local/audit/export/`
 - c. Use grep to extract the audit messages associated with the potentially lost object and send them to an output file. Enter: `grep uuid-valueaudit_file_name > output_file_name`

For example:

```
Admin: # grep 926026C4-00A4-449B-AC72-BCCA72DD1311 audit.log >
messages_about_lost_object.txt
```

- d. Use grep to extract the Location Lost (LLST) audit messages from this output file. Enter: `grep LLST output_file_name`

For example:

```
Admin: # grep LLST messages_about_lost_objects.txt
```

An LLST audit message looks like this sample message.

```
[AUDT:\[NOID\(\UI32\)\]:12448208\] [CBIL(\UI64):0x38186FE53E3C49A5]
[UUID(CSTR\):"926026C4-00A4-449B-AC72-BCCA72DD1311"] [LTYP(FC32):CLDI]
[PCLD\(\CSTR\)\:"/var/local/rangedb/1/p/17/11/00rH0%DkRs&LgA%\#3tN6"\]
[TSRC(FC32):SYST] [RSLT(FC32):NONE] [AVER(\UI32):10] [ATIM(\UI64):
1581535134379225] [ATYP(FC32):LLST] [ANID(\UI32):12448208] [AMID(FC32):CL
SM]
[ATID(\UI64):7086871083190743409]]
```

- e. Find the PCLD field and the NOID field in the LLST message.

If present, the value of PCLD is the complete path on disk to the missing replicated object copy. The value of NOID is the node id of the LDR where a copy of the object might be found.

If you find an object location, you might be able to restore the object.

- f. Find the Storage Node for this LDR node ID.

There are two ways to use the node ID to find the Storage Node:

- In the Grid Manager, select **SUPPORT > Tools > Grid topology**. Then select **Data Center > Storage Node > LDR**. The LDR node ID is in the Node Information table. Review the information for each Storage Node until you find the one that hosts this LDR.
 - Download and unzip the Recovery Package for the grid. There is a `\docs` directory in the SAID package. If you open the `index.html` file, the Servers Summary shows all node IDs for all grid nodes.
2. Determine if the object exists on the Storage Node indicated in the audit message:
- a. Log in to the grid node:
 - i. Enter the following command: `ssh admin@grid_node_IP`
 - ii. Enter the password listed in the `Passwords.txt` file.
 - iii. Enter the following command to switch to root: `su -`
 - iv. Enter the password listed in the `Passwords.txt` file.

When you are logged in as root, the prompt changes from `$` to `#`.

- b. Determine if the file path for the object exists.

For the file path of the object, use the value of PCLD from the LLST audit message.

For example, enter:

```
ls '/var/local/rangedb/1/p/17/11/00rH0%DkRs&LgA%#3tN6'
```

Note: Always enclose the object file path in single quotes in commands to escape any special characters.

- If the object path is not found, the object is lost and cannot be restored using this procedure. Contact technical support.
- If the object path is found, continue with step [Restore the object to StorageGRID](#). You can attempt to restore the found object back to StorageGRID.

1. If the object path was found, attempt to restore the object to StorageGRID:

- a. From the same Storage Node, change the ownership of the object file so that it can be managed by StorageGRID. Enter: `chown ldr-user:broadcast 'file_path_of_object'`
- b. Telnet to localhost 1402 to access the LDR console. Enter: `telnet 0 1402`
- c. Enter: `cd /proc/STOR`
- d. Enter: `Object_Found 'file_path_of_object'`

For example, enter:

```
Object_Found '/var/local/rangedb/1/p/17/11/00rH0%DkRs&LgA%#3tN6'
```

Issuing the `Object_Found` command notifies the grid of the object's location. It also triggers the active ILM policy, which makes additional copies as specified in the policy.

Note: If the Storage Node where you found the object is offline, you can copy the object to any Storage Node that is online. Place the object in any /var/local/rangedb directory of the online Storage Node. Then, issue the Object_Found command using that file path to the object.

- If the object cannot be restored, the Object_Found command fails. Contact technical support.
- If the object was successfully restored to StorageGRID, a success message appears. For example:

```
ade 12448208: /proc/STOR > Object_Found  
'/var/local/rangedb/1/p/17/11/00rH0%DkRs&LgA%#3tN6'  
  
ade 12448208: /proc/STOR > Object found succeeded.  
First packet of file was valid. Extracted key: 38186FE53E3C49A5  
Renamed '/var/local/rangedb/1/p/17/11/00rH0%DkRs&LgA%#3tN6' to  
'/var/local/rangedb/1/p/17/11/00rH0%DkRt78Ilia#3udu'
```

Continue with step [Verify that new locations were created](#)

1. If the object was successfully restored to StorageGRID, verify that new locations were created.
 - a. Enter: cd /proc/OBRP
 - b. Enter: ObjectByUUID UUID_value

The following example shows that there are two locations for the object with UUID 926026C4-00A4-449B-AC72-BCCA72DD1311.

```
ade 12448208: /proc/OBRP > ObjectByUUID 926026C4-00A4-449B-AC72-  
BCCA72DD1311  
  
{  
    "TYPE(Object Type)": "Data object",  
    "CHND(Content handle)": "926026C4-00A4-449B-AC72-BCCA72DD1311",  
    "NAME": "cats",  
    "CBID": "0x38186FE53E3C49A5",  
    "PHND(Parent handle, UUID)": "221CABD0-4D9D-11EA-89C3-ACBB00BB82DD",  
    "PPTH(Parent path)": "source",  
    "META": {  
        "BASE(Protocol metadata)": {  
            "PAWS(S3 protocol version)": "2",  
            "ACCT(S3 account ID)": "44084621669730638018",  
            "*ctp(HTTP content MIME type)": "binary/octet-stream"  
        },  
        "BYCB(System metadata)": {  
            "CSIZ(Plaintext object size)": "5242880",  
            "SHSH(Supplementary Plaintext hash)": "MD5D  
0xBAC2A2617C1DFF7E959A76731E6EAF5E",  
            "BSIZ(Content block size)": "5252084",  
        }  
    }  
}
```

```

    "CVER(Content block version)": "196612",
    "CTME(Object store begin timestamp)": "2020-02-
12T19:16:10.983000",
    "MTME(Object store modified timestamp)": "2020-02-
12T19:16:10.983000",
    "ITME": "1581534970983000"
},
"CMSM": {
    "LATM(Object last access time)": "2020-02-12T19:16:10.983000"
},
"AWS3": {
    "LOCC": "us-east-1"
}
},
"CLCO\ (Locations)": \[
\{
    "Location Type": "CLDI\ (Location online\)",
    "NOID\ (Node ID\)": "12448208",
    "VOLI\ (Volume ID\)": "3222345473",
    "Object File Path":
"/var/local/rangedb/1/p/17/11/00rH0%DkRt78Ila\#3udu",
    "LTIM\ (Location timestamp)": "2020-02-12T19:36:17.880569"
\},
\{
    "Location Type": "CLDI\ (Location online\)",
    "NOID\ (Node ID\)": "12288733",
    "VOLI\ (Volume ID\)": "3222345984",
    "Object File Path":
"/var/local/rangedb/0/p/19/11/00rH0%DkRt78Rrb\#3s;L",
    "LTIM\ (Location timestamp)": "2020-02-12T19:36:17.934425"
}
]
}

```

- Sign out of the LDR console. Enter: `exit`
 - From an Admin Node, search the audit logs for the ORLM audit message for this object to confirm that information lifecycle management (ILM) has placed copies as required.
- Log in to the grid node:
 - Enter the following command: `ssh admin@grid_node_IP`
 - Enter the password listed in the `Passwords.txt` file.
 - Enter the following command to switch to root: `su -`
 - Enter the password listed in the `Passwords.txt` file. When you are logged in as root, the prompt changes from `$` to `#`.

- c. Change to the directory where the audit logs are located: cd /var/local/audit/export/
- d. Use grep to extract the audit messages associated with the object to an output file. Enter: grep uuid-valueaudit_file_name > output_file_name

For example:

```
Admin: # grep 926026C4-00A4-449B-AC72-BCCA72DD1311 audit.log > messages_about_restored_object.txt
```

- e. Use grep to extract the Object Rules Met (ORLM) audit messages from this output file. Enter: grep ORLM output_file_name

For example:

```
Admin: # grep ORLM messages_about_restored_object.txt
```

An ORLM audit message looks like this sample message.

```
[AUDT:[CBID(UI64):0x38186FE53E3C49A5] [RULE(CSTR) :"Make 2 Copies"]  
[STAT(FC32):DONE] [CSIZ(UI64):0] [UUID(CSTR) :"926026C4-00A4-449B-AC72-  
BCCA72DD1311"]  
[LOCS(CSTR) :"**CLDI 12828634 2148730112**, CLDI 12745543 2147552014"]  
[RSLT(FC32):SUCS] [AVER(UI32):10] [ATYP(FC32):ORLM] [ATIM(UI64):15633982306  
69]  
[ATID(UI64):15494889725796157557] [ANID(UI32):13100453] [AMID(FC32):BCMS]]
```

- f. Find the LOCS field in the audit message.

If present, the value of CLDI in LOCS is the node ID and the volume ID where an object copy has been created. This message shows that the ILM has been applied and that two object copies have been created in two locations in the grid. . Reset the count of lost objects in the Grid Manager.

Related information

[Investigate lost objects](#)

[Reset lost and missing object counts](#)

[Review audit logs](#)

Reset lost and missing object counts

After investigating the StorageGRID system and verifying that all recorded lost objects are permanently lost or that it is a false alarm, you can reset the value of the Lost Objects attribute to zero.

What you'll need

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

About this task

You can reset the Lost Objects counter from either of the following pages:

- **SUPPORT > Tools > Grid topology > Site > Storage Node > LDR > Data Store > Overview > Main**
- **SUPPORT > Tools > Grid topology > Site > Storage Node > DDS > Data Store > Overview > Main**

These instructions show resetting the counter from the **LDR > Data Store** page.

Steps

1. Select **SUPPORT > Tools > Grid topology**.
2. Select **Site > Storage Node > LDR > Data Store > Configuration** for the Storage Node that has the **Objects lost** alert or the LOST alarm.
3. Select **Reset Lost Objects Count**.

4. Click **Apply Changes**.

The Lost Objects attribute is reset to 0 and the **Objects lost** alert and the LOST alarm clear, which can take a few minutes.

5. Optionally, reset other related attribute values that might have been incremented in the process of identifying the lost object.
 - a. Select **Site > Storage Node > LDR > Erasure Coding > Configuration**.
 - b. Select **Reset Reads Failure Count** and **Reset Corrupt Copies Detected Count**.
 - c. Click **Apply Changes**.
 - d. Select **Site > Storage Node > LDR > Verification > Configuration**.
 - e. Select **Reset Missing Objects Count** and **Reset Corrupt Objects Count**.
 - f. If you are confident that quarantined objects are not required, you can select **Delete Quarantined Objects**.

Quarantined objects are created when background verification identifies a corrupt replicated object copy. In most cases StorageGRID automatically replaces the corrupt object, and it is safe to delete the quarantined objects. However, if the **Objects lost** alert or the LOST alarm is triggered, technical support might want to access the quarantined objects.

g. Click **Apply Changes**.

It can take a few moments for the attributes to reset after you click **Apply Changes**.

Troubleshoot the Low object data storage alert

The **Low object data storage** alert monitors how much space is available for storing object data on each Storage Node.

What you'll need

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

About this task

The **Low object data storage** alert is triggered when the total amount of replicated and erasure coded object data on a Storage Node meets one of the conditions configured in the alert rule.

By default, a major alert is triggered when this condition evaluates as true:

```
(storagegrid_storage_utilization_data_bytes/
(storagegrid_storage_utilization_data_bytes +
storagegrid_storage_utilization_usable_space_bytes)) >=0.90
```

In this condition:

- `storagegrid_storage_utilization_data_bytes` is an estimate of the total size of replicated and erasure coded object data for a Storage Node.
- `storagegrid_storage_utilization_usable_space_bytes` is the total amount of object storage space remaining for a Storage Node.

If a major or minor **Low object data storage** alert is triggered, you should perform an expansion procedure as soon as possible.

Steps

1. Select **ALERTS > Current**.

The Alerts page appears.

2. From the table of alerts, expand the **Low object data storage** alert group, if required, and select the alert you want to view.



Select the alert, not the heading for a group of alerts.

3. Review the details in the dialog box, and note the following:

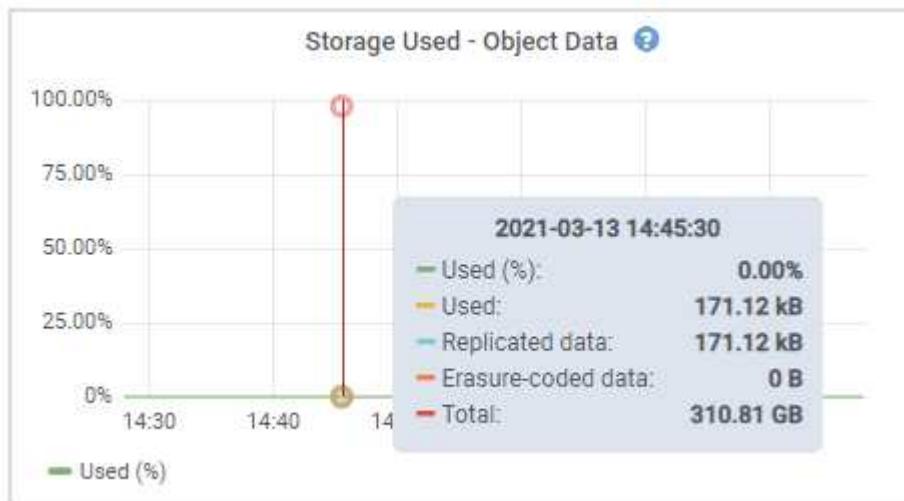
- Time triggered
- The name of the site and node
- The current values of the metrics for this alert

4. Select **NODES > Storage Node or Site > Storage**.

5. Hover 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.



6. Select the time controls above the graph to view storage use over different time periods.

Looking at storage use over time can help you understand how much storage was used before and after the alert was triggered and can help you estimate how long it might take for the node's remaining space to become full.

7. As soon as possible, perform an expansion procedure to add storage capacity.

You can add storage volumes (LUNs) to existing Storage Nodes, or you can add new Storage Nodes.



To manage a full Storage Node, see the instructions for administering StorageGRID.

Related information

[Troubleshoot the Storage Status \(SSTS\) alarm](#)

[Expand your grid](#)

[Administer StorageGRID](#)

Troubleshoot Low read-only watermark override alerts

If you use custom values for storage volume watermarks, you might need to resolve the **Low read-only watermark override** alert. If possible, you should update your system to

start using the optimized values.

In previous releases, the three [storage volume watermarks](#) were global settings — the same values applied to every storage volume on every Storage Node. Starting in StorageGRID 11.6, the software can optimize these watermarks for each storage volume, based on the size of the Storage Node and the relative capacity of the volume.

When you upgrade to StorageGRID 11.6, optimized read-only and read-write watermarks are automatically applied to all storage volumes, unless either of the following is true:

- Your system is close to capacity and would not be able to accept new data if optimized watermarks were applied. StorageGRID will not change watermark settings in this case.
- You previously set any of the storage volume watermarks to a custom value. StorageGRID will not override custom watermark settings with optimized values. However, StorageGRID might trigger the **Low read-only watermark override** alert if your custom value for the Storage Volume Soft Read-Only Watermark is too small.

Understand the alert

If you use custom values for storage volume watermarks, the **Low read-only watermark override** alert might be triggered for one or more Storage Nodes.

Each instance of the alert indicates that the custom value of the **Storage Volume Soft Read-Only Watermark** is smaller than the minimum optimized value for that Storage Node. If you continue to use the custom setting, the Storage Node might run critically low on space before it can safely transition to the read-only state. Some storage volumes might become inaccessible (automatically unmounted) when the node reaches capacity.

For example, suppose you previously set the **Storage Volume Soft Read-Only Watermark** to 5 GB. Now suppose that StorageGRID has calculated the following optimized values for the four storage volumes in Storage Node A:

Volume 0	12 GB
Volume 1	12 GB
Volume 2	11 GB
Volume 3	15 GB

The **Low read-only watermark override** alert is triggered for Storage Node A because your custom watermark (5 GB) is smaller than the minimum optimized value for all volumes in that node (11 GB). If you continue using the custom setting, the node might run critically low on space before it can safely transition to the read-only state.

Resolve the alert

Follow these steps if one or more **Low read-only watermark override** alerts have been triggered. You can also use these instructions if you currently use custom watermark settings and want to start using optimized settings even if no alerts have been triggered.

What you'll need

- You have completed the upgrade to StorageGRID 11.6.

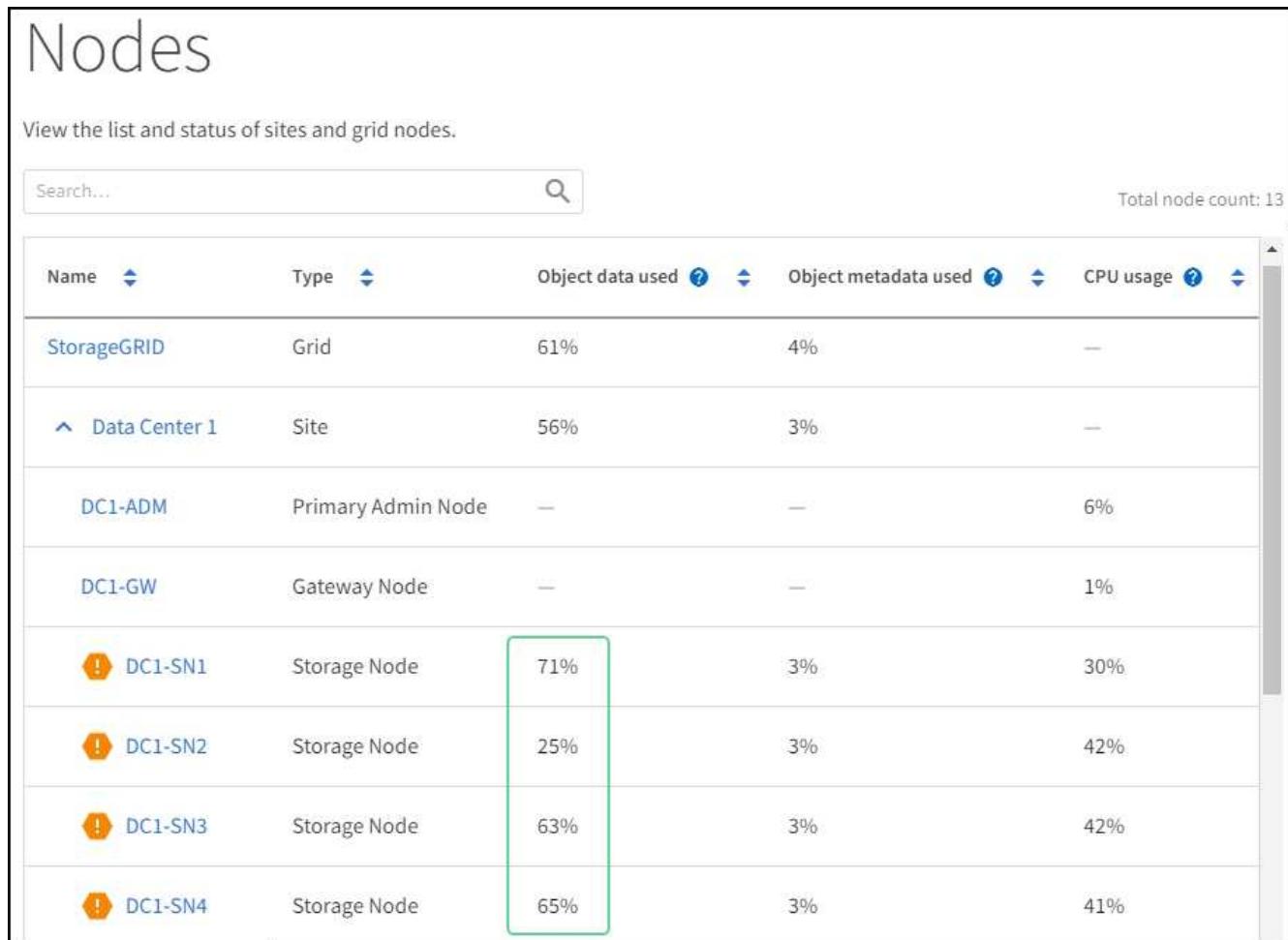
- You are signed in to the Grid Manager using a [supported web browser](#).
- You have the Root access permission.

About this task

You can resolve the **Low read-only watermark override** alert by updating custom watermark settings to the new watermark overrides. However, if one or more Storage Nodes are close to full or you have special ILM requirements, you should first view the optimized storage watermarks and determine if it is safe to use them.

Assess object data usage for entire grid

1. Select **NODES**.
2. For each site in the grid, expand the list of nodes.
3. Review the percentage values shown in the **Object data used** column for each Storage Node at every site.



The screenshot shows the 'Nodes' page in the Grid Manager. At the top, there's a search bar and a total node count of 13. Below is a table with columns: Name, Type, Object data used, Object metadata used, and CPU usage. The table lists nodes under 'Data Center 1': StorageGRID (Grid, 61%, 4%, —), DC1-ADM (Primary Admin Node, —, —, 6%), DC1-GW (Gateway Node, —, —, 1%), DC1-SN1 (Storage Node, 71%, 3%, 30%), DC1-SN2 (Storage Node, 25%, 3%, 42%), DC1-SN3 (Storage Node, 63%, 3%, 42%), and DC1-SN4 (Storage Node, 65%, 3%, 41%). The 'Object data used' column for DC1-SN1 is highlighted with a green border.

Name	Type	Object data used	Object metadata used	CPU usage
StorageGRID	Grid	61%	4%	—
▲ Data Center 1	Site	56%	3%	—
DC1-ADM	Primary Admin Node	—	—	6%
DC1-GW	Gateway Node	—	—	1%
⚠ DC1-SN1	Storage Node	71%	3%	30%
⚠ DC1-SN2	Storage Node	25%	3%	42%
⚠ DC1-SN3	Storage Node	63%	3%	42%
⚠ DC1-SN4	Storage Node	65%	3%	41%

4. If none of the Storage Nodes are close to full (for example, all **Object data used** values are less than 80%), you can start using the override settings. Go to [Use optimized watermarks](#).



There are some exceptions to this general rule. For example, if ILM rules use Strict ingest behavior or if specific storage pools are close to full, you should first perform the steps in [View optimized storage watermarks](#) and [Determine if you can use optimized watermarks](#).

5. If one or more Storage Nodes are close to full, perform the steps in [View optimized storage watermarks](#) and [Determine if you can use optimized watermarks](#).

View optimized storage watermarks

StorageGRID uses two Prometheus metrics to show the optimized values it has calculated for the **Storage Volume Soft Read-Only Watermark**. You can view the minimum and maximum optimized values for each Storage Node in your grid.

1. Select **SUPPORT > Tools > Metrics**.
2. In the Prometheus section, select the link to access the Prometheus user interface.
3. To see the recommended minimum soft read-only watermark, enter the following Prometheus metric, and select **Execute**:

```
storagegrid_storage_volume_minimum_optimized_soft_readonly_watermark
```

The last column shows the minimum optimized value of the Soft Read-Only Watermark for all storage volumes on each Storage Node. If this value is greater than the custom setting for the **Storage Volume Soft Read-Only Watermark**, the **Low read-only watermark override** alert is triggered for the Storage Node.

4. To see the recommended maximum soft read-only watermark, enter the following Prometheus metric, and select **Execute**:

```
storagegrid_storage_volume_maximum_optimized_soft_readonly_watermark
```

The last column shows the maximum optimized value of the Soft Read-Only Watermark for all storage volumes on each Storage Node.

5. Note the maximum optimized value for each Storage Node.

Determine if you can use optimized watermarks

1. Select **NODES**.
2. Repeat these steps for each online Storage Node:
 - a. Select **Storage Node > Storage**.
 - b. Scroll down to the Object Stores table.
 - c. Compare the **Available** value for each object store (volume) to the maximum optimized watermark you noted for that Storage Node.
3. If at least one volume on every online Storage Node has more space available than maximum optimized watermark for that node, go to [Use optimized watermarks](#) to start using the optimized watermarks.

Otherwise, [expand your grid](#) as soon as possible. Either add storage volumes to an existing node or add new Storage Nodes. Then, go to [Use optimized watermarks](#) to update watermark settings.

4. If you need to continue using custom values for the storage volume watermarks, [silence](#) or [disable](#) the **Low read-only watermark override** alert.



The same custom watermark values are applied to every storage volume on every Storage Node. Using smaller-than-recommended values for storage volume watermarks might cause some storage volumes to become inaccessible (automatically unmounted) when the node reaches capacity.

Use optimized watermarks

1. Go to **CONFIGURATION > System > Storage options**.
2. Select **Configuration** from the Storage Options menu.
3. Change all three Watermark Overrides to 0.
4. Select **Apply Changes**.

Optimized storage volume watermark settings are now in effect for each storage volume, based on the size of the Storage Node and the relative capacity of the volume.

The screenshot shows the 'Storage Options Overview' page. On the left, a sidebar has 'Overview' selected. The main area displays 'Object Segmentation' and 'Storage Watermarks' tables. A green box highlights the 'Storage Watermarks' table, specifically the rows for 'Storage Volume Read-Write Watermark Override', 'Storage Volume Soft Read-Only Watermark Override', and 'Storage Volume Hard Read-Only Watermark Override', which are all set to 0 B.

Description	Settings
Segmentation	Enabled
Maximum Segment Size	1 GB

Description	Settings
Storage Volume Read-Write Watermark Override	0 B
Storage Volume Soft Read-Only Watermark Override	0 B
Storage Volume Hard Read-Only Watermark Override	0 B
Metadata Reserved Space	3.000 GB

Description	Settings
CLB S3 Port	8082
CLB Swift Port	8083
LDR S3 Port	18082
LDR Swift Port	18083

Troubleshoot the Storage Status (SSTS) alarm

The Storage Status (SSTS) alarm is triggered if a Storage Node has insufficient free space remaining for object storage.

What you'll need

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

About this task

The SSTS (Storage Status) alarm is triggered at the Notice level when the amount of free space on every volume in a Storage Node falls below the value of the Storage Volume Soft Read Only Watermark (**CONFIGURATION > System > Storage options**).



Storage Options Overview

Updated: 2019-10-09 13:09:30 MDT

Object Segmentation

Description	Settings
Segmentation	Enabled
Maximum Segment Size	1 GB

Storage Watermarks

Description	Settings
Storage Volume Read-Write Watermark	30 GB
Storage Volume Soft Read-Only Watermark	10 GB
Storage Volume Hard Read-Only Watermark	5 GB
Metadata Reserved Space	3,000 GB

For example, suppose the Storage Volume Soft Read-Only Watermark is set to 10 GB, which is its default value. The SSTS alarm is triggered if less than 10 GB of usable space remains on each storage volume in the Storage Node. If any of the volumes has 10 GB or more of available space, the alarm is not triggered.

If an SSTS alarm has been triggered, you can follow these steps to better understand the issue.

Steps

1. Select **SUPPORT > Alarms (legacy) > Current alarms**.
2. From the Service column, select the data center, node, and service that are associated with the SSTS alarm.

The Grid Topology page appears. The Alarms tab shows the active alarms for the node and service you selected.



Alarms: LDR (DC1-S3-101-195) - Storage

Updated: 2019-10-09 12:52:43 MDT

Severity	Attribute	Description	Alarm Time	Trigger Value	Current Value	Acknowledge Time	Acknowledge
! Notice	SSTS (Storage Status)	Insufficient Free Space	2019-10-09 12:42:51 MDT	Insufficient Free Space	Insufficient Free Space		<input type="checkbox"/>
! Notice	SAVP (Total Usable Space (Percent))	Under 10 %	2019-10-09 12:43:21 MDT	7.95 %	7.95 %		<input type="checkbox"/>
✓ Normal	SHLH (Health)						<input type="checkbox"/>

Apply Changes

In this example, both the SSTS (Storage Status) and SAVP (Total Usable Space (Percent)) alarms have been triggered at the Notice level.



Typically, both the SSTS alarm and the SAVP alarm are triggered at about the same time; however, whether both alarms are triggered depends on the the watermark setting in GB and the SAVP alarm setting in percent.

- To determine how much usable space is actually available, select **LDR > Storage > Overview**, and find the Total Usable Space (STAS) attribute.

The screenshot shows the LDR Storage Overview page with the following data:

Attribute	Value	Status
Storage State - Desired	Online	OK
Storage State - Current	Read-only	Warning
Storage Status	Insufficient Free Space	Warning

Utilization

Total Space	164 GB	OK
Total Usable Space	19.6 GB	Warning
Total Usable Space (Percent)	11.937 %	OK
Total Data	139 GB	Warning
Total Data (Percent)	84.567 %	Warning

Replication

Block Reads	0	OK
Block Writes	2,279,881	Warning
Objects Retrieved	0	OK
Objects Committed	88,882	Warning
Objects Deleted	16	Warning
Delete Service State	Enabled	Warning

Object Store Volumes

ID	Total	Available	Replicated Data	EC Data	Stored (%)	Health
0000	54.7 GB	2.93 GB	46.2 GB	0 B	84.486 %	No Errors OK
0001	54.7 GB	8.32 GB	46.3 GB	0 B	84.644 %	No Errors OK
0002	54.7 GB	8.36 GB	46.3 GB	0 B	84.57 %	No Errors OK

In this example, only 19.6 GB of the 164 GB of space on this Storage Node remains available. Note that the total value is the sum of the **Available** values for the three object store volumes. The SSTS alarm was triggered because each of the three storage volumes had less than 10 GB of available space.

- To understand how storage has been used over time, select the **Reports** tab, and plot Total Usable Space over the last few hours.

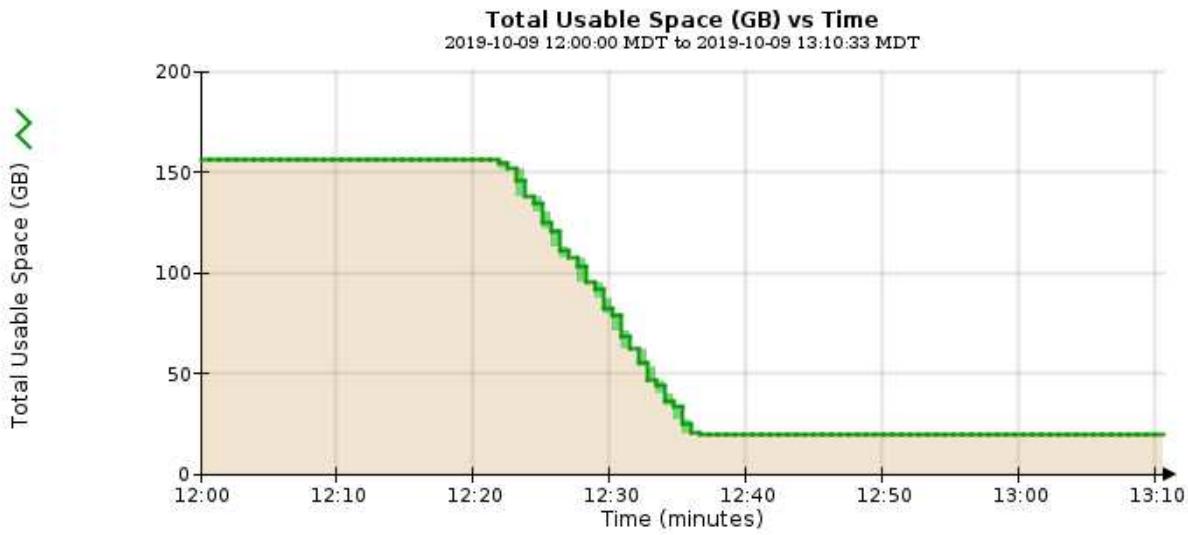
In this example, Total Usable Space dropped from roughly 155 GB at 12:00 to 20 GB at 12:35, which corresponds to the time at which the SSTS alarm was triggered.

Overview Alarms **Reports** Configuration

Charts Text

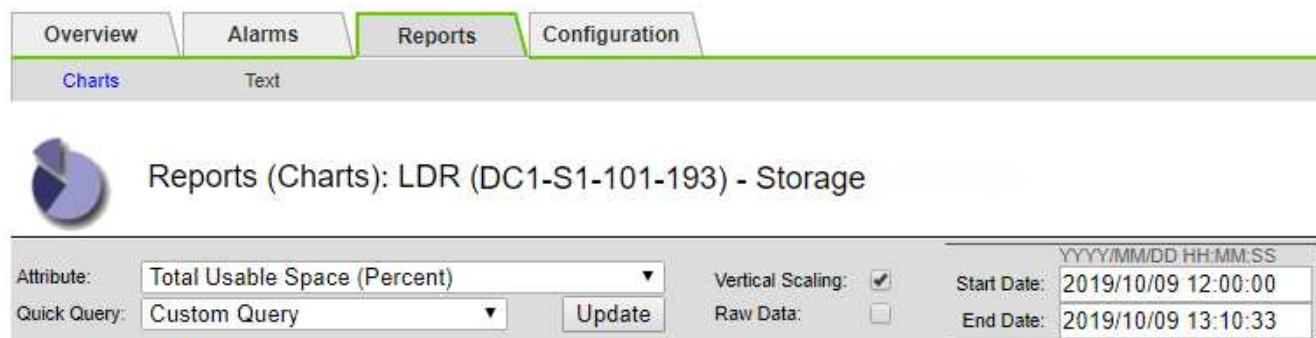
 Reports (Charts): LDR (DC1-S1-101-193) - Storage

Attribute:	Total Usable Space	Vertical Scaling:	<input checked="" type="checkbox"/>	Start Date:	YYYY/MM/DD HH:MM:SS 2019/10/09 12:00:00
Quick Query:	Custom Query	Update	<input type="checkbox"/>	Raw Data:	End Date: 2019/10/09 13:10:33



5. To understand how storage is being used as a percent of the total, plot Total Usable Space (Percent) over the last few hours.

In this example, the total usable space dropped from 95% to just over 10% at approximately the same time.



- As required, add storage capacity by [expanding the StorageGRID system](#).

For procedures on how to manage a full Storage Node, see the [instructions for administering StorageGRID](#).

Troubleshoot delivery of platform services messages (SMTT alarm)

The Total Events (SMTT) alarm is triggered in the Grid Manager if a platform service message is delivered to an destination that cannot accept the data.

About this task

For example, an S3 multipart upload can succeed even though the associated replication or notification message cannot be delivered to the configured endpoint. Or, a message for CloudMirror replication can fail to be delivered if the metadata is too long.

The SMTT alarm contains a Last Event message that says, Failed to publish notifications for *bucket-name object key* for the last object whose notification failed.

Event messages are also listed in the `/var/local/log/bycast-err.log` log file. See the [Log files reference](#).

For additional information about troubleshooting platform services, see the [instructions for administering StorageGRID](#). You might need to [access the tenant from the Tenant Manager](#) to debug a platform service error.

Steps

1. To view the alarm, select **NODES > site > grid node > Events**.

2. View Last Event at the top of the table.

Event messages are also listed in `/var/local/log/bycast-err.log`.

3. Follow the guidance provided in the SMTT alarm contents to correct the issue.

4. Select **Reset event counts**.

5. Notify the tenant of the objects whose platform services messages have not been delivered.

6. Instruct the tenant to trigger the failed replication or notification by updating the object's metadata or tags.

Troubleshoot metadata issues

You can perform several tasks to help determine the source of metadata problems.

Troubleshoot the Low metadata storage alert

If the **Low metadata storage** alert is triggered, you must add new Storage Nodes.

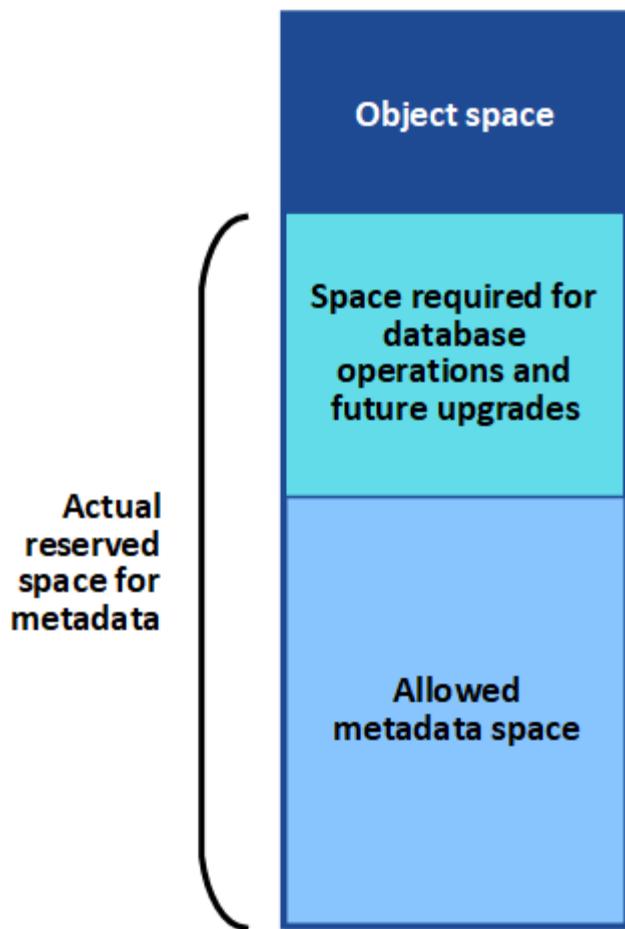
What you'll need

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

About this task

StorageGRID reserves a certain amount of space on volume 0 of each Storage Node for object metadata. This space is known as the actual reserved space, and it is subdivided into the space allowed for object metadata (the allowed metadata space) and the space required for essential database operations, such as compaction and repair. The allowed metadata space governs overall object capacity.

Volume 0



If object metadata consumes more than 100% of the space allowed for metadata, database operations cannot run efficiently and errors will occur.

You can [monitor object metadata capacity for each Storage Node](#) to help you anticipate errors and correct them before they occur.

StorageGRID uses the following Prometheus metric to measure how full the allowed metadata space is:

```
storagegrid_storage_utilization_metadata_bytes/storagegrid_storage_utilization_metadata_allowed_bytes
```

When this Prometheus expression reaches certain thresholds, the **Low metadata storage** alert is triggered.

- **Minor:** Object metadata is using 70% or more of the allowed metadata space. You should add new Storage Nodes as soon as possible.
- **Major:** Object metadata is using 90% or more of the allowed metadata space. You must add new Storage Nodes immediately.



When object metadata is using 90% or more of the allowed metadata space, a warning appears on the Dashboard. If this warning appears, you must add new Storage Nodes immediately. You must never allow object metadata to use more than 100% of the allowed space.

- **Critical:** Object metadata is using 100% or more of the allowed metadata space and is starting to consume the space required for essential database operations. You must stop the ingest of new objects, and you must add new Storage Nodes immediately.

In the following example, object metadata is using more than 100% of the allowed metadata space. This is a critical situation, which will result in inefficient database operation and errors.

The following Storage Nodes are using more than 90% of the space allowed for object metadata:

Node	% Used	Used	Allowed
DC1-S2-227	104.51%	6.73 GB	6.44 GB
DC1-S3-228	104.36%	6.72 GB	6.44 GB
DC2-S2-233	104.20%	6.71 GB	6.44 GB
DC1-S1-226	104.20%	6.71 GB	6.44 GB
DC2-S3-234	103.43%	6.66 GB	6.44 GB

Undesirable results can occur if object metadata uses more than 100% of the allowed space. You must add new Storage Nodes immediately or contact support.

 If the size of volume 0 is smaller than the Metadata Reserved Space storage option (for example, in a non-production environment), the calculation for the **Low metadata storage** alert might be inaccurate.

Steps

1. Select **ALERTS > Current**.
2. From the table of alerts, expand the **Low metadata storage** alert group, if required, and select the specific alert you want to view.
3. Review the details in the alert dialog box.
4. If a major or critical **Low metadata storage** alert has been triggered, perform an expansion to add Storage Nodes immediately.



Because StorageGRID keeps complete copies of all object metadata at each site, the metadata capacity of the entire grid is limited by the metadata capacity of the smallest site. If you need to add metadata capacity to one site, you should also [expand any other sites](#) by the same number of Storage Nodes.

After you perform the expansion, StorageGRID redistributes the existing object metadata to the new nodes, which increases the overall metadata capacity of the grid. No user action is required. The **Low metadata storage** alert is cleared.

Troubleshoot the Services: Status - Cassandra (SVST) alarm

The Services: Status - Cassandra (SVST) alarm indicates that you might need to rebuild the Cassandra database for a Storage Node. Cassandra is used as the metadata store for StorageGRID.

What you'll need

- You must be signed in to the Grid Manager using a [supported web browser](#).
- You must have specific access permissions.
- You must have the `Passwords.txt` file.

About this task

If Cassandra is stopped for more than 15 days (for example, the Storage Node is powered off), Cassandra will not start when the node is brought back online. You must rebuild the Cassandra database for the affected DDS

service.

You can [run diagnostics](#) to obtain additional information on the current state of your grid.



If two or more of the Cassandra database services are down for more than 15 days, contact technical support, and do not proceed with the steps below.

Steps

1. Select **SUPPORT > Tools > Grid topology**.
2. Select **Site > Storage Node > SSM > Services > Alarms > Main** to display alarms.

This example shows that the SVST alarm was triggered.

The screenshot shows the 'Alarms' tab selected in the top navigation bar. Below it, a sub-navigation bar has 'Main' highlighted. The main content area displays a table titled 'Alarms: SSM (DC1-S3) - Services' with one entry:

Severity Attribute	Description	Alarm Time	Trigger Value	Current Value	Acknowledge Time	Acknowledge
Minor SVST (Services: Status - Cassandra)	Not Running	2014-08-14 14:56:28 PDT	Not Running	Not Running		<input type="checkbox"/>

The SSM Services Main page also indicates that Cassandra is not running.

The screenshot shows the 'Overview' tab selected in the top navigation bar. Below it, a sub-navigation bar has 'Main' highlighted. The main content area displays a table titled 'Overview: SSM (DC2-S1) - Services' with one entry:

Operating System:	Linux 3.16.0-4-amd64				
Services					
Service	Version	Status	Threads	Load	Memory
Account Service	10.4.0-20161224.0333.803cd91	Running		7	0.002 %
Administrative Domain Controller (ADC)	10.4.0-20170329.0039.8800cae	Running		52	0.14 %
Cassandra	4.6.12-1.byc.0-20170308.0109.ba3598a	Not Running		0	0 %
Content Management System (CMS)	10.4.0-20170220.1846.1a76aed	Running		18	0.055 %
Distributed Data Store (DDS)	10.4.0-20170329.0039.8800cae	Running		104	1.301 %
Identity Service	10.4.0-20170203.2038.a457d45	Running		6	0 %
Keystone Service	10.4.0-20170104.1815.6e52138	Running		5	0 %
Local Distribution Router (LDR)	10.4.0-20170329.0039.8800cae	Running		109	0.218 %
Server Manager	10.4.0-20170306.2303.9649faf	Running		4	3.58 %

3. Try restarting Cassandra from the Storage Node:

- a. Log in to the grid node:
 - i. Enter the following command: `ssh admin@grid_node_IP`

- ii. Enter the password listed in the `Passwords.txt` file.
 - iii. Enter the following command to switch to root: `su -`
 - iv. Enter the password listed in the `Passwords.txt` file. When you are logged in as root, the prompt changes from `$` to `#`.
- b. Enter: `/etc/init.d/cassandra status`
- c. If Cassandra is not running, restart it: `/etc/init.d/cassandra restart`
4. If Cassandra does not restart, determine how long Cassandra has been down. If Cassandra has been down for longer than 15 days, you must rebuild the Cassandra database.

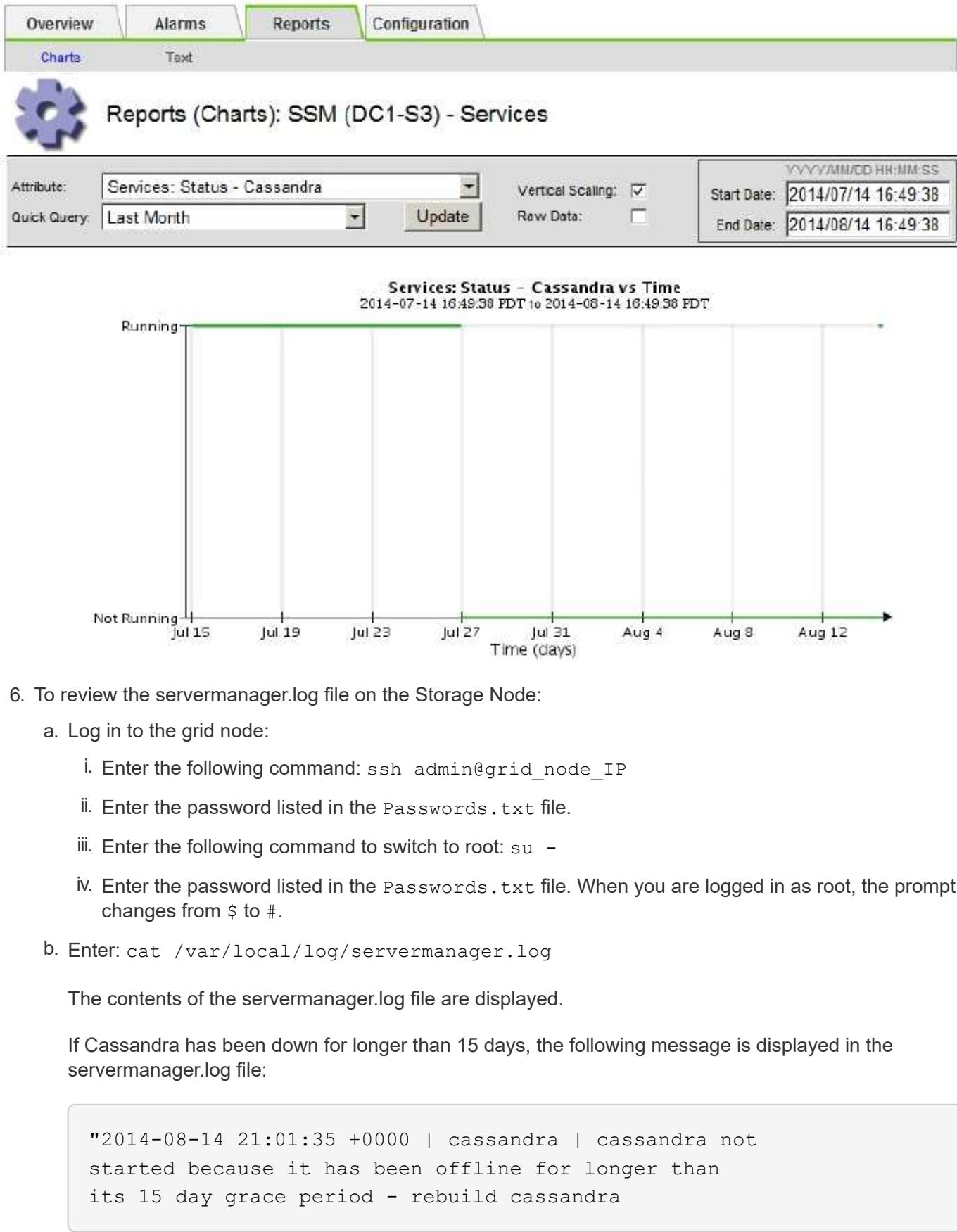


If two or more of the Cassandra database services are down, contact technical support, and do not proceed with the steps below.

You can determine how long Cassandra has been down by charting it or by reviewing the `servermanager.log` file.

5. To chart Cassandra:
- a. Select **SUPPORT > Tools > Grid topology**. Then select **Site > Storage Node > SSM > Services > Reports > Charts**.
 - b. Select **Attribute > Service: Status - Cassandra**.
 - c. For **Start Date**, enter a date that is at least 16 days before the current date. For **End Date**, enter the current date.
 - d. Click **Update**.
 - e. If the chart shows Cassandra as being down for more than 15 days, rebuild the Cassandra database.

The following chart example shows that Cassandra has been down for at least 17 days.



- Make sure the timestamp of this message is the time when you attempted restarting Cassandra as instructed in step [Restart Cassandra from the Storage Node](#).

There can be more than one entry for Cassandra; you must locate the most recent entry.

- d. If Cassandra has been down for longer than 15 days, you must rebuild the Cassandra database.
For instructions, see [Recover Storage Node down more than 15 days](#).
- e. Contact technical support if alarms do not clear after Cassandra is rebuilt.

Troubleshoot Cassandra Out of Memory errors (SMTT alarm)

A Total Events (SMTT) alarm is triggered when the Cassandra database has an out-of-memory error. If this error occurs, contact technical support to work through the issue.

About this task

If an out-of-memory error occurs for the Cassandra database, a heap dump is created, a Total Events (SMTT) alarm is triggered, and the Cassandra Heap Out Of Memory Errors count is incremented by one.

Steps

1. To view the event, select **SUPPORT > Tools > Grid topology > Configuration**.
2. Verify that the Cassandra Heap Out Of Memory Errors count is 1 or greater.

You can [run diagnostics](#) to obtain additional information on the current state of your grid.

3. Go to `/var/local/core/`, compress the `Cassandra.hprof` file, and send it to technical support.
4. Make a backup of the `Cassandra.hprof` file, and delete it from the `/var/local/core/` directory.

This file can be as large as 24 GB, so you should remove it to free up space.

5. After the issue is resolved, select the **Reset** check box for the Cassandra Heap Out Of Memory Errors count. Then select **Apply Changes**.



To reset event counts, you must have the Grid Topology Page Configuration permission.

Troubleshoot certificate errors

If you see a security or certificate issue when you try to connect to StorageGRID using a web browser, an S3 or Swift client, or an external monitoring tool, you should check the certificate.

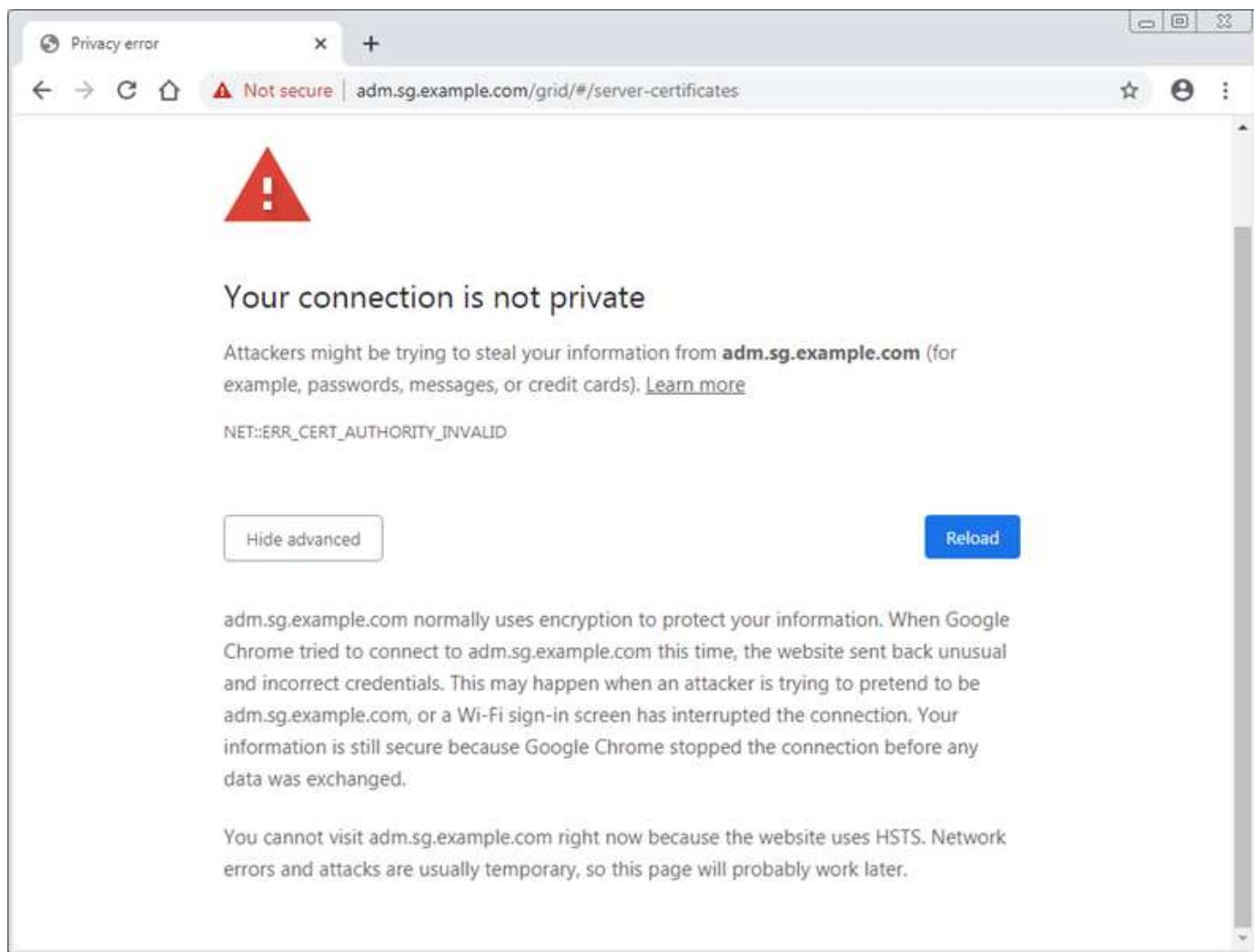
About this task

Certificate errors can cause problems when you try to connect to StorageGRID using the Grid Manager, Grid Management API, Tenant Manager, or the Tenant Management API. Certificate errors can also occur when you try to connect with an S3 or Swift client or external monitoring tool.

If you are accessing the Grid Manager or Tenant Manager using a domain name instead of an IP address, the browser shows a certificate error without an option to bypass if either of the following occurs:

- Your custom management interface certificate expires.
- You revert from a custom management interface certificate to the default server certificate.

The following example shows a certificate error when the custom management interface certificate expired:



To ensure that operations are not disrupted by a failed server certificate, the **Expiration of server certificate for Management Interface** alert is triggered when the server certificate is about to expire.

When you are using client certificates for external Prometheus integration, certificate errors can be caused by the StorageGRID management interface certificate or by client certificates. The **Expiration of client certificates configured on the Certificates page** alert is triggered when a client certificate is about to expire.

Steps

If you received an alert notification about an expired certificate, access the certificate details: . Select **CONFIGURATION > Security > Certificates** and then [select the appropriate certificate tab](#).

1. Check the validity period of the certificate.
Some web browsers and S3 or Swift clients do not accept certificates with a validity period greater than 398 days.
2. If the certificate has expired or will expire soon, upload or generate a new certificate.
 - For a server certificate, see the steps for [configuring a custom server certificate for the Grid Manager and the Tenant Manager](#).
 - For a client certificate, see the steps for [configuring a client certificate](#).
3. For server certificate errors, try either or both of the following options:
 - Ensure that the Subject Alternative Name (SAN) of the certificate is populated, and that the SAN matches the IP address or host name of the node that you are connecting to.

- If you are attempting to connect to StorageGRID using a domain name:
 - i. Enter the IP address of the Admin Node instead of the domain name to bypass the connection error and access the Grid Manager.
 - ii. From the Grid Manager, select **CONFIGURATION > Security > Certificates** and then [select the appropriate certificate tab](#) to install a new custom certificate or continue with the default certificate.
 - iii. In the instructions for administering StorageGRID, see the steps for [configuring a custom server certificate for the Grid Manager and the Tenant Manager](#).

Troubleshoot Admin Node and user interface issues

There are several tasks you can perform to help determine the source of issues related to Admin Nodes and the StorageGRID user interface.

Troubleshoot sign-on errors

If you experience an error when you are signing in to a StorageGRID Admin Node, your system might have an issue with the identity federation configuration, a networking or hardware problem, an issue with Admin Node services, or an issue with the Cassandra database on connected Storage Nodes.

What you'll need

- You must have the `Passwords.txt` file.
- You must have specific access permissions.

About this task

Use these troubleshooting guidelines if you see any of the following error messages when attempting to sign in to an Admin Node:

- Your credentials for this account were invalid. Please try again.
- Waiting for services to start...
- Internal server error. The server encountered an error and could not complete your request. Please try again. If the problem persists, contact Technical Support.
- Unable to communicate with server. Reloading page...

Steps

1. Wait 10 minutes, and try signing in again.

If the error is not resolved automatically, go to the next step.

2. If your StorageGRID system has more than one Admin Node, try signing in to the Grid Manager from another Admin Node.
 - If you are able to sign in, you can use the **Dashboard**, **NODES**, **Alerts**, and **SUPPORT** options to help determine the cause of the error.
 - If you have only one Admin Node or you still cannot sign in, go to the next step.
3. Determine if the node's hardware is offline.
4. If single sign-on (SSO) is enabled for your StorageGRID system, refer to the steps for configuring single sign-on, in the instructions for administering StorageGRID.

You might need to temporarily disable and re-enable SSO for a single Admin Node to resolve any issues.



If SSO is enabled, you cannot sign on using a restricted port. You must use port 443.

5. Determine if the account you are using belongs to a federated user.

If the federated user account is not working, try signing in to the Grid Manager as a local user, such as root.

- If the local user can sign in:
 - i. Review any displayed alarms.
 - ii. Select **CONFIGURATION > Access Control > Identity federation**.
 - iii. Click **Test Connection** to validate your connection settings for the LDAP server.
 - iv. If the test fails, resolve any configuration errors.
- If the local user cannot sign in and you are confident that the credentials are correct, go to the next step.

6. Use Secure Shell (ssh) to log in to the Admin Node:

- a. Enter the following command: `ssh admin@Admin_Node_IP`
- b. Enter the password listed in the `Passwords.txt` file.
- c. Enter the following command to switch to root: `su -`
- d. Enter the password listed in the `Passwords.txt` file.

When you are logged in as root, the prompt changes from \$ to #.

7. View the status of all services running on the grid node: `storagegrid-status`

Make sure the nms, mi, nginx, and mgmt api services are all running.

The output is updated immediately if the status of a service changes.

```
$ storagegrid-status
Host Name           99-211
IP Address          10.96.99.211
Operating System Kernel 4.19.0      Verified
Operating System Environment Debian 10.1  Verified
StorageGRID Webscale Release   11.4.0      Verified
Networking          Verified
Storage Subsystem    Verified
Database Engine     5.5.9999+default Running
Network Monitoring  11.4.0      Running
Time Synchronization 1:4.2.8p10+dfsg Running
ams                11.4.0      Running
cmn                11.4.0      Running
nms                11.4.0      Running
ssm                11.4.0      Running
mi                 11.4.0      Running
dynip              11.4.0      Running
nginx              1.10.3      Running
tomcat             9.0.27      Running
grafana            6.4.3       Running
mgmt api           11.4.0      Running
prometheus         11.4.0      Running
persistence         11.4.0      Running
ade exporter        11.4.0      Running
alertmanager        11.4.0      Running
attrDownPurge       11.4.0      Running
attrDownSamp1       11.4.0      Running
attrDownSamp2       11.4.0      Running
node exporter       0.17.0+ds  Running
sg snmp agent       11.4.0      Running
```

8. Confirm that the nginx-gw service is running # service nginx-gw status
9. Use Lumberjack to collect logs: # /usr/local/sbin/lumberjack.rb

If the failed authentication happened in the past, you can use the --start and --end Lumberjack script options to specify the appropriate time range. Use lumberjack -h for details on these options.

The output to the terminal indicates where the log archive has been copied.

10. Review the following logs:

- /var/local/log/bycast.log
- /var/local/log/bycast-err.log
- /var/local/log/nms.log
- **/*commands.txt

11. If you could not identify any issues with the Admin Node, issue either of the following commands to determine the IP addresses of the three Storage Nodes that run the ADC service at your site. Typically, these are the first three Storage Nodes that were installed at the site.

```
# cat /etc/hosts
```

```
# vi /var/local/gpt-data/specs/grid.xml
```

Admin Nodes use the ADC service during the authentication process.

12. From the Admin Node, log in to each of the ADC Storage Nodes, using the IP addresses you identified.
- Enter the following command: `ssh admin@grid_node_IP`
 - Enter the password listed in the `Passwords.txt` file.
 - Enter the following command to switch to root: `su -`
 - Enter the password listed in the `Passwords.txt` file.

When you are logged in as root, the prompt changes from `$` to `#`.

13. View the status of all services running on the grid node: `storagegrid-status`

Make sure the idnt, acct, nginx, and cassandra services are all running.

14. Repeat steps [Use Lumberjack to collect logs](#) and [Review logs](#) to review the logs on the Storage Nodes.
15. If you are unable to resolve the issue, contact technical support.

Provide the logs you collected to technical support. See also [Log files reference](#).

Troubleshoot user interface issues

You might see issues with the Grid Manager or the Tenant Manager after upgrading to a new version of StorageGRID software.

Web interface does not respond as expected

The Grid Manager or the Tenant Manager might not respond as expected after StorageGRID software is upgraded.

If you experience issues with the web interface:

- Make sure you are using a [supported web browser](#).



Browser support has changed for StorageGRID 11.5. Confirm you are using a supported version.

- Clear your web browser cache.

Clearing the cache removes outdated resources used by the previous version of StorageGRID software,

and permits the user interface to operate correctly again. For instructions, see the documentation for your web browser.

Check the status of an unavailable Admin Node

If the StorageGRID system includes multiple Admin Nodes, you can use another Admin Node to check the status of an unavailable Admin Node.

What you'll need

You must have specific access permissions.

Steps

1. From an available Admin Node, sign in to the Grid Manager using a [supported web browser](#).
2. Select **SUPPORT > Tools > Grid topology**.
3. Select **Site > unavailable Admin Node > SSM > Services > Overview > Main**.
4. Look for services that have a status of Not Running and that might also be displayed in blue.

The screenshot shows the 'Services' overview for an unavailable Admin Node. The top navigation bar has tabs for Overview, Alarms, Reports, and Configuration, with 'Overview' being the active tab. Below the tabs, there's a sub-navigation bar with 'Main' selected. The main content area has a title 'Overview: SSM (MM-10-224-4-81-ADM1) - Services' and a subtitle 'Updated: 2017-01-27 11:52:51 EST'. On the left is a gear icon. The table below lists various services with their details:

Service	Version	Status	Threads	Load	Memory
Audit Management System (AMS)	10.4.0-20170113.2207.3ec2cd0	Running	52	0.043 %	35.7 MB
CIFS Filesharing (nmbd)	2:4.2.14+dfsg-0+deb8u2	Running	1	0 %	5.5 MB
CIFS Filesharing (smbd)	2:4.2.14+dfsg-0+deb8u2	Running	1	0 %	14.5 MB
CIFS Filesharing (winbindd)	2:4.2.14+dfsg-0+deb8u2	Not Running	0	0 %	0 B
Configuration Management Node (CMN)	10.4.0-20170113.2207.3ec2cd0	Running	52	0.055 %	41.3 MB
Database Engine	5.5.53-0+deb8u1	Running	47	0.354 %	1.33 GB
Grid Deployment Utility Server	10.4.0-20170112.2125.r4253hb	Running	3	0 %	32.8 MB
Management Application Program Interface (mgmt-api)	10.4.0-20170113.2136.07c4997	Not Running	0	0 %	0 B
NFS Filesharing	10.4.0-20161224.0333.803cd91	Not Running	0	0 %	0 B
NMS Data Cleanup	10.4.0-20161224.0333.803cd91	Running	22	0.008 %	52.4 MB
NMS Data Downampler 1	10.4.0-20161224.0333.803cd91	Running	22	0.049 %	195 MB
NMS Data Downampler 2	10.4.0-20161224.0333.803cd91	Running	22	0.009 %	157 MB
NMS Processing Engine	10.4.0-20161224.0333.803cd91	Running	40	0.132 %	200 MB

5. Determine if alarms have been triggered.

- Take the appropriate actions to resolve the issue.

Related information

[Administer StorageGRID](#)

Troubleshoot network, hardware, and platform issues

There are several tasks you can perform to help determine the source of issues related to StorageGRID network, hardware, and platform issues.

Troubleshoot “422: Unprocessable Entity” errors

The error 422: Unprocessable Entity can occur in a number of circumstances. Check the error message to determine what caused your issue.

If you see one of the listed error messages, take the recommended action.

Error message	Root cause and corrective action
<p>422: Unprocessable Entity</p> <p>Validation failed. Please check the values you entered for errors. Test connection failed. Please verify your configuration. Unable to authenticate, please verify your username and password:</p> <p>LDAP Result Code 8 "Strong Auth Required": 00002028:</p> <p>LdapErr: DSID-0C090256, comment: The server requires binds to turn on integrity checking if SSL\TLS are not already active on the connection, data 0, v3839</p>	<p>This message might occur if you select the Do not use TLS option for Transport Layer Security (TLS) when configuring identity federation using Windows Active Directory (AD).</p> <p>Using the Do not use TLS option is not supported for use with AD servers that enforce LDAP signing. You must select either the Use STARTTLS option or the Use LDAPS option for TLS.</p>

Error message	Root cause and corrective action
<pre>422: Unprocessable Entity Validation failed. Please check the values you entered for errors. Test connection failed. Please verify your configuration. Unable to begin TLS, verify your certificate and TLS configuration: LDAP Result Code 200 "Network Error": TLS handshake failed (EOF)</pre>	<p>This message appears if you try to use an unsupported cipher to make a Transport Layer Security (TLS) connection from StorageGRID to an external system used for identify federation or Cloud Storage Pools.</p> <p>Check the ciphers that are offered by the external system. The system must use one of the ciphers supported by StorageGRID for outgoing TLS connections, as shown in the instructions for administering StorageGRID.</p>

Related information

[Administer StorageGRID](#)

Troubleshoot the Grid Network MTU mismatch alert

The **Grid Network MTU mismatch** alert is triggered when the maximum transmission unit (MTU) setting for the Grid Network interface (eth0) differs significantly across nodes in the grid.

About this task

The differences in MTU settings could indicate that some, but not all, eth0 networks are configured for jumbo frames. An MTU size mismatch of greater than 1000 might cause network performance problems.

Steps

1. List the MTU settings for eth0 on all nodes.
 - Use the query provided in the Grid Manager.
 - Navigate to *primary Admin Node IP address/metrics/graph* and enter the following query:
`node_network_mtu_bytes{interface='eth0'}`
2. Modify the MTU settings as necessary to ensure they are the same for the Grid Network interface (eth0) on all nodes.
 - For appliance nodes, see the installation and maintenance instructions for your appliance.
 - For Linux- and VMware-based nodes, use the following command: `/usr/sbin/change-ip.py [-h] [-n node] mtu network [network...]`

Example: `change-ip.py -n node 1500 grid admin`

Note: On Linux-based nodes, if the desired MTU value for the network in the container exceeds the value already configured on the host interface, you must first configure the host interface to have the desired MTU value, and then use the `change-ip.py` script to change the MTU value of the network in the container.

Use the following arguments for modifying the MTU on Linux- or VMware-based nodes.

Positional arguments	Description
mtu	The MTU to set. Must be in the range 1280 to 9216.
network	The networks to apply the MTU to. Include one or more of the following network types: <ul style="list-style-type: none">• grid• admin• client

Optional arguments	Description
-h, --help	Show the help message and exit.
-n node, --node node	The node. The default is the local node.

Related information

[SG100 and SG1000 services appliances](#)

[SG6000 storage appliances](#)

[SG5700 storage appliances](#)

[SG5600 storage appliances](#)

Troubleshoot the Network Receive Error (NRER) alarm

Network Receive Error (NRER) alarms can be caused by connectivity issues between StorageGRID and your network hardware. In some cases, NRER errors can clear without manual intervention. If the errors do not clear, take the recommended actions.

About this task

NRER alarms can be caused by the following issues with networking hardware that connects to StorageGRID:

- Forward error correction (FEC) is required and not in use
- Switch port and NIC MTU mismatch
- High link error rates
- NIC ring buffer overrun

Steps

1. Follow the troubleshooting steps for all potential causes of the NRER alarm given your network configuration.
 - If the error is caused by FEC mismatch, perform the following steps:

Note: These steps are applicable only for NRER errors caused by FEC mismatch on StorageGRID appliances.

- i. Check the FEC status of the port in the switch attached to your StorageGRID appliance.
- ii. Check the physical integrity of the cables from the appliance to the switch.
- iii. If you want to change FEC settings to try to resolve the NRER alarm, first ensure that the appliance is configured for **Auto** mode on the Link Configuration page of the StorageGRID Appliance Installer (see the installation and maintenance instructions for your appliance). Then, change the FEC settings on the switch ports. The StorageGRID appliance ports will adjust their FEC settings to match, if possible.

(You cannot configure FEC settings on StorageGRID appliances. Instead, the appliances attempt to discover and mirror the FEC settings on the switch ports they are connected to. If the links are forced to 25-GbE or 100-GbE network speeds, the switch and NIC might fail to negotiate a common FEC setting. Without a common FEC setting, the network will fall back to “no-FEC” mode. When FEC is not enabled, the connections are more susceptible to errors caused by electrical noise.)

Note: StorageGRID appliances support Firecode (FC) and Reed Solomon (RS) FEC, as well as no FEC.

- If the error is caused by a switch port and NIC MTU mismatch, check that the MTU size configured on the node is the same as the MTU setting for the switch port.

The MTU size configured on the node might be smaller than the setting on the switch port the node is connected to. If a StorageGRID node receives an Ethernet frame larger than its MTU, which is possible with this configuration, the NRER alarm might be reported. If you believe this is what is happening, either change the MTU of the switch port to match the StorageGRID network interface MTU, or change the MTU of the StorageGRID network interface to match the switch port, depending on your end-to-end MTU goals or requirements.



For the best network performance, all nodes should be configured with similar MTU values on their Grid Network interfaces. The **Grid Network MTU mismatch** alert is triggered if there is a significant difference in MTU settings for the Grid Network on individual nodes. The MTU values do not have to be the same for all network types.



To change the MTU setting, see the installation and maintenance guide for your appliance.

- If the error is caused by high link error rates, perform the following steps:
 - i. Enable FEC, if not already enabled.
 - ii. Verify that your network cabling is of good quality and is not damaged or improperly connected.
 - iii. If the cables do not appear to be the problem, contact technical support.



You might notice high error rates in an environment with high electrical noise.

- If the error is a NIC ring buffer overrun, contact technical support.

The ring buffer can be overrun when the StorageGRID system is overloaded and unable to process network events in a timely manner.

2. After you resolve the underlying problem, reset the error counter.

- a. Select **SUPPORT > Tools > Grid topology**.
- b. Select **site > grid node > SSM > Resources > Configuration > Main**.
- c. Select **Reset Receive Error Count** and click **Apply Changes**.

Related information

[Troubleshoot the Grid Network MTU mismatch alert](#)

[Alarms reference \(legacy system\)](#)

[SG6000 storage appliances](#)

[SG5700 storage appliances](#)

[SG5600 storage appliances](#)

[SG100 and SG1000 services appliances](#)

Troubleshoot time synchronization errors

You might see issues with time synchronization in your grid.

If you encounter time synchronization problems, verify that you have specified at least four external NTP sources, each providing a Stratum 3 or better reference, and that all external NTP sources are operating normally and are accessible by your StorageGRID nodes.

 When specifying the external NTP source for a production-level StorageGRID installation, do not use the Windows Time (W32Time) service on a version of Windows earlier than Windows Server 2016. The time service on earlier versions of Windows is not sufficiently accurate and is not supported by Microsoft for use in high-accuracy environments, such as StorageGRID.

Related information

[Recover and maintain](#)

Linux: Network connectivity issues

You might see issues with network connectivity for StorageGRID grid nodes hosted on Linux hosts.

MAC address cloning

In some cases, network issues can be resolved by using MAC address cloning. If you are using virtual hosts, set the value of the MAC address cloning key for each of your networks to "true" in your node configuration file. This setting causes the MAC address of the StorageGRID container to use the MAC address of the host. To create node configuration files, see the instructions in the installation guide for your platform.

 Create separate virtual network interfaces for use by the Linux host OS. Using the same network interfaces for the Linux host OS and the StorageGRID container might cause the host OS to become unreachable if promiscuous mode has not been enabled on the hypervisor.

For more information on enabling MAC cloning, see the instructions in the installation guide for your platform.

Promiscuous mode

If you do not want to use MAC address cloning and would rather allow all interfaces to receive and transmit data for MAC addresses other than the ones assigned by the hypervisor, ensure that the security properties at the virtual switch and port group levels are set to **Accept** for Promiscuous Mode, MAC Address Changes, and Forged Transmits. The values set on the virtual switch can be overridden by the values at the port group level, so ensure that settings are the same in both places.

Related information

[Install Red Hat Enterprise Linux or CentOS](#)

[Install Ubuntu or Debian](#)

Linux: Node status is “orphaned”

A Linux node in an orphaned state usually indicates that either the storagegrid service or the StorageGRID node daemon controlling the node’s container died unexpectedly.

About this task

If a Linux node reports that it is in an orphaned state, you should:

- Check logs for errors and messages.
- Attempt to start the node again.
- If necessary, use container engine commands to stop the existing node container.
- Restart the node.

Steps

1. Check logs for both the service daemon and the orphaned node for obvious errors or messages about exiting unexpectedly.
2. Log in to the host as root or using an account with sudo permission.
3. Attempt to start the node again by running the following command: `$ sudo storagegrid node start node-name`

```
$ sudo storagegrid node start DC1-S1-172-16-1-172
```

If the node is orphaned, the response is

```
Not starting ORPHANED node DC1-S1-172-16-1-172
```

4. From Linux, stop the container engine and any controlling storagegrid-node processes. For example:`sudo docker stop --time secondscontainer-name`

For seconds, enter the number of seconds you want to wait for the container to stop (typically 15 minutes or less). For example:

```
sudo docker stop --time 900 storagegrid-DC1-S1-172-16-1-172
```

5. Restart the node: `storagegrid node start node-name`

```
storagegrid node start DC1-S1-172-16-1-172
```

Linux: Troubleshoot IPv6 support

You might need to enable IPv6 support in the kernel if you have installed StorageGRID nodes on Linux hosts and you notice that IPv6 addresses have not been assigned to the node containers as expected.

About this task

You can see the IPv6 address that has been assigned to a grid node in the following locations in the Grid Manager:

- Select **NODES**, and select the node. Then, select **Show more** next to **IP Addresses** on the Overview tab.

The screenshot shows the Storage Node overview for DC1-S2. In the IP Addresses section, the IPv6 address fd20:328:328:0:250:56ff:fe87:b532 is highlighted with a green border, indicating it is the assigned IPv6 address for the Grid Network interface.

Interface	IP address
eth0 (Grid Network)	172.16.1.227
eth0 (Grid Network)	fd20:328:328:0:250:56ff:fe87:b532
eth1 (Admin Network)	10.224.1.227

- Select **SUPPORT > Tools > Grid topology**. Then, select **node > SSM > Resources**. If an IPv6 address has been assigned, it is listed below the IPv4 address in the **Network Addresses** section.

If the IPv6 address is not shown and the node is installed on a Linux host, follow these steps to enable IPv6 support in the kernel.

Steps

1. Log in to the host as root or using an account with sudo permission.

2. Run the following command: `sysctl net.ipv6.conf.all.disable_ipv6`

```
root@SG:~ # sysctl net.ipv6.conf.all.disable_ipv6
```

The result should be 0.

```
net.ipv6.conf.all.disable_ipv6 = 0
```



If the result is not 0, see the documentation for your operating system for changing `sysctl` settings. Then, change the value to 0 before continuing.

3. Enter the StorageGRID node container: `storagegrid node enter node-name`

4. Run the following command: `sysctl net.ipv6.conf.all.disable_ipv6`

```
root@DC1-S1:~ # sysctl net.ipv6.conf.all.disable_ipv6
```

The result should be 1.

```
net.ipv6.conf.all.disable_ipv6 = 1
```



If the result is not 1, this procedure does not apply. Contact technical support.

5. Exit the container: `exit`

```
root@DC1-S1:~ # exit
```

6. As root, edit the following file: `/var/lib/storagegrid/settings/sysctl.d/net.conf`.

```
sudo vi /var/lib/storagegrid/settings/sysctl.d/net.conf
```

7. Locate the following two lines and remove the comment tags. Then, save and close the file.

```
net.ipv6.conf.all.disable_ipv6 = 0
```

```
net.ipv6.conf.default.disable_ipv6 = 0
```

8. Run these commands to restart the StorageGRID container:

```
storagegrid node stop node-name
```

```
storagegrid node start node-name
```

Troubleshoot an external syslog server

The following table describes external syslog server error messages and lists corrective actions.

Error message	Description and recommended actions
Cannot resolve hostname	<p>The FQDN you entered for the syslog server could not be resolved to an IP address.</p> <ol style="list-style-type: none"><li data-bbox="605 734 1432 830">1. Check the hostname you entered. If you entered an IP address, make sure it is a valid IP address in W.X.Y.Z (“dotted decimal”) notation.<li data-bbox="605 846 1302 880">2. Check that the DNS servers are configured correctly.<li data-bbox="605 897 1460 950">3. Confirm that each node can access the IP addresses for the DNS server.
Connection refused	<p>A TCP or TLS connection to the syslog server was refused. There might be no service listening on the TCP or TLS port for the host, or a firewall might be blocking access.</p> <ol style="list-style-type: none"><li data-bbox="605 1151 1473 1203">1. Check that you entered the correct FQDN or IP address, port, and protocol for the syslog server.<li data-bbox="605 1220 1416 1294">2. Confirm that the host for the syslog service is running a syslog daemon that is listening on the specified port.<li data-bbox="605 1311 1473 1385">3. Confirm that a firewall is not blocking access to TCP/TLS connections from the nodes to the IP and port of the syslog server.
Network unreachable	<p>The syslog server is not on a directly attached subnet. A router returned an ICMP failure message to indicate it could not forward the test messages from the listed nodes to the syslog server.</p> <ol style="list-style-type: none"><li data-bbox="605 1573 1432 1626">1. Check that you entered the correct FQDN or IP address for the syslog server.<li data-bbox="605 1643 1494 1797">2. For each node listed, check the Grid Network Subnet List, the Admin Networks Subnet Lists, and the Client Network gateways. Confirm these are configured to route traffic to the syslog server over the expected network interface and gateway (Grid, Admin, or Client).

Error message	Description and recommended actions
Host unreachable	<p>The syslog server is on a directly attached subnet (subnet used by the listed nodes for their Grid, Admin, or Client IP addresses). The nodes attempted to send test messages, but did not receive responses to ARP requests for the syslog server's MAC address.</p> <ol style="list-style-type: none"> 1. Check that you entered the correct FQDN or IP address for the syslog server. 2. Check that the host running the syslog service is up.
Connection timed out	<p>A TCP/TLS connection attempt was made, but no response was received from the syslog server for a long time. There might be a routing misconfiguration or a firewall might be dropping traffic without sending any response (a common configuration).</p> <ol style="list-style-type: none"> 1. Check that you entered the correct FQDN or IP address for the syslog server. 2. For each node listed, check the Grid Network Subnet List, the Admin Networks Subnet Lists, and the Client Network gateways. Confirm these are configured to route traffic to the syslog server via the network interface and gateway (Grid, Admin, or Client) over which you expect the syslog server to be reached. 3. Confirm that a firewall is not blocking access to TCP/TLS connections from the nodes listed to the IP and port of the syslog server.
Connection closed by partner	<p>A TCP connection to the syslog server was successfully established but was later closed. Reasons for this might include:</p> <ul style="list-style-type: none"> • The syslog server might have been restarted or rebooted. • The node and the syslog server might have different TCP/TLS settings. • An intermediate firewall might be closing idle TCP connections. • A non-syslog server listening on the syslog server port might have closed the connection. <ol style="list-style-type: none"> 1. Check that you entered the correct FQDN or IP address, port, and protocol for the syslog server. 2. If you are using TLS, confirm the syslog server is also using TLS. If you are using TCP, confirm the syslog server is also using TCP. 3. Check that an intermediate firewall is not configured to close idle TCP connections.

Error message	Description and recommended actions
TLS certificate error	<p>The server certificate received from the syslog server was not compatible with the CA certificate bundle and client certificate you provided.</p> <ol style="list-style-type: none"> 1. Confirm that the CA certificate bundle and client certificate (if any) are compatible with the server certificate on the syslog server. 2. Confirm that the identities in the server certificate from the syslog server include the expected IP or FQDN values.
Forwarding suspended	<p>Syslog records are no longer being forwarded to the syslog server and StorageGRID is unable to detect the reason.</p> <p>Review the debugging logs provided with this error to attempt to determine the root cause.</p>
TLS session terminated	<p>The syslog server terminated the TLS session and StorageGRID is unable to detect the reason.</p> <ol style="list-style-type: none"> 1. Review the debugging logs provided with this error to attempt to determine the root cause. 2. Check that you entered the correct FQDN or IP address, port, and protocol for the syslog server. 3. If you are using TLS, confirm the syslog server is also using TLS. If you are using TCP, confirm the syslog server is also using TCP. 4. Confirm that the CA certificate bundle and client certificate (if any) are compatible with the server certificate from the syslog server. 5. Confirm that the identities in the server certificate from the syslog server include the expected IP or FQDN values.
Results query failed	<p>The Admin Node used for syslog server configuration and testing is unable to request test results from the nodes listed. One or more nodes might be down.</p> <ol style="list-style-type: none"> 1. Follow standard troubleshooting steps to ensure that the nodes are online and all expected services are running. 2. Restart the miscd service on the nodes listed.

Alerts reference

The following table lists all default StorageGRID alerts. As required, you can create custom alert rules to fit your system management approach.

See the information about [commonly used Prometheus metrics](#) to learn about the metrics used in some of these alerts.

Alert name	Description and recommended actions
Appliance battery expired	<p>The battery in the appliance's storage controller has expired.</p> <ol style="list-style-type: none"> 1. Replace the battery. The steps to remove and replace a battery are included in the procedure for replacing a storage controller. See the instructions for your storage appliance: <ul style="list-style-type: none"> ◦ SG5600 storage appliances ◦ SG5700 storage appliances ◦ SG6000 storage appliances 2. If this alert persists, contact technical support.
Appliance battery failed	<p>The battery in the appliance's storage controller has failed.</p> <ol style="list-style-type: none"> 1. Replace the battery. The steps to remove and replace a battery are included in the procedure for replacing a storage controller. See the instructions for your storage appliance: <ul style="list-style-type: none"> ◦ SG5600 storage appliances ◦ SG5700 storage appliances ◦ SG6000 storage appliances 2. If this alert persists, contact technical support.
Appliance battery has insufficient learned capacity	<p>The battery in the appliance's storage controller has insufficient learned capacity.</p> <ol style="list-style-type: none"> 1. Replace the battery. The steps to remove and replace a battery are included in the procedure for replacing a storage controller. See the instructions for your storage appliance: <ul style="list-style-type: none"> ◦ SG5600 storage appliances ◦ SG5700 storage appliances ◦ SG6000 storage appliances 2. If this alert persists, contact technical support.
Appliance battery near expiration	<p>The battery in the appliance's storage controller is nearing expiration.</p> <ol style="list-style-type: none"> 1. Replace the battery soon. The steps to remove and replace a battery are included in the procedure for replacing a storage controller. See the instructions for your storage appliance: <ul style="list-style-type: none"> ◦ SG5600 storage appliances ◦ SG5700 storage appliances ◦ SG6000 storage appliances 2. If this alert persists, contact technical support.

Alert name	Description and recommended actions
Appliance battery removed	<p>The battery in the appliance's storage controller is missing.</p> <ol style="list-style-type: none"> 1. Install a battery. The steps to remove and replace a battery are included in the procedure for replacing a storage controller. See the instructions for your storage appliance: <ul style="list-style-type: none"> ◦ SG5600 storage appliances ◦ SG5700 storage appliances ◦ SG6000 storage appliances 2. If this alert persists, contact technical support.
Appliance battery too hot	<p>The battery in the appliance's storage controller is overheated.</p> <ol style="list-style-type: none"> 1. Determine if there is another alert affecting this node. This alert might be resolved when you resolve the other alert. 2. Investigate possible reasons for the temperature increase, such as a fan or HVAC failure. 3. If this alert persists, contact technical support.
Appliance BMC communication error	<p>Communication with the baseboard management controller (BMC) has been lost.</p> <ol style="list-style-type: none"> 1. Confirm that the BMC is operating normally. Select NODES, and then select the Hardware tab for the appliance node. Locate the Compute Controller BMC IP field, and browse to that IP. 2. Attempt to restore BMC communications by placing the node into maintenance mode and then powering the appliance off and back on. See the instructions for your appliance: <ul style="list-style-type: none"> ◦ SG100 and SG1000 services appliances ◦ SG6000 storage appliances 3. If this alert persists, contact technical support.
Appliance cache backup device failed	<p>A persistent cache backup device has failed.</p> <ol style="list-style-type: none"> 1. Determine if there is another alert affecting this node. This alert might be resolved when you resolve the other alert. 2. Contact technical support.
Appliance cache backup device insufficient capacity	<p>There is insufficient cache backup device capacity.</p> <p>Contact technical support.</p>
Appliance cache backup device write-protected	<p>A cache backup device is write-protected.</p> <p>Contact technical support.</p>

Alert name	Description and recommended actions
Appliance cache memory size mismatch	<p>The two controllers in the appliance have different cache sizes.</p> <p>Contact technical support.</p>
Appliance compute controller chassis temperature too high	<p>The temperature of the compute controller in a StorageGRID appliance has exceeded a nominal threshold.</p> <ol style="list-style-type: none"> <li data-bbox="605 403 1449 466">1. Check the hardware components for overheating conditions, and follow the recommended actions: <ul style="list-style-type: none"> <li data-bbox="670 487 1416 519">◦ If you have an SG100, SG1000, or SG6000, use the BMC. <li data-bbox="670 540 1416 604">◦ If you have an SG5600 or SG5700, use SANtricity System Manager. <li data-bbox="605 625 1454 688">2. If necessary, replace the component. See the instructions for your appliance: <ul style="list-style-type: none"> <li data-bbox="670 709 1192 741">◦ SG100 and SG1000 services appliances <li data-bbox="670 762 1041 794">◦ SG6000 storage appliances <li data-bbox="670 815 1041 846">◦ SG5700 storage appliances <li data-bbox="670 868 1041 899">◦ SG5600 storage appliances
Appliance compute controller CPU temperature too high	<p>The temperature of the CPU in the compute controller in a StorageGRID appliance has exceeded a nominal threshold.</p> <ol style="list-style-type: none"> <li data-bbox="605 1036 1449 1100">1. Check the hardware components for overheating conditions, and follow the recommended actions: <ul style="list-style-type: none"> <li data-bbox="670 1121 1416 1153">◦ If you have an SG100, SG1000, or SG6000, use the BMC. <li data-bbox="670 1174 1416 1237">◦ If you have an SG5600 or SG5700, use SANtricity System Manager. <li data-bbox="605 1258 1454 1322">2. If necessary, replace the component. See the instructions for your appliance: <ul style="list-style-type: none"> <li data-bbox="670 1343 1192 1374">◦ SG100 and SG1000 services appliances <li data-bbox="670 1396 1041 1427">◦ SG5600 storage appliances <li data-bbox="670 1448 1041 1480">◦ SG5700 storage appliances <li data-bbox="670 1501 1041 1533">◦ SG6000 storage appliances

Alert name	Description and recommended actions
Appliance compute controller needs attention	<p>A hardware fault has been detected in the compute controller of a StorageGRID appliance.</p> <ol style="list-style-type: none"> 1. Check the hardware components for errors, and follow the recommended actions: <ul style="list-style-type: none"> ◦ If you have an SG100, SG1000, or SG6000, use the BMC. ◦ If you have an SG5600 or SG5700, use SANtricity System Manager. 2. If necessary, replace the component. See the instructions for your appliance: <ul style="list-style-type: none"> ◦ SG100 and SG1000 services appliances ◦ SG5600 storage appliances ◦ SG5700 storage appliances ◦ SG6000 storage appliances
Appliance compute controller power supply A has a problem	<p>Power supply A in the compute controller has a problem. This alert might indicate that the power supply has failed or that it has a problem providing power.</p> <ol style="list-style-type: none"> 1. Check the hardware components for errors, and follow the recommended actions: <ul style="list-style-type: none"> ◦ If you have an SG100, SG1000, or SG6000, use the BMC. ◦ If you have an SG5600 or SG5700, use SANtricity System Manager. 2. If necessary, replace the component. See the instructions for your appliance: <ul style="list-style-type: none"> ◦ SG100 and SG1000 services appliances ◦ SG5600 storage appliances ◦ SG5700 storage appliances ◦ SG6000 storage appliances

Alert name	Description and recommended actions
Appliance compute controller power supply B has a problem	<p>Power supply B in the compute controller has a problem.</p> <p>This alert might indicate that the power supply has failed or that it has a problem providing power.</p> <ol style="list-style-type: none"> 1. Check the hardware components for errors, and follow the recommended actions: <ul style="list-style-type: none"> ◦ If you have an SG100, SG1000, or SG6000, use the BMC. ◦ If you have an SG5600 or SG5700, use SANtricity System Manager. 2. If necessary, replace the component. See the instructions for your appliance: <ul style="list-style-type: none"> ◦ SG100 and SG1000 services appliances ◦ SG5600 storage appliances ◦ SG5700 storage appliances ◦ SG6000 storage appliances
Appliance compute hardware monitor service stalled	<p>The service that monitors storage hardware status has stopped reporting data.</p> <ol style="list-style-type: none"> 1. Check the status of the eos-system-status service in the base-os. 2. If the service is in a stopped or error state, restart the service. 3. If this alert persists, contact technical support.

Alert name	Description and recommended actions
Appliance Fibre Channel fault detected	<p>A Fibre Channel link problem has been detected between the appliance storage controller and compute controller.</p> <p>This alert might indicate that there is a problem with the Fibre Channel connection between the storage and compute controllers in the appliance.</p> <ol style="list-style-type: none"> Check the hardware components for errors (NODES > appliance node > Hardware). If the status of any of the components is not "Nominal," take these actions: <ol style="list-style-type: none"> Verify that the Fibre Channel cables between controllers are completely connected. Ensure that the Fibre Channel cables are free of excessive bends. Confirm that the SFP+ modules are properly seated. <p>Note: If this problem persists, the StorageGRID system might take the problematic connection offline automatically.</p> If necessary, replace components. See the instructions for your appliance: <ul style="list-style-type: none"> ◦ SG5700 storage appliances ◦ SG6000 storage appliances
Appliance Fibre Channel HBA port failure	<p>A Fibre Channel HBA port is failing or has failed.</p> <p>Contact technical support.</p>
Appliance flash cache drives non-optimal	<p>The drives used for the SSD cache are non-optimal.</p> <ol style="list-style-type: none"> Replace the SSD cache drives. See the instructions for your appliance: <ul style="list-style-type: none"> ◦ SG5600 storage appliances ◦ SG5700 storage appliances ◦ SG6000 storage appliances If this alert persists, contact technical support.

Alert name	Description and recommended actions
Appliance interconnect/battery canister removed	<p>The interconnect/battery canister is missing.</p> <ol style="list-style-type: none"> Replace the battery. The steps to remove and replace a battery are included in the procedure for replacing a storage controller. See the instructions for your storage appliance. <ul style="list-style-type: none"> SG5600 storage appliances SG5700 storage appliances SG6000 storage appliances If this alert persists, contact technical support.
Appliance LACP port missing	<p>A port on a StorageGRID appliance is not participating in the LACP bond.</p> <ol style="list-style-type: none"> Check the configuration for the switch. Ensure the interface is configured in the correct link aggregation group. If this alert persists, contact technical support.
Appliance overall power supply degraded	<p>The power of a StorageGRID appliance has deviated from the recommended operating voltage.</p> <ol style="list-style-type: none"> Check the status of power supply A and B to determine which power supply is operating abnormally, and follow the recommended actions: <ul style="list-style-type: none"> If you have an SG100, SG1000, or SG6000, use the BMC. If you have an SG5600 or SG5700, use SANtricity System Manager. If necessary, replace the component. See the instructions for your appliance: <ul style="list-style-type: none"> SG6000 storage appliances SG5700 storage appliances SG5600 storage appliances SG100 and SG1000 services appliances
Appliance storage controller A failure	<p>Storage controller A in a StorageGRID appliance has failed.</p> <ol style="list-style-type: none"> Use SANtricity System Manager to check hardware components, and follow the recommended actions. If necessary, replace the component. See the instructions for your appliance: <ul style="list-style-type: none"> SG6000 storage appliances SG5700 storage appliances SG5600 storage appliances

Alert name	Description and recommended actions
Appliance storage controller B failure	<p>Storage controller B in a StorageGRID appliance has failed.</p> <ol style="list-style-type: none"> 1. Use SANtricity System Manager to check hardware components, and follow the recommended actions. 2. If necessary, replace the component. See the instructions for your appliance: <ul style="list-style-type: none"> ◦ SG6000 storage appliances ◦ SG5700 storage appliances ◦ SG5600 storage appliances
Appliance storage controller drive failure	<p>One or more drives in a StorageGRID appliance has failed or is not optimal.</p> <ol style="list-style-type: none"> 1. Use SANtricity System Manager to check hardware components, and follow the recommended actions. 2. If necessary, replace the component. See the instructions for your appliance: <ul style="list-style-type: none"> ◦ SG6000 storage appliances ◦ SG5700 storage appliances ◦ SG5600 storage appliances
Appliance storage controller hardware issue	<p>SANtricity software is reporting "Needs attention" for a component in a StorageGRID appliance.</p> <ol style="list-style-type: none"> 1. Use SANtricity System Manager to check hardware components, and follow the recommended actions. 2. If necessary, replace the component. See the instructions for your appliance: <ul style="list-style-type: none"> ◦ SG6000 storage appliances ◦ SG5700 storage appliances ◦ SG5600 storage appliances
Appliance storage controller power supply A failure	<p>Power supply A in a StorageGRID appliance has deviated from the recommended operating voltage.</p> <ol style="list-style-type: none"> 1. Use SANtricity System Manager to check hardware components, and follow the recommended actions. 2. If necessary, replace the component. See the instructions for your appliance: <ul style="list-style-type: none"> ◦ SG6000 storage appliances ◦ SG5700 storage appliances ◦ SG5600 storage appliances

Alert name	Description and recommended actions
Appliance storage controller power supply B failure	<p>Power supply B in a StorageGRID appliance has deviated from the recommended operating voltage.</p> <ol style="list-style-type: none"> 1. Use SANtricity System Manager to check hardware components, and follow the recommended actions. 2. If necessary, replace the component. See the instructions for your appliance: <ul style="list-style-type: none"> ◦ SG6000 storage appliances ◦ SG5700 storage appliances ◦ SG5600 storage appliances
Appliance storage hardware monitor service stalled	<p>The service that monitors storage hardware status has stopped reporting data.</p> <ol style="list-style-type: none"> 1. Check the status of the eos-system-status service in the base-os. 2. If the service is in a stopped or error state, restart the service. 3. If this alert persists, contact technical support.
Appliance storage shelves degraded	<p>The status of one of the components in the storage shelf for a storage appliance is degraded.</p> <ol style="list-style-type: none"> 1. Use SANtricity System Manager to check hardware components, and follow the recommended actions. 2. If necessary, replace the component. See the instructions for your appliance: <ul style="list-style-type: none"> ◦ SG6000 storage appliances ◦ SG5700 storage appliances ◦ SG5600 storage appliances
Appliance temperature exceeded	<p>The nominal or maximum temperature for the appliance's storage controller has been exceeded.</p> <ol style="list-style-type: none"> 1. Determine if there is another alert affecting this node. This alert might be resolved when you resolve the other alert. 2. Investigate possible reasons for the temperature increase, such as a fan or HVAC failure. 3. If this alert persists, contact technical support.
Appliance temperature sensor removed	<p>A temperature sensor has been removed. Contact technical support.</p>

Alert name	Description and recommended actions
Cassandra auto-compactor error	<p>The Cassandra auto-compactor has experienced an error.</p> <p>The Cassandra auto-compactor exists on all Storage Nodes and manages the size of the Cassandra database for overwrite and delete heavy workloads. While this condition persists, certain workloads will experience unexpectedly high metadata consumption.</p> <ol style="list-style-type: none"> 1. Determine if there is another alert affecting this node. This alert might be resolved when you resolve the other alert. 2. Contact technical support.
Audit logs are being added to the in-memory queue	<p>Node cannot send logs to the local syslog server and the in-memory queue is filling up.</p> <ol style="list-style-type: none"> 1. Ensure that the rsyslog service is running on the node. 2. If necessary, restart the rsyslog service on the node using the command <code>service rsyslog restart</code>. 3. If the rsyslog service cannot be restarted and you do not save audit messages on Admin Nodes, contact technical support. Audit logs will be lost if this condition is not corrected.
Cassandra auto-compactor metrics out of date	<p>The metrics that describe the Cassandra auto-compactor are out of date.</p> <p>The Cassandra auto-compactor exists on all Storage Nodes and manages the size of the Cassandra database for overwrite and delete heavy workloads. While this alert persists, certain workloads will experience unexpectedly high metadata consumption.</p> <ol style="list-style-type: none"> 1. Determine if there is another alert affecting this node. This alert might be resolved when you resolve the other alert. 2. Contact technical support.

Alert name	Description and recommended actions
Cassandra communication error	<p>The nodes that run the Cassandra service are having trouble communicating with each other.</p> <p>This alert indicates that something is interfering with node-to-node communications. There might be a network issue or the Cassandra service might be down on one or more Storage Nodes.</p> <ol style="list-style-type: none"> 1. Determine if there is another alert affecting one or more Storage Nodes. This alert might be resolved when you resolve the other alert. 2. Check for a network issue that might be affecting one or more Storage Nodes. 3. Select SUPPORT > Tools > Grid topology. 4. For each Storage Node in your system, select SSM > Services. Ensure that the status of the Cassandra service is "Running." 5. If Cassandra is not running, follow the steps for starting or restarting a service. 6. If all instances of the Cassandra service are now running and the alert is not resolved, contact technical support.
Cassandra compactions overloaded	<p>The Cassandra compaction process is overloaded.</p> <p>If the compaction process is overloaded, read performance might be degraded and RAM might be used up. The Cassandra service might also become unresponsive or crash.</p> <ol style="list-style-type: none"> 1. Restart the Cassandra service by following the steps for restarting a service. 2. If this alert persists, contact technical support.
Cassandra repair metrics out of date	<p>The metrics that describe Cassandra repair jobs are out of date. If this condition persists for more than 48 hours, client queries, such as bucket listings, might show deleted data.</p> <ol style="list-style-type: none"> 1. Reboot the node. From the Grid Manager, go to NODES, select the node, and select the Tasks tab. 2. If this alert persists, contact technical support.

Alert name	Description and recommended actions
Cassandra repair progress slow	<p>The progress of Cassandra database repairs is slow.</p> <p>When database repairs are slow, Cassandra data consistency operations are impeded. If this condition persists for more than 48 hours, client queries, such as bucket listings, might show deleted data.</p> <ol style="list-style-type: none"> 1. Confirm that all Storage Nodes are online and there are no networking-related alerts. 2. Monitor this alert for up to 2 days to see if the issue resolves on its own. 3. If database repairs continue to proceed slowly, contact technical support.
Cassandra repair service not available	<p>The Cassandra repair service is not available.</p> <p>The Cassandra repair service exists on all Storage Nodes and provides critical repair functions for the Cassandra database. If this condition persists for more than 48 hours, client queries, such as bucket listings, might show deleted data.</p> <ol style="list-style-type: none"> 1. Select SUPPORT > Tools > Grid topology. 2. For each Storage Node in your system, select SSM > Services. Ensure that the status of the Cassandra Reaper service is "Running." 3. If Cassandra Reaper is not running, follow the steps for follow the steps for starting or restarting a service. 4. If all instances of the Cassandra Reaper service are now running and the alert is not resolved, contact technical support.
Cassandra table corruption	<p>Cassandra has detected table corruption.</p> <p>Cassandra automatically restarts if it detects table corruption.</p> <p>Contact technical support.</p>
Cloud Storage Pool connectivity error	<p>The health check for Cloud Storage Pools detected one or more new errors.</p> <ol style="list-style-type: none"> 1. Go to the Cloud Storage Pools section of the Storage Pools page. 2. Look at the Last Error column to determine which Cloud Storage Pool has an error. 3. See the instructions for managing objects with information lifecycle management.

Alert name	Description and recommended actions
DHCP lease expired	<p>The DHCP lease on a network interface has expired. If the DHCP lease has expired, follow the recommended actions:</p> <ol style="list-style-type: none"> 1. Ensure there is connectivity between this node and the DHCP server on the affected interface. 2. Ensure there are IP addresses available to assign in the affected subnet on the DHCP server. 3. Ensure there is a permanent reservation for the IP address configured in the DHCP server. Or, use the StorageGRID Change IP tool to assign a static IP address outside of the DHCP address pool. See the recovery and maintenance instructions.
DHCP lease expiring soon	<p>The DHCP lease on a network interface is expiring soon.</p> <p>To prevent the DHCP lease from expiring, follow the recommended actions:</p> <ol style="list-style-type: none"> 1. Ensure there is connectivity between this node and the DHCP server on the affected interface. 2. Ensure there are IP addresses available to assign in the affected subnet on the DHCP server. 3. Ensure there is a permanent reservation for the IP address configured in the DHCP server. Or, use the StorageGRID Change IP tool to assign a static IP address outside of the DHCP address pool. See the recovery and maintenance instructions.
DHCP server unavailable	<p>The DHCP server is unavailable.</p> <p>The StorageGRID node is unable to contact your DHCP server. The DHCP lease for the node's IP address cannot be validated.</p> <ol style="list-style-type: none"> 1. Ensure there is connectivity between this node and the DHCP server on the affected interface. 2. Ensure there are IP addresses available to assign in the affected subnet on the DHCP server. 3. Ensure there is a permanent reservation for the IP address configured in the DHCP server. Or, use the StorageGRID Change IP tool to assign a static IP address outside of the DHCP address pool. See the recovery and maintenance instructions.

Alert name	Description and recommended actions
Disk I/O is very slow	<p>Very slow disk I/O might be impacting StorageGRID performance.</p> <ol style="list-style-type: none"> 1. If the issue is related to a storage appliance node, use SANtricity System Manager to check for faulty drives, drives with predicted faults, or in-progress drive repairs. Also check the status of the Fibre Channel or SAS links between the appliance compute and storage controllers to see if any links are down or showing excessive error rates. 2. Examine the storage system that hosts this node's volumes to determine, and correct, the root cause of the slow I/O. 3. If this alert persists, contact technical support. <p>Note: Affected nodes might disable services and reboot themselves to avoid impacting overall grid performance. When the underlying condition is cleared and these nodes detect normal I/O performance, they will return to full service automatically.</p>
EC rebalance failure	<p>The job to rebalance erasure-coded data among Storage Nodes has failed or has been paused by the user.</p> <ol style="list-style-type: none"> 1. Ensure that all Storage Nodes at the site being rebalanced are online and available. 2. Ensure that there are no volume failures at the site being rebalanced. If there are, terminate the EC rebalance job so that you can run a repair job. <code>'rebalance-data terminate --job-id <ID>'</code> 3. Ensure that there are no service failures on the site being rebalanced. If a service is not running, follow the steps for starting or restarting a service in the recovery and maintenance instructions. 4. After resolving any issues, restart the job by running the following command on the primary Admin Node: <code>'rebalance-data start --job-id <ID>'</code> 5. If you are unable to resolve the problem, contact technical support.

Alert name	Description and recommended actions
EC repair failure	<p>A repair job for erasure-coded data has failed or has been stopped.</p> <ol style="list-style-type: none"> 1. Ensure that there are sufficient available Storage Nodes or volumes to take the place of the failed Storage Node or volume. 2. Ensure that there are sufficient available Storage Nodes to satisfy the active ILM policy. 3. Ensure there are no network connectivity issues. 4. After resolving any issues, restart the job by running the following command on the primary Admin Node: <pre>'repair-data start-ec-node-repair --repair-id <ID>'</pre> <ol style="list-style-type: none"> 5. If you are unable to resolve the problem, contact technical support.
EC repair stalled	<p>A repair job for erasure-coded data has stalled.</p> <ol style="list-style-type: none"> 1. Ensure that there are sufficient available Storage Nodes or volumes to take the place of the failed Storage Node or volume. 2. Ensure there are no network connectivity issues. 3. After resolving any issues, check if the alert is resolved. To see a more detailed report on the repair progress, run the following command on the primary Admin Node: <pre>'repair-data show-ec-repair-status --repair-id <ID>'</pre> <ol style="list-style-type: none"> 4. If you are unable to resolve the problem, contact technical support.

Alert name	Description and recommended actions
Email notification failure	<p>The email notification for an alert could not be sent.</p> <p>This alert is triggered when an alert email notification fails or a test email (sent from the ALERTS > Email setup page) cannot be delivered.</p> <ol style="list-style-type: none"> 1. Sign in to Grid Manager from the Admin Node listed in the Site/Node column of the alert. 2. Go to the ALERTS > Email setup page, check the settings, and change them if required. 3. Click Send Test Email, and check the inbox of a test recipient for the email. A new instance of this alert might be triggered if the test email cannot be sent. 4. If the test email could not be sent, confirm your email server is online. 5. If the server is working, select SUPPORT > Tools > Logs, and collect the log for the Admin Node. Specify a time period that is 15 minutes before and after the time of the alert. 6. Extract the downloaded archive, and review the contents of <code>prometheus.log</code> <code>(/_/GID<gid><time_stamp>/<site_node>/<time_stamp>/metrics/prometheus.log)</code>. 7. If you are unable to resolve the problem, contact technical support.
Expiration of client certificates configured on the Certificates page	<p>One or more client certificates configured on the Certificates page are about to expire.</p> <ol style="list-style-type: none"> 1. In the Grid Manager, select CONFIGURATION > Security > Certificates and then select the Client tab. 2. Select a certificate that will expire soon. 3. Select Attach new certificate to upload or generate a new certificate. 4. Repeat these steps for each certificate that will expire soon.
Expiration of load balancer endpoint certificate	<p>One or more load balancer endpoint certificates are about to expire.</p> <ol style="list-style-type: none"> 1. Select CONFIGURATION > Network > Load balancer endpoints. 2. Select an endpoint that has a certificate that will expire soon. 3. Select Edit endpoint to upload or generate a new certificate. 4. Repeat these steps for each endpoint that has an expired certificate or one that will expire soon. <p>For more information about managing load balancer endpoints, see the instructions for administering StorageGRID.</p>

Alert name	Description and recommended actions
Expiration of server certificate for management interface	<p>The server certificate used for the management interface is about to expire.</p> <ol style="list-style-type: none"> 1. Select CONFIGURATION > Security > Certificates. 2. On the Global tab, select Management interface certificate. 3. Upload a new management interface certificate.
Expiration of global server certificate for S3 and Swift API	<p>The server certificate used for accessing storage API endpoints is about to expire.</p> <ol style="list-style-type: none"> 1. Select CONFIGURATION > Security > Certificates. 2. On the Global tab, select S3 and Swift API certificate. 3. Upload a new S3 and Swift API certificate.
External syslog CA certificate expiration	<p>The certificate authority (CA) certificate used to sign the external syslog server certificate is about to expire.</p> <ol style="list-style-type: none"> 1. Update the CA certificate on the external syslog server. 2. Obtain a copy of the updated CA certificate. 3. From the Grid Manager, go to CONFIGURATION > Monitoring > Audit and syslog server. 4. Select Edit external syslog server. 5. Select Browse to upload the new certificate. 6. Complete the Configuration wizard to save the new certificate and key.
External syslog client certificate expiration	<p>The client certificate for an external syslog server is about to expire.</p> <ol style="list-style-type: none"> 1. From the Grid Manager, go to CONFIGURATION > Monitoring > Audit and syslog server. 2. Select Edit external syslog server. 3. Select Browse to upload the new certificate. 4. Select Browse to upload the new private key. 5. Complete the Configuration wizard to save the new certificate and key.
External syslog server certificate expiration	<p>The server certificate presented by the external syslog server is about to expire.</p> <ol style="list-style-type: none"> 1. Update the server certificate on the external syslog server. 2. If you previously used the Grid Manager API to provide a server certificate for certificate validation, upload the updated server certificate using the API.

Alert name	Description and recommended actions
External syslog server forwarding error	<p>Node cannot forward logs to the external syslog server.</p> <ol style="list-style-type: none"> From the Grid Manager, go to CONFIGURATION > Monitoring > Audit and syslog server. Select Edit external syslog server. Advance through the Configuration wizard until you are able to select Send test messages. Select Send test messages to determine why logs cannot be forwarded to the external syslog server. Resolve any reported issues.
Grid Network MTU mismatch	<p>The maximum transmission unit (MTU) setting for the Grid Network interface (eth0) differs significantly across nodes in the grid.</p> <p>The differences in MTU settings could indicate that some, but not all, eth0 networks are configured for jumbo frames. An MTU size mismatch of greater than 1000 might cause network performance problems.</p> <p>See the instructions for the Grid Network MTU mismatch alert in Troubleshoot network, hardware, and platform issues.</p>
High Java heap use	<p>A high percentage of Java heap space is being used.</p> <p>If the Java heap becomes full, metadata services can become unavailable and client requests can fail.</p> <ol style="list-style-type: none"> Review the ILM activity on the Dashboard. This alert might resolve on its own when the ILM workload decreases. Determine if there is another alert affecting this node. This alert might be resolved when you resolve the other alert. If this alert persists, contact technical support.
High latency for metadata queries	<p>The average time for Cassandra metadata queries is too long.</p> <p>An increase in query latency can be caused by a hardware change, such as replacing a disk; a workload change, such as a sudden increase in ingest; or a network change, such as a communication problem between nodes and sites.</p> <ol style="list-style-type: none"> Determine if there were any hardware, workload, or network changes around the time the query latency increased. If you are unable to resolve the problem, contact technical support.

Alert name	Description and recommended actions
Identity federation synchronization failure	<p>Unable to synchronize federated groups and users from the identity source.</p> <ol style="list-style-type: none"> 1. Confirm that the configured LDAP server is online and available. 2. Review the settings on the Identity Federation page. Confirm that all values are current. See Use identity federation in the instructions for administering StorageGRID. 3. Click Test Connection to validate the settings for the LDAP server. 4. If you cannot resolve the issue, contact technical support.
Identity federation synchronization failure for a tenant	<p>Unable to synchronize federated groups and users from the identity source configured by a tenant.</p> <ol style="list-style-type: none"> 1. Sign in to the Tenant Manager. 2. Confirm that the LDAP server configured by the tenant is online and available. 3. Review the settings on the Identity Federation page. Confirm that all values are current. See Use identity federation in the instructions for using a tenant account. 4. Click Test Connection to validate the settings for the LDAP server. 5. If you cannot resolve the issue, contact technical support.
ILM placement unachievable	<p>A placement instruction in an ILM rule cannot be achieved for certain objects.</p> <p>This alert indicates that a node required by a placement instruction is unavailable or that an ILM rule is misconfigured. For example, a rule might specify more replicated copies than there are Storage Nodes.</p> <ol style="list-style-type: none"> 1. Ensure that all nodes are online. 2. If all nodes are online, review the placement instructions in all ILM rules that are used the active ILM policy. Confirm that there are valid instructions for all objects. See the instructions for managing objects with information lifecycle management. 3. As required, update rule settings and activate a new policy. <p>Note: It might take up to 1 day for the alert to clear.</p> <ol style="list-style-type: none"> 4. If the problem persists, contact technical support. <p>Note: This alert might appear during an upgrade and could persist for 1 day after the upgrade is completed successfully. When this alert is triggered by an upgrade, it will clear on its own.</p>

Alert name	Description and recommended actions
ILM scan period too long	<p>The time required to scan, evaluate objects, and apply ILM is too long.</p> <p>If the estimated time to complete a full ILM scan of all objects is too long (see Scan Period - Estimated on the Dashboard), the active ILM policy might not be applied to newly ingested objects. Changes to the ILM policy might not be applied to existing objects.</p> <ol style="list-style-type: none"> 1. Determine if there is another alert affecting this node. This alert might be resolved when you resolve the other alert. 2. Confirm that all Storage Nodes are online. 3. Temporarily reduce the amount of client traffic. For example, from the Grid Manager, select CONFIGURATION > Network > Traffic classification, and create a policy that limits bandwidth or the number of requests. 4. If disk I/O or CPU are overloaded, try to reduce the load or increase the resource. 5. If necessary, update ILM rules to use synchronous placement (default for rules created after StorageGRID 11.3). 6. If this alert persists, contact technical support. <p>Administer StorageGRID</p>
ILM scan rate low	<p>The ILM scan rate is set to less than 100 objects/second.</p> <p>This alert indicates that someone has changed the ILM scan rate for your system to less than 100 objects/second (default: 400 objects/second). The active ILM policy might not be applied to newly ingested objects. Subsequent changes to the ILM policy will not be applied to existing objects.</p> <ol style="list-style-type: none"> 1. Determine if a temporary change was made to the ILM scan rate as part of an ongoing support investigation. 2. Contact technical support. <p> Never change the ILM scan rate without contacting technical support.</p>

Alert name	Description and recommended actions
KMS CA certificate expiration	<p>The certificate authority (CA) certificate used to sign the key management server (KMS) certificate is about to expire.</p> <ol style="list-style-type: none"> Using the KMS software, update the CA certificate for the key management server. From the Grid Manager, select CONFIGURATION > Security > Key management server. Select the KMS that has a certificate status warning. Select Edit. Select Next to go to Step 2 (Upload Server Certificate). Select Browse to upload the new certificate. Select Save. <p>Administer StorageGRID</p>
KMS client certificate expiration	<p>The client certificate for a key management server is about to expire.</p> <ol style="list-style-type: none"> From the Grid Manager, select CONFIGURATION > Security > Key management server. Select the KMS that has a certificate status warning. Select Edit. Select Next to go to Step 3 (Upload Client Certificates). Select Browse to upload the new certificate. Select Browse to upload the new private key. Select Save. <p>Administer StorageGRID</p>
KMS configuration failed to load	<p>The configuration for the key management server exists but failed to load.</p> <ol style="list-style-type: none"> Determine if there is another alert affecting this node. This alert might be resolved when you resolve the other alert. If this alert persists, contact technical support.

Alert name	Description and recommended actions
KMS connectivity error	<p>An appliance node could not connect to the key management server for its site.</p> <ol style="list-style-type: none"> From the Grid Manager, select CONFIGURATION > Security > Key management server. Confirm that the port and hostname entries are correct. Confirm that the server certificate, client certificate, and the client certificate private key are correct and not expired. Ensure that firewall settings allow the appliance node to communicate with the specified KMS. Correct any networking or DNS issues. If you need assistance or this alert persists, contact technical support.
KMS encryption key name not found	<p>The configured key management server does not have an encryption key that matches the name provided.</p> <ol style="list-style-type: none"> Confirm that the KMS assigned to the site is using the correct name for the encryption key and any prior versions. If you need assistance or this alert persists, contact technical support.
KMS encryption key rotation failed	<p>All appliance volumes were decrypted, but one or more volumes could not rotate to the latest key. Contact technical support.</p>
KMS is not configured	<p>No key management server exists for this site.</p> <ol style="list-style-type: none"> From the Grid Manager, select CONFIGURATION > Security > Key management server. Add a KMS for this site or add a default KMS. <p>Administer StorageGRID</p>
KMS key failed to decrypt an appliance volume	<p>One or more volumes on an appliance with node encryption enabled could not be decrypted with the current KMS key.</p> <ol style="list-style-type: none"> Determine if there is another alert affecting this node. This alert might be resolved when you resolve the other alert. Ensure that the key management server (KMS) has the configured encryption key and any previous key versions. If you need assistance or this alert persists, contact technical support.

Alert name	Description and recommended actions
KMS server certificate expiration	<p>The server certificate used by the key management server (KMS) is about to expire.</p> <ol style="list-style-type: none"> Using the KMS software, update the server certificate for the key management server. If you need assistance or this alert persists, contact technical support. <p>Administer StorageGRID</p>
Large audit queue	<p>The disk queue for audit messages is full.</p> <ol style="list-style-type: none"> Check the load on the system—if there have been a significant number of transactions, the alert should resolve itself over time, and you can ignore the alert. If the alert persists and increases in severity, view a chart of the queue size. If the number is steadily increasing over hours or days, the audit load has likely exceeded the audit capacity of the system. Reduce the client operation rate or decrease the number of audit messages logged by changing the audit level for Client Writes and Client Reads to Error or Off (CONFIGURATION > Monitoring > Audit and syslog server). <p>Review audit logs</p>
Legacy CLB load balancer activity detected	<p>Some clients might be connecting to the deprecated CLB load balancer service using the default S3 and Swift API certificate.</p> <ol style="list-style-type: none"> To simplify future upgrades, install a custom S3 and Swift API certificate on the Global tab of the Certificates page. Then, ensure that all S3 or Swift clients who connect to the legacy CLB have the new certificate. Create one or more load balancer endpoints. Then, direct all existing S3 and Swift clients to these endpoints. Contact technical support if you need to remap the client port. <p>Other activity might trigger this alert, including port scans. To determine if the deprecated CLB service is currently in use, view the <code>storagegrid_private_clb_http_connection_established_successful</code> Prometheus metric.</p> <p>As required, silence or disable this alert rule if the CLB service is no longer in use.</p>

Alert name	Description and recommended actions
Logs are being added to the on-disk queue	<p>Node cannot forward logs to the external syslog server and the on-disk queue is filling up.</p> <ol style="list-style-type: none"> From the Grid Manager, go to CONFIGURATION > Monitoring > Audit and syslog server. Select Edit external syslog server. Advance through the Configuration wizard until you are able to select Send test messages. Select Send test messages to determine why logs cannot be forwarded to the external syslog server. Resolve any reported issues.
Low audit log disk capacity	<p>The space available for audit logs is low.</p> <ol style="list-style-type: none"> Monitor this alert to see if the issue resolves on its own and the disk space becomes available again. Contact technical support if the available space continues to decrease.
Low available node memory	<p>The amount of RAM available on a node is low.</p> <p>Low available RAM could indicate a change in the workload or a memory leak with one or more nodes.</p> <ol style="list-style-type: none"> Monitor this alert to see if the issue resolves on its own. If the available memory falls below the major alert threshold, contact technical support.
Low free space for storage pool	<p>The amount of space available to store object data in a storage pool is low.</p> <ol style="list-style-type: none"> Select ILM > Storage pools. Select the storage pool listed in the alert, and select View details. Determine where additional storage capacity is required. You can either add Storage Nodes to each site in the storage pool or add storage volumes (LUNs) to one or more existing Storage Nodes. Perform an expansion procedure to increase storage capacity. <p>Expand your grid</p>

Alert name	Description and recommended actions
Low installed node memory	<p>The amount of installed memory on a node is low.</p> <p>Increase the amount of RAM available to the virtual machine or Linux host. Check the threshold value for the major alert to determine the default minimum requirement for a StorageGRID node. See the installation instructions for your platform:</p> <ul style="list-style-type: none"> • Install Red Hat Enterprise Linux or CentOS • Install Ubuntu or Debian • Install VMware
Low metadata storage	<p>The space available for storing object metadata is low.</p> <p>Critical alert</p> <ol style="list-style-type: none"> 1. Stop ingesting objects. 2. Immediately add Storage Nodes in an expansion procedure. <p>Major alert</p> <p>Immediately add Storage Nodes in an expansion procedure.</p> <p>Minor alert</p> <ol style="list-style-type: none"> 1. Monitor the rate at which object metadata space is being used. Select NODES > Storage Node > Storage, and view the Storage Used - Object Metadata graph. 2. Add Storage Nodes in an expansion procedure as soon as possible. <p>Once new Storage Nodes are added, the system automatically rebalances object metadata across all Storage Nodes, and the alarm clears.</p> <p>See the instructions for the Low metadata storage alert in Troubleshoot metadata issues.</p>
Low metrics disk capacity	<p>The space available for the metrics database is low.</p> <ol style="list-style-type: none"> 1. Monitor this alert to see if the issue resolves on its own and the disk space becomes available again. 2. Contact technical support if the available space continues to decrease.

Alert name	Description and recommended actions
Low object data storage	<p>The space available for storing object data is low.</p> <p>Perform an expansion procedure. You can add storage volumes (LUNs) to existing Storage Nodes, or you can add new Storage Nodes.</p> <p>Troubleshoot the Low object data storage alert</p> <p>Expand your grid</p>
Low read-only watermark override	<p>The Storage Volume Soft Read-Only Watermark Override is less than the minimum optimized watermark for a Storage Node.</p> <p>To learn how to resolve this alert, go to Troubleshoot Low read-only watermark override alerts.</p>
Low root disk capacity	<p>The space available for the root disk is low.</p> <ol style="list-style-type: none"> Monitor this alert to see if the issue resolves on its own and the disk space becomes available again. Contact technical support if the available space continues to decrease.
Low system data capacity	<p>The space available for StorageGRID system data on the /var/local file system is low.</p> <ol style="list-style-type: none"> Monitor this alert to see if the issue resolves on its own and the disk space becomes available again. Contact technical support if the available space continues to decrease.
Low tmp directory free space	<p>The space available in the /tmp directory is low.</p> <ol style="list-style-type: none"> Monitor this alert to see if the issue resolves on its own and the disk space becomes available again. Contact technical support if the available space continues to decrease.
Node network connectivity error	<p>Errors have occurred while transferring data between nodes.</p> <p>Network connectivity errors might clear without manual intervention. Contact technical support if the errors do not clear.</p> <p>See the instructions for the Network Receive Error (NRER) alarm in Troubleshoot network, hardware, and platform issues.</p>

Alert name	Description and recommended actions
Node network reception frame error	<p>A high percentage of the network frames received by a node had errors. This alert might indicate a hardware issue, such as a bad cable or a failed transceiver on either end of the Ethernet connection.</p> <ol style="list-style-type: none"> 1. If you are using an appliance, try replacing each SFP+ or SFP28 transceiver and cable, one at a time, to see if the alert clears. 2. If this alert persists, contact technical support.
Node not in sync with NTP server	<p>The node's time is not in sync with the network time protocol (NTP) server.</p> <ol style="list-style-type: none"> 1. Verify that you have specified at least four external NTP servers, each providing a Stratum 3 or better reference. 2. Check that all NTP servers are operating normally. 3. Verify the connections to the NTP servers. Make sure they are not blocked by a firewall.
Node not locked with NTP server	<p>The node is not locked to a network time protocol (NTP) server.</p> <ol style="list-style-type: none"> 1. Verify that you have specified at least four external NTP servers, each providing a Stratum 3 or better reference. 2. Check that all NTP servers are operating normally. 3. Verify the connections to the NTP servers. Make sure they are not blocked by a firewall.
Non appliance node network down	<p>One or more network devices are down or disconnected. This alert indicates that a network interface (eth) for a node installed on a virtual machine or Linux host is not accessible.</p> <p>Contact technical support.</p>

Alert name	Description and recommended actions
Object existence check failed	<p>The object existence check job has failed.</p> <ol style="list-style-type: none"> 1. Select MAINTENANCE > Object existence check. 2. Note the error message. Perform the appropriate corrective actions: <p>Failed to start, Lost connection, Unknown error</p> <ol style="list-style-type: none"> a. Ensure the Storage Nodes and volumes included in the job are online and available. b. Ensure there are no service or volume failures on the Storage Nodes. If a service is not running, start or restart the service. See the recovery and maintenance instructions. c. Ensure the selected consistency control can be satisfied. d. After resolving any issues, select Retry. The job will resume from the last valid state. <p>Critical storage error in volume</p> <ol style="list-style-type: none"> a. Recover the failed volume. See the recovery and maintenance instructions. b. Select Retry. c. After the job completes, create another job for the remaining volumes on the node to check for additional errors. <ol style="list-style-type: none"> 3. If you are unable to resolve the issues, contact technical support.
Object existence check stalled	<p>The object existence check job has stalled.</p> <p>The object existence check job cannot continue. Either one or more Storage Nodes or volumes included in the job are offline or unresponsive, or the selected consistency control can no longer be satisfied because too many nodes are down or unavailable.</p> <ol style="list-style-type: none"> 1. Ensure that all Storage Nodes and volumes being checked are online and available (select NODES). 2. Ensure that sufficient Storage Nodes are online and available to allow the current coordinator node to read object metadata using the selected consistency control. If necessary, start or restart a service. See the recovery and maintenance instructions. <p>When you resolve steps 1 and 2, the job will automatically start where it left off.</p> <ol style="list-style-type: none"> 3. If the selected consistency control cannot be satisfied, cancel the job and start another job using a lower consistency control. 4. If you are unable to resolve the issues, contact technical support.

Alert name	Description and recommended actions
Objects lost	<p>One or more objects have been lost from the grid.</p> <p>This alert might indicate that data has been permanently lost and is not retrievable.</p> <ol style="list-style-type: none"> 1. Investigate this alert immediately. You might need to take action to prevent further data loss. You also might be able to restore a lost object if you take prompt action. <p>Troubleshoot lost and missing object data</p> <ol style="list-style-type: none"> 2. When the underlying problem is resolved, reset the counter: <ol style="list-style-type: none"> a. Select SUPPORT > Tools > Grid topology. b. For the Storage Node that raised the alert, select site > grid node > LDR > Data Store > Configuration > Main. c. Select Reset Lost Objects Count and click Apply Changes.
Platform services unavailable	<p>Too few Storage Nodes with the RSM service are running or available at a site.</p> <p>Make sure that the majority of the Storage Nodes that have the RSM service at the affected site are running and in a non-error state.</p> <p>See “Troubleshooting platform services” in the instructions for administering StorageGRID.</p>
S3 PUT Object size too large	<p>An S3 client is attempting to perform a PUT Object operation that exceeds the S3 size limits.</p> <ol style="list-style-type: none"> 1. Use the tenant ID shown in the alert details to identify the tenant account. 2. Go to Support > Tools > Logs, and collect the Application Logs for the Storage Node shown in the alert details. Specify a time period that is 15 minutes before and after the time of the alert. 3. Extract the downloaded archive, and navigate to the location of <code>broadcast.log</code> <code>(/GID<grid_id>_<time_stamp>/<site_node>/<time_stamp>/grid/broadcast.log)</code>. 4. Search the contents of <code>broadcast.log</code> for "method=PUT" and identify the IP address of the S3 client by looking at the <code>clientIP</code> field. 5. Inform all client users that the maximum PUT Object size is 5 GiB. 6. Use multipart uploads for objects larger than 5 GiB.

Alert name	Description and recommended actions
Services appliance link down on Admin Network port 1	<p>The Admin Network port 1 on the appliance is down or disconnected.</p> <ol style="list-style-type: none"> Check the cable and physical connection to Admin Network port 1. Address any connection issues. See the installation and maintenance instructions for your appliance hardware. If this port is disconnected on purpose, disable this rule. From the Grid Manager, select ALERTS > Rules, select the rule, and click Edit rule. Then, uncheck the Enabled check box. <ul style="list-style-type: none"> SG100 and SG1000 services appliances Disable alert rules
Services appliance link down on Admin Network (or Client Network)	<p>The appliance interface to the Admin Network (eth1) or the Client Network (eth2) is down or disconnected.</p> <ol style="list-style-type: none"> Check the cables, SFPs, and physical connections to the StorageGRID network. Address any connection issues. See the installation and maintenance instructions for your appliance hardware. If this port is disconnected on purpose, disable this rule. From the Grid Manager, select ALERTS > Rules, select the rule, and click Edit rule. Then, uncheck the Enabled check box. <ul style="list-style-type: none"> SG100 and SG1000 services appliances Disable alert rules
Services appliance link down on network port 1, 2, 3, or 4	<p>Network port 1, 2, 3, or 4 on the appliance is down or disconnected.</p> <ol style="list-style-type: none"> Check the cables, SFPs, and physical connections to the StorageGRID network. Address any connection issues. See the installation and maintenance instructions for your appliance hardware. If this port is disconnected on purpose, disable this rule. From the Grid Manager, select ALERTS > Rules, select the rule, and click Edit rule. Then, uncheck the Enabled check box. <ul style="list-style-type: none"> SG100 and SG1000 services appliances Disable alert rules

Alert name	Description and recommended actions
Services appliance storage connectivity degraded	<p>One of the two SSDs in a services appliance has failed or is out of synchronization with the other.</p> <p>Appliance functionality is not impacted, but you should address the issue immediately. If both drives fail, the appliance will no longer function.</p> <ol style="list-style-type: none"> From the Grid Manager, select NODES > services appliance, and then select the Hardware tab. Review the message in the Storage RAID Mode field. If the message shows the progress of a resynchronization operation, wait for the operation to complete and then confirm that the alert is resolved. A resynchronization message means that SSD was replaced recently or that it is being resynchronized for another reason. If the message indicates that one of the SSDs has failed, replace the failed drive as soon as possible. <p>For instructions on how to replace a drive in a services appliance, see the SG100 and SG1000 appliances installation and maintenance guide.</p> <p>SG100 and SG1000 services appliances</p>
Storage appliance link down on Admin Network port 1	<p>The Admin Network port 1 on the appliance is down or disconnected.</p> <ol style="list-style-type: none"> Check the cable and physical connection to Admin Network port 1. Address any connection issues. See the installation and maintenance instructions for your appliance hardware. If this port is disconnected on purpose, disable this rule. From the Grid Manager, select ALERTS > Rules, select the rule, and click Edit rule. Then, uncheck the Enabled check box. <ul style="list-style-type: none"> SG6000 storage appliances SG5700 storage appliances SG5600 storage appliances Disable alert rules

Alert name	Description and recommended actions
Storage appliance link down on Admin Network (or Client Network)	<p>The appliance interface to the Admin Network (eth1) or the Client Network (eth2) is down or disconnected.</p> <ol style="list-style-type: none"> Check the cables, SFPs, and physical connections to the StorageGRID network. Address any connection issues. See the installation and maintenance instructions for your appliance hardware. If this port is disconnected on purpose, disable this rule. From the Grid Manager, select ALERTS > Rules, select the rule, and click Edit rule. Then, uncheck the Enabled check box. <ul style="list-style-type: none"> SG6000 storage appliances SG5700 storage appliances SG5600 storage appliances Disable alert rules
Storage appliance link down on network port 1, 2, 3, or 4	<p>Network port 1, 2, 3, or 4 on the appliance is down or disconnected.</p> <ol style="list-style-type: none"> Check the cables, SFPs, and physical connections to the StorageGRID network. Address any connection issues. See the installation and maintenance instructions for your appliance hardware. If this port is disconnected on purpose, disable this rule. From the Grid Manager, select ALERTS > Rules, select the rule, and click Edit rule. Then, uncheck the Enabled check box. <ul style="list-style-type: none"> SG6000 storage appliances SG5700 storage appliances SG5600 storage appliances Disable alert rules
Storage appliance storage connectivity degraded	<p>There is a problem with one or more connections between the compute controller and storage controller.</p> <ol style="list-style-type: none"> Go to the appliance to check the port indicator lights. If a port's lights are off, confirm the cable is properly connected. As needed, replace the cable. Wait up to five minutes. <p>Note: If a second cable needs to be replaced, do not unplug it for at least 5 minutes. Otherwise, the root volume might become read-only, which requires a hardware restart.</p> <ol style="list-style-type: none"> From the Grid Manager, select NODES. Then, select the Hardware tab of the node that had the problem. Verify that the alert condition has resolved.

Alert name	Description and recommended actions
Storage device inaccessible	<p>A storage device cannot be accessed.</p> <p>This alert indicates that a volume cannot be mounted or accessed because of a problem with an underlying storage device.</p> <ol style="list-style-type: none"> Check the status of all storage devices used for the node: <ul style="list-style-type: none"> If the node is installed on a virtual machine or Linux host, follow the instructions for your operating system to run hardware diagnostics or perform a filesystem check. <ul style="list-style-type: none"> Install Red Hat Enterprise Linux or CentOS Install Ubuntu or Debian Install VMware If the node is installed on an SG100, SG1000 or SG6000 appliance, use the BMC. If the node is installed on a SG5600 or SG5700 appliance, use SANtricity System Manager. If necessary, replace the component. See the instructions for your appliance: <ul style="list-style-type: none"> SG6000 storage appliances SG5700 storage appliances SG5600 storage appliances
Tenant quota usage high	<p>A high percentage of tenant quota space is being used. If a tenant exceeds its quota, new ingestions are rejected.</p> <p>Note: This alert rule is disabled by default because it might generate a lot of notifications.</p> <ol style="list-style-type: none"> From the Grid Manager, select TENANTS. Sort the table by Quota Utilization. Select a tenant whose quota utilization is close to 100%. Do either or both of the following: <ul style="list-style-type: none"> Select Edit to increase the storage quota for the tenant. Notify the tenant that their quota utilization is high.

Alert name	Description and recommended actions
Unable to communicate with node	<p>One or more services are unresponsive, or the node cannot be reached.</p> <p>This alert indicates that a node is disconnected for an unknown reason. 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>Monitor this alert to see if the issue resolves on its own. If the issue persists:</p> <ol style="list-style-type: none"> 1. Determine if there is another alert affecting this node. This alert might be resolved when you resolve the other alert. 2. Confirm that all of the services on this node are running. If a service is stopped, try starting it. See the recovery and maintenance instructions. 3. Ensure that the host for the node is powered on. If it is not, start the host. <p>Note: If more than one host is powered off, see the recovery and maintenance instructions.</p> <ol style="list-style-type: none"> 4. Determine if there is a network connectivity issue between this node and the Admin Node. 5. If you cannot resolve the alert, contact technical support.
Unexpected node reboot	<p>A node rebooted unexpectedly within the last 24 hours.</p> <ol style="list-style-type: none"> 1. Monitor this alert. The alert will be cleared after 24 hours. However, if the node reboots unexpectedly again, this alert will be triggered again. 2. If you cannot resolve the alert, there might be a hardware failure. Contact technical support.
Unidentified corrupt object detected	<p>A file was found in replicated object storage that could not be identified as a replicated object.</p> <ol style="list-style-type: none"> 1. Determine if there are any issues with the underlying storage on a Storage Node. For example, run hardware diagnostics or perform a filesystem check. 2. After resolving any storage issues, run object existence check to determine if any replicated copies, as defined by your ILM policy, are missing. 3. Monitor this alert. The alert will clear after 24 hours, but will be triggered again if the issue has not been fixed. 4. If you cannot resolve the alert, contact technical support.

Commonly used Prometheus metrics

The Prometheus service on Admin Nodes collects time series metrics from the services on all nodes. While Prometheus collects more than a thousand metrics, a relatively small number are required to monitor the most critical StorageGRID operations.

Metrics are stored on each Admin Node until the space reserved for Prometheus data is full. When the `/var/local/mysql_ibdata/` volume reaches capacity, the oldest metrics are deleted first.

To obtain the complete list of metrics, use the Grid Management API.

1. From the top of the Grid Manager, select the help icon and select **API Documentation**.
2. Locate the **metrics** operations.
3. Execute the `GET /grid/metric-names` operation.
4. Download the results.

The following table lists the most commonly used Prometheus metrics. You can refer to this list to better understand the conditions in the default alert rules or to construct the conditions for custom alert rules.



Metrics that include *private* in their names are intended for internal use only and are subject to change between StorageGRID releases without notice.

Prometheus metric	Description
<code>alertmanager_notifications_failed_total</code>	The total number of failed alert notifications.
<code>node_filesystem_avail_bytes</code>	The amount of filesystem space available to non-root users in bytes.
<code>node_memory_MemAvailable_bytes</code>	Memory information field <code>MemAvailable_bytes</code> .
<code>node_network_carrier</code>	Carrier value of <code>/sys/class/net/<iface></code> .
<code>node_network_receive_errs_total</code>	Network device statistic <code>receive_errs</code> .
<code>node_network_transmit_errs_total</code>	Network device statistic <code>transmit_errs</code> .
<code>storagegrid_administratively_down</code>	The node is not connected to the grid for an expected reason. For example, the node, or services on the node, has been gracefully shut down, the node is rebooting, or the software is being upgraded.
<code>storagegrid_appliance_compute_controller_hardware_status</code>	The status of the compute controller hardware in an appliance.
<code>storagegrid_appliance_failed_disks</code>	For the storage controller in an appliance, the number of drives that are not optimal.

Prometheus metric	Description
storagegrid_appliance_storage_controller_hardware_status	The overall status of the storage controller hardware in an appliance.
storagegrid_content_buckets_and_containers	The total number of S3 buckets and Swift containers known by this Storage Node.
storagegrid_content_objects	The total number of S3 and Swift data objects known by this Storage Node. Count is valid only for data objects created by client applications that interface with the system through S3 or Swift.
storagegrid_content_objects_lost	The total number of objects this service detects as missing from the StorageGRID system. Action should be taken to determine the cause of the loss and if recovery is possible. Troubleshoot lost and missing object data
storagegrid_http_sessions_incoming_attempted	The total number of HTTP sessions that have been attempted to a Storage Node.
storagegrid_http_sessions_incoming_currently_established	The number of HTTP sessions that are currently active (open) on the Storage Node.
storagegrid_http_sessions_incoming_failed	The total number of HTTP sessions that failed to complete successfully, either due to a malformed HTTP request or a failure while processing an operation.
storagegrid_http_sessions_incoming_successful	The total number of HTTP sessions that have completed successfully.
storagegrid_ilm_awaiting_background_objects	The total number of objects on this node awaiting ILM evaluation from the scan.
storagegrid_ilm_awaiting_client_evaluation_objects_per_second	The current rate at which objects are evaluated against the ILM policy on this node.
storagegrid_ilm_awaiting_client_objects	The total number of objects on this node awaiting ILM evaluation from client operations (for example, ingest).
storagegrid_ilm_awaiting_total_objects	The total number of objects awaiting ILM evaluation.
storagegrid_ilm_scan_objects_per_second	The rate at which objects owned by this node are scanned and queued for ILM.

Prometheus metric	Description
storagegrid_ilm_scan_period_estimated_minutes	<p>The estimated time to complete a full ILM scan on this node.</p> <p>Note: A full scan does not guarantee that ILM has been applied to all objects owned by this node.</p>
storagegrid_load_balancer_endpoint_cert_expiry_time	The expiration time of the load balancer endpoint certificate in seconds since the epoch.
storagegrid_metadata_queries_average_latency_milliseconds	The average time required to run a query against the metadata store through this service.
storagegrid_network_received_bytes	The total amount of data received since installation.
storagegrid_network_transmitted_bytes	The total amount of data sent since installation.
storagegrid_node_cpu_utilization_percentage	The percentage of available CPU time currently being used by this service. Indicates how busy the service is. The amount of available CPU time depends on the number of CPUs for the server.
storagegrid_ntp_chosen_time_source_offset_milliseconds	Systematic offset of time provided by a chosen time source. Offset is introduced when the delay to reach a time source is not equal to the time required for the time source to reach the NTP client.
storagegrid_ntp_locked	The node is not locked to a network time protocol (NTP) server.
storagegrid_s3_data_transfers_bytes_ingested	The total amount of data ingested from S3 clients to this Storage Node since the attribute was last reset.
storagegrid_s3_data_transfers_bytes_retrieved	The total amount of data retrieved by S3 clients from this Storage Node since the attribute was last reset.
storagegrid_s3_operations_failed	The total number of failed S3 operations (HTTP status codes 4xx and 5xx), excluding those caused by S3 authorization failure.
storagegrid_s3_operations_successful	The total number of successful S3 operations (HTTP status code 2xx).
storagegrid_s3_operations_unauthorized	The total number of failed S3 operations that are the result of an authorization failure.

Prometheus metric	Description
storagegrid_servercertificate_management_interface_cert_expiry_days	The number of days before the Management Interface certificate expires.
storagegrid_servercertificate_storage_api_endpoints_cert_expiry_days	The number of days before the Object Storage API certificate expires.
storagegrid_service_cpu_seconds	The cumulative amount of time that the CPU has been used by this service since installation.
storagegrid_service_memory_usage_bytes	The amount of memory (RAM) currently in use by this service. This value is identical to that displayed by the Linux top utility as RES.
storagegrid_service_network_received_bytes	The total amount of data received by this service since installation.
storagegrid_service_network_transmitted_bytes	The total amount of data sent by this service.
storagegrid_service_restarts	The total number of times the service has been restarted.
storagegrid_service_runtime_seconds	The total amount of time that the service has been running since installation.
storagegrid_service_uptime_seconds	The total amount of time the service has been running since it was last restarted.
storagegrid_storage_state_current	<p>The current state of the storage services. Attribute values are:</p> <ul style="list-style-type: none"> • 10 = Offline • 15 = Maintenance • 20 = Read-only • 30 = Online
storagegrid_storage_status	<p>The current status of the storage services. Attribute values are:</p> <ul style="list-style-type: none"> • 0 = No Errors • 10 = In Transition • 20 = Insufficient Free Space • 30 = Volume(s) Unavailable • 40 = Error

Prometheus metric	Description
storagegrid_storage_utilization_metadata_bytes	An estimate of the total size of replicated and erasure coded object data on the Storage Node.
storagegrid_storage_utilization_metadata_allowed_bytes	The total space on volume 0 of each Storage Node that is allowed for object metadata. This value is always less than the actual space reserved for metadata on a node, because a portion of the reserved space is required for essential database operations (such as compaction and repair) and future hardware and software upgrades. The allowed space for object metadata controls overall object capacity.
storagegrid_storage_utilization_metadata_bytes	The amount of object metadata on storage volume 0, in bytes.
storagegrid_storage_utilization_total_space_bytes	The total amount of storage space allocated to all object stores.
storagegrid_storage_utilization_usable_space_bytes	The total amount of object storage space remaining. Calculated by adding together the amount of available space for all object stores on the Storage Node.
storagegrid_swift_data_transfers_bytes_ingested	The total amount of data ingested from Swift clients to this Storage Node since the attribute was last reset.
storagegrid_swift_data_transfers_bytes_retrieved	The total amount of data retrieved by Swift clients from this Storage Node since the attribute was last reset.
storagegrid_swift_operations_failed	The total number of failed Swift operations (HTTP status codes 4xx and 5xx), excluding those caused by Swift authorization failure.
storagegrid_swift_operations_successful	The total number of successful Swift operations (HTTP status code 2xx).
storagegrid_swift_operations_unauthorized	The total number of failed Swift operations that are the result of an authorization failure (HTTP status codes 401, 403, 405).
storagegrid_tenant_usage_data_bytes	The logical size of all objects for the tenant.
storagegrid_tenant_usage_object_count	The number of objects for the tenant.

Prometheus metric	Description
storagegrid_tenant_usage_quota_bytes	The maximum amount of logical space available for the tenant's objects. If a quota metric is not provided, an unlimited amount of space is available.

Alarms reference (legacy system)

The following table lists all of the legacy Default alarms. If an alarm is triggered, you can look up the alarm code in this table to find the recommended actions.



While the legacy alarm system continues to be supported, the alert system offers significant benefits and is easier to use.

Code	Name	Service	Recommended action
ABRL	Available Attribute Relays	BADC, BAMS, BARC, BCLB, BCMN, BLDR, BNMS, BSSM, BDDS	<p>Restore connectivity to a service (an ADC service) running an Attribute Relay Service as soon as possible. If there are no connected attribute relays, the grid node cannot report attribute values to the NMS service. Thus, the NMS service can no longer monitor the status of the service, or update attributes for the service.</p> <p>If the problem persists, contact technical support.</p>
ACMS	Available Metadata Services	BARC, BLDR, BCMN	<p>An alarm is triggered when an LDR or ARC service loses connection to a DDS service. If this occurs, ingest or retrieve transactions cannot be processed. If the unavailability of DDS services is only a brief transient issue, transactions can be delayed.</p> <p>Check and restore connections to a DDS service to clear this alarm and return the service to full functionality.</p>
ACTS	Cloud Tiering Service Status	ARC	<p>Only available for Archive Nodes with a Target Type of Cloud Tiering - Simple Storage Service (S3).</p> <p>If the ACTS attribute for the Archive Node is set to Read-Only Enabled or Read-Write Disabled, you must set the attribute to Read-Write Enabled.</p> <p>If a major alarm is triggered due to an authentication failure, verify the credentials associated with destination bucket and update values, if necessary.</p> <p>If a major alarm is triggered due to any other reason, contact technical support.</p>

Code	Name	Service	Recommended action
ADCA	ADC Status	ADC	<p>If an alarm is triggered, select SUPPORT > Tools > Grid topology. Then select site > grid node > ADC > Overview > Main and ADC > Alarms > Main to determine the cause of the alarm.</p> <p>If the problem persists, contact technical support.</p>
ADCE	ADC State	ADC	<p>If the value of ADC State is Standby, continue monitoring the service and if the problem persists, contact technical support.</p> <p>If the value of ADC State is Offline, restart the service. If the problem persists, contact technical support.</p>
AITE	Retrieve State	BARC	<p>Only available for Archive Node's with a Target Type of Tivoli Storage Manager (TSM).</p> <p>If the value of Retrieve State is Waiting for Target, check the TSM middleware server and ensure that it is operating correctly. If the Archive Node has just been added to the StorageGRID system, ensure that the Archive Node's connection to the targeted external archival storage system is configured correctly.</p> <p>If the value of Archive Retrieve State is Offline, attempt to update the state to Online. Select SUPPORT > Tools > Grid topology. Then select site > grid node > ARC > Retrieve > Configuration > Main, select Archive Retrieve State > Online, and click Apply Changes.</p> <p>If the problem persists, contact technical support.</p>
AITU	Retrieve Status	BARC	<p>If the value of Retrieve Status is Target Error, check the targeted external archival storage system for errors.</p> <p>If the value of Archive Retrieve Status is Session Lost, check the targeted external archival storage system to ensure it is online and operating correctly. Check the network connection with the target.</p> <p>If the value of Archive Retrieve Status is Unknown Error, contact technical support.</p>

Code	Name	Service	Recommended action
ALIS	Inbound Attribute Sessions	ADC	<p>If the number of inbound attribute sessions on an attribute relay grows too large, it can be an indication that the StorageGRID system has become unbalanced. Under normal conditions, attribute sessions should be evenly distributed amongst ADC services. An imbalance can lead to performance issues.</p> <p>If the problem persists, contact technical support.</p>
ALOS	Outbound Attribute Sessions	ADC	<p>The ADC service has a high number of attribute sessions, and is becoming overloaded. If this alarm is triggered, contact technical support.</p>
ALUR	Unreachable Attribute Repositories	ADC	<p>Check network connectivity with the NMS service to ensure that the service can contact the attribute repository.</p> <p>If this alarm is triggered and network connectivity is good, contact technical support.</p>
AMQS	Audit Messages Queued	BADC, BAMS, BARC, BCLB, BCMN, BLDR, BNMS, BDDS	<p>If audit messages cannot be immediately forwarded to an audit relay or repository, the messages are stored in a disk queue. If the disk queue becomes full, outages can occur.</p> <p>To allow you to respond in time to prevent an outage, AMQS alarms are triggered when the number of messages in the disk queue reaches the following thresholds:</p> <ul style="list-style-type: none"> • Notice: More than 100,000 messages • Minor: At least 500,000 messages • Major: At least 2,000,000 messages • Critical: At least 5,000,000 messages <p>If an AMQS alarm is triggered, check the load on the system—if there have been a significant number of transactions, the alarm should resolve itself over time. In this case, you can ignore the alarm.</p> <p>If the alarm persists and increases in severity, view a chart of the queue size. If the number is steadily increasing over hours or days, the audit load has likely exceeded the audit capacity of the system. Reduce the client operation rate or decrease the number of audit messages logged by changing the audit level to Error or Off. See Configure audit messages and log destinations.</p>

Code	Name	Service	Recommended action
AOTE	Store State	BARC	<p>Only available for Archive Node's with a Target Type of Tivoli Storage Manager (TSM).</p> <p>If the value of Store State is Waiting for Target, check the external archival storage system and ensure that it is operating correctly. If the Archive Node has just been added to the StorageGRID system, ensure that the Archive Node's connection to the targeted external archival storage system is configured correctly.</p> <p>If the value of Store State is Offline, check the value of Store Status. Correct any problems before moving the Store State back to Online.</p>
AOTU	Store Status	BARC	<p>If the value of Store Status is Session Lost check that the external archival storage system is connected and online.</p> <p>If the value of Target Error, check the external archival storage system for errors.</p> <p>If the value of Store Status is Unknown Error, contact technical support.</p>
APMS	Storage Multipath Connectivity	SSM	<p>If the multipath state alarm appears as “Degraded” (select SUPPORT > Tools > Grid topology, then select site > grid node > SSM > Events), do the following:</p> <ol style="list-style-type: none"> <li data-bbox="833 1205 1481 1269">1. Plug in or replace the cable that does not display any indicator lights. <li data-bbox="833 1284 1176 1320">2. Wait one to five minutes. <p data-bbox="866 1353 1486 1522">Do not unplug the other cable until at least five minutes after you plug in the first one. Unplugging too early can cause the root volume to become read-only, which requires that the hardware be restarted.</p> <ol style="list-style-type: none"> <li data-bbox="833 1564 1486 1660">3. Return to the SSM > Resources page, and verify that the “Degraded” Multipath status has changed to “Nominal” in the Storage Hardware section.

Code	Name	Service	Recommended action
ARCE	ARC State	ARC	<p>The ARC service has a state of Standby until all ARC components (Replication, Store, Retrieve, Target) have started. It then transitions to Online.</p> <p>If the value of ARC State does not transition from Standby to Online, check the status of the ARC components.</p> <p>If the value of ARC State is Offline, restart the service. If the problem persists, contact technical support.</p>
AROQ	Objects Queued	ARC	<p>This alarm can be triggered if the removable storage device is running slowly due to problems with the targeted external archival storage system, or if it encounters multiple read errors. Check the external archival storage system for errors, and ensure that it is operating correctly.</p> <p>In some cases, this error can occur as a result of a high rate of data requests. Monitor the number of objects queued as system activity declines.</p>
ARRF	Request Failures	ARC	<p>If a retrieval from the targeted external archival storage system fails, the Archive Node retries the retrieval as the failure can be due to a transient issue. However, if the object data is corrupt or has been marked as being permanently unavailable, the retrieval does not fail. Instead, the Archive Node continuously retries the retrieval and the value for Request Failures continues to increase.</p> <p>This alarm can indicate that the storage media holding the requested data is corrupt. Check the external archival storage system to further diagnose the problem.</p> <p>If you determine that the object data is no longer in the archive, the object will have to be removed from the StorageGRID system. For more information, contact technical support.</p> <p>Once the problem that triggered this alarm is addressed, reset the failures count. Select SUPPORT > Tools > Grid topology. Then select site > grid node > ARC > Retrieve > Configuration > Main, select Reset Request Failure Count and click Apply Changes.</p>

Code	Name	Service	Recommended action
ARRV	Verification Failures	ARC	<p>To diagnose and correct this problem, contact technical support.</p> <p>Once the problem that triggered this alarm is addressed, reset the failures count. Select SUPPORT > Tools > Grid topology. Then select site > grid node > ARC > Retrieve > Configuration > Main, select Reset Verification Failure Count and click Apply Changes.</p>
ARVF	Store Failures	ARC	<p>This alarm can occur as a result of errors with the targeted external archival storage system. Check the external archival storage system for errors, and ensure that it is operating correctly.</p> <p>Once the problem that triggered this alarm is addressed, reset the failures count. Select SUPPORT > Tools > Grid topology. Then select site > grid node > ARC > Retrieve > Configuration > Main, select Reset Store Failure Count, and click Apply Changes.</p>
ASXP	Audit Shares	AMS	<p>An alarm is triggered if the value of Audit Shares is Unknown. This alarm can indicate a problem with the installation or configuration of the Admin Node.</p> <p>If the problem persists, contact technical support.</p>
AUMA	AMS Status	AMS	<p>If the value of AMS Status is DB Connectivity Error, restart the grid node.</p> <p>If the problem persists, contact technical support.</p>
AUME	AMS State	AMS	<p>If the value of AMS State is Standby, continue monitoring the StorageGRID system. If the problem persists, contact technical support.</p> <p>If the value of AMS State is Offline, restart the service. If the problem persists, contact technical support.</p>
AUXS	Audit Export Status	AMS	<p>If an alarm is triggered, correct the underlying problem, and then restart the AMS service.</p> <p>If the problem persists, contact technical support.</p>
BADD	Storage Controller Failed Drive Count	SSM	This alarm is triggered when one or more drives in a StorageGRID appliance has failed or is not optimal. Replace the drives as required.

Code	Name	Service	Recommended action
BASF	Available Object Identifiers	CMN	<p>When a StorageGRID system is provisioned, the CMN service is allocated a fixed number of object identifiers. This alarm is triggered when the StorageGRID system begins to exhaust its supply of object identifiers.</p> <p>To allocate more identifiers, contact technical support.</p>
BASS	Identifier Block Allocation Status	CMN	<p>By default, an alarm is triggered when object identifiers cannot be allocated because ADC quorum cannot be reached.</p> <p>Identifier block allocation on the CMN service requires a quorum ($50\% + 1$) of the ADC services to be online and connected. If quorum is unavailable, the CMN service is unable to allocate new identifier blocks until ADC quorum is re-established. If ADC quorum is lost, there is generally no immediate impact on the StorageGRID system (clients can still ingest and retrieve content), as approximately one month's supply of identifiers are cached elsewhere in the grid; however, if the condition continues, the StorageGRID system will lose the ability to ingest new content.</p> <p>If an alarm is triggered, investigate the reason for the loss of ADC quorum (for example, it can be a network or Storage Node failure) and take corrective action.</p> <p>If the problem persists, contact technical support.</p>
BRDT	Compute Controller Chassis Temperature	SSM	<p>An alarm is triggered if the temperature of the compute controller in a StorageGRID appliance exceeds a nominal threshold.</p> <p>Check hardware components and environmental issues for overheated condition. If necessary, replace the component.</p>
BTOF	Offset	BADC, BLDR, BNMS, BAMS, BCLB, BCMN, BARC	<p>An alarm is triggered if the service time (seconds) differs significantly from the operating system time. Under normal conditions, the service should resynchronize itself. If the service time drifts too far from the operating system time, system operations can be affected. Confirm that the StorageGRID system's time source is correct.</p> <p>If the problem persists, contact technical support.</p>

Code	Name	Service	Recommended action
BTSE	Clock State	BADC, BLDR, BNMS, BAMS, BCLB, BCMN, BARC	<p>An alarm is triggered if the service's time is not synchronized with the time tracked by the operating system. Under normal conditions, the service should resynchronize itself. If the time drifts too far from operating system time, system operations can be affected. Confirm that the StorageGRID system's time source is correct.</p> <p>If the problem persists, contact technical support.</p>
CAHP	Java Heap Usage Percent	DDS	<p>An alarm is triggered if Java is unable to perform garbage collection at a rate that allows enough heap space for the system to properly function. An alarm might indicate a user workload that exceeds the resources available across the system for the DDS metadata store. Check the ILM Activity in the Dashboard, or select SUPPORT > Tools > Grid topology, then select site > grid node > DDS > Resources > Overview > Main.</p> <p>If the problem persists, contact technical support.</p>
CAIH	Number Available Ingest Destinations	CLB	This alarm is deprecated.
CAQH	Number Available Destinations	CLB	<p>This alarm clears when underlying issues of available LDR services are corrected. Ensure that the HTTP component of LDR services are online and running normally.</p> <p>If the problem persists, contact technical support.</p>

Code	Name	Service	Recommended action
CASA	Data Store Status	DDS	<p>An alarm is raised if the Cassandra metadata store becomes unavailable.</p> <p>Check the status of Cassandra:</p> <ol style="list-style-type: none"> 1. At the Storage Node, log in as admin and <code>su</code> to root using the password listed in the <code>Passwords.txt</code> file. 2. Enter: <code>service cassandra status</code> 3. If Cassandra is not running, restart it: <code>service cassandra restart</code> <p>This alarm might also indicate that the metadata store (Cassandra database) for a Storage Node requires rebuilding.</p> <p>See information about troubleshooting the Services: Status - Cassandra (SVST) alarm in Troubleshoot metadata issues.</p> <p>If the problem persists, contact technical support.</p>
CASE	Data Store State	DDS	This alarm is triggered during installation or expansion to indicate a new data store is joining the grid.
CCES	Incoming Sessions - Established	CLB	This alarm is triggered if there are 20,000 or more HTTP sessions currently active (open) on the Gateway Node. If a client has too many connections, you might see connection failures. You should reduce the workload.
CCNA	Compute Hardware	SSM	This alarm is triggered if the status of the compute controller hardware in a StorageGRID appliance is Needs Attention.

Code	Name	Service	Recommended action
CDLP	Metadata Used Space (Percent)	DDS	<p>This alarm is triggered when the Metadata Effective Space (CEMS) reaches 70% full (minor alarm), 90% full (major alarm), and 100% full (critical alarm).</p> <p>If this alarm reaches the 90% threshold, a warning appears on the Dashboard in the Grid Manager. You must perform an expansion procedure to add new Storage Nodes as soon as possible. See Expand your grid.</p> <p>If this alarm reaches the 100% threshold, you must stop ingesting objects and add Storage Nodes immediately. Cassandra requires a certain amount of space to perform essential operations such as compaction and repair. These operations will be impacted if object metadata uses more than 100% of the allowed space. Undesirable results can occur.</p> <p>Note: Contact technical support if you are unable to add Storage Nodes.</p> <p>After new Storage Nodes are added, the system automatically rebalances object metadata across all Storage Nodes, and the alarm clears.</p> <p>Also see information about troubleshooting the Low metadata storage alert in Troubleshoot metadata issues.</p>
CLBA	CLB Status	CLB	<p>If an alarm is triggered, select SUPPORT > Tools > Grid topology, then select site > grid node > CLB > Overview > Main and CLB > Alarms > Main to determine the cause of the alarm and to troubleshoot the problem.</p> <p>If the problem persists, contact technical support.</p>
CLBE	CLB State	CLB	<p>If the value of CLB State is Standby, continue monitoring the situation and if the problem persists, contact technical support.</p> <p>If the state is Offline and there are no known server hardware issues (for example, the server is unplugged) or scheduled downtime, restart the service. If the problem persists, contact technical support.</p>

Code	Name	Service	Recommended action
CMNA	CMN Status	CMN	<p>If the value of CMN Status is Error, select SUPPORT > Tools > Grid topology, then select site > grid node > CMN > Overview > Main and CMN > Alarms > Main to determine the cause of the error and to troubleshoot the problem.</p> <p>An alarm is triggered and the value of CMN Status is No Online CMN during a hardware refresh of the primary Admin Node when the CMNs are switched (the value of the old CMN State is Standby and the new is Online).</p> <p>If the problem persists, contact technical support.</p>
CPRC	Remaining Capacity	NMS	<p>An alarm is triggered if the remaining capacity (number of available connections that can be opened to the NMS database) falls below the configured alarm severity.</p> <p>If an alarm is triggered, contact technical support.</p>
CPSA	Compute Controller Power Supply A	SSM	<p>An alarm is triggered if there is an issue with power supply A in the compute controller for a StorageGRID appliance.</p> <p>If necessary, replace the component.</p>
CPSB	Compute Controller Power Supply B	SSM	<p>An alarm is triggered if there is an issue with power supply B in the compute controller for a StorageGRID appliance.</p> <p>If necessary, replace the component.</p>
CPUT	Compute Controller CPU Temperature	SSM	<p>An alarm is triggered if the temperature of the CPU in the compute controller in a StorageGRID appliance exceeds a nominal threshold.</p> <p>If the Storage Node is a StorageGRID appliance, the StorageGRID system indicates that the controller needs attention.</p> <p>Check hardware components and environment issues for overheated condition. If necessary, replace the component.</p>
DNST	DNS Status	SSM	<p>After installation completes, a DNST alarm is triggered in the SSM service. After the DNS is configured and the new server information reaches all grid nodes, the alarm is canceled.</p>

Code	Name	Service	Recommended action
ECCD	Corrupt Fragments Detected	LDR	<p>An alarm is triggered when the background verification process detects a corrupt erasure coded fragment. If a corrupt fragment is detected, an attempt is made to rebuild the fragment. Reset the Corrupt Fragments Detected and Copies Lost attributes to zero and monitor them to see if counts go up again. If counts do go up, there may be a problem with the Storage Node's underlying storage. A copy of erasure coded object data is not considered missing until such time that the number of lost or corrupt fragments breaches the erasure code's fault tolerance; therefore, it is possible to have corrupt fragment and to still be able to retrieve the object.</p> <p>If the problem persists, contact technical support.</p>
ECST	Verification Status	LDR	<p>This alarm indicates the current status of the background verification process for erasure coded object data on this Storage Node.</p> <p>A major alarm is triggered if there is an error in the background verification process.</p>
FOPN	Open File Descriptors	BADC, BAMS, BARC, BCLB, BCMN, BLDR, BNMS, BSSM, BDDS	FOPN can become large during peak activity. If it does not diminish during periods of slow activity, contact technical support.
HSTE	HTTP State	BLDR	See recommended actions for HSTU.

Code	Name	Service	Recommended action
HSTU	HTTP Status	BLDR	<p>HSTE and HSTU are related to the HTTP protocol for all LDR traffic, including S3, Swift, and other internal StorageGRID traffic. An alarm indicates that one of the following situations has occurred:</p> <ul style="list-style-type: none"> • The HTTP protocol has been taken offline manually. • The Auto-Start HTTP attribute has been disabled. • The LDR service is shutting down. <p>The Auto-Start HTTP attribute is enabled by default. If this setting is changed, HTTP could remain offline after a restart.</p> <p>If necessary, wait for the LDR service to restart.</p> <p>Select SUPPORT > Tools > Grid topology. Then select Storage Node > LDR > Configuration. If the HTTP protocol is offline, place it online. Verify that the Auto-Start HTTP attribute is enabled.</p> <p>If the HTTP protocol remains offline, contact technical support.</p>
HTAS	Auto-Start HTTP	LDR	Specifies whether to start HTTP services automatically on start-up. This is a user-specified configuration option.
IRSU	Inbound Replication Status	BLDR, BARC	An alarm indicates that inbound replication has been disabled. Confirm configuration settings: Select SUPPORT > Tools > Grid topology . Then select site > grid node > LDR > Replication > Configuration > Main .
LATA	Average Latency	NMS	<p>Check for connectivity issues.</p> <p>Check system activity to confirm that there is an increase in system activity. An increase in system activity will result in an increase to attribute data activity. This increased activity will result in a delay to the processing of attribute data. This can be normal system activity and will subside.</p> <p>Check for multiple alarms. An increase in average latency times can be indicated by an excessive number of triggered alarms.</p> <p>If the problem persists, contact technical support.</p>

Code	Name	Service	Recommended action
LDRE	LDR State	LDR	<p>If the value of LDR State is Standby, continue monitoring the situation and if the problem persists, contact technical support.</p> <p>If the value of LDR State is Offline, restart the service. If the problem persists, contact technical support.</p>
LOST	Lost Objects	DDS, LDR	<p>Triggered when the StorageGRID system fails to retrieve a copy of the requested object from anywhere in the system. Before a LOST (Lost Objects) alarm is triggered, the system attempts to retrieve and replace a missing object from elsewhere in the system.</p> <p>Lost objects represent a loss of data. The Lost Objects attribute is incremented whenever the number of locations for an object drops to zero without the DDS service purposely purging the content to satisfy the ILM policy.</p> <p>Investigate LOST (LOST Object) alarms immediately. If the problem persists, contact technical support.</p> <p>Troubleshoot lost and missing object data</p>
MCEP	Management Interface Certificate Expiry	CMN	<p>Triggered when the certificate used for accessing the management interface is about to expire.</p> <ol style="list-style-type: none"> From the Grid Manager, select CONFIGURATION > Security > Certificates. On the Global tab, select Management interface certificate. Upload a new management interface certificate.
MINQ	E-mail Notifications Queued	NMS	<p>Check the network connections of the servers hosting the NMS service and the external mail server. Also confirm that the email server configuration is correct.</p> <p>Configure email server settings for alarms (legacy system)</p>
MINS	E-mail Notifications Status	BNMS	<p>A minor alarm is triggered if the NMS service is unable to connect to the mail server. Check the network connections of the servers hosting the NMS service and the external mail server. Also confirm that the email server configuration is correct.</p> <p>Configure email server settings for alarms (legacy system)</p>

Code	Name	Service	Recommended action
MISS	NMS Interface Engine Status	BNMS	An alarm is triggered if the NMS interface engine on the Admin Node that gathers and generates interface content is disconnected from the system. Check Server Manager to determine if the server individual application is down.
NANG	Network Auto Negotiate Setting	SSM	<p>Check the network adapter configuration. The setting must match preferences of your network routers and switches.</p> <p>An incorrect setting can have a severe impact on system performance.</p>
NDUP	Network Duplex Setting	SSM	<p>Check the network adapter configuration. The setting must match preferences of your network routers and switches.</p> <p>An incorrect setting can have a severe impact on system performance.</p>
NLNK	Network Link Detect	SSM	<p>Check the network cable connections on the port and at the switch.</p> <p>Check the network router, switch, and adapter configurations.</p> <p>Restart the server.</p> <p>If the problem persists, contact technical support.</p>
NRER	Receive Errors	SSM	<p>The following can be causes of NRER alarms:</p> <ul style="list-style-type: none"> • Forward error correction (FEC) mismatch • Switch port and NIC MTU mismatch • High link error rates • NIC ring buffer overrun <p>See information about troubleshooting the Network Receive Error (NRER) alarm in Troubleshoot network, hardware, and platform issues.</p>

Code	Name	Service	Recommended action
NRLY	Available Audit Relays	BADC, BARC, BCLB, BCMN, BLDR, BNMS, BDDS	If audit relays are not connected to ADC services, audit events cannot be reported. They are queued and unavailable to users until the connection is restored. Restore connectivity to an ADC service as soon as possible. If the problem persists, contact technical support.
NSCA	NMS Status	NMS	If the value of NMS Status is DB Connectivity Error, restart the service. If the problem persists, contact technical support.
NSCE	NMS State	NMS	If the value of NMS State is Standby, continue monitoring and if the problem persists, contact technical support. If the value of NMS State is Offline, restart the service. If the problem persists, contact technical support.
NSPD	Speed	SSM	This can be caused by network connectivity or driver compatibility issues. If the problem persists, contact technical support.
NTBR	Free Tablespace	NMS	If an alarm is triggered, check how fast database usage has been changing. A sudden drop (as opposed to a gradual change over time) indicates an error condition. If the problem persists, contact technical support. Adjusting the alarm threshold allows you to proactively manage when additional storage needs to be allocated. If the available space reaches a low threshold (see alarm threshold), contact technical support to change the database allocation.

Code	Name	Service	Recommended action
NTER	Transmit Errors	SSM	<p>These errors can clear without being manually reset. If they do not clear, check network hardware. Check that the adapter hardware and driver are correctly installed and configured to work with your network routers and switches.</p> <p>When the underlying problem is resolved, reset the counter. Select SUPPORT > Tools > Grid topology. Then select site > grid node > SSM > Resources > Configuration > Main, select Reset Transmit Error Count, and click Apply Changes.</p>
NTFQ	NTP Frequency Offset	SSM	If the frequency offset exceeds the configured threshold, there is likely a hardware problem with the local clock. If the problem persists, contact technical support to arrange a replacement.
NTLK	NTP Lock	SSM	If the NTP daemon is not locked to an external time source, check network connectivity to the designated external time sources, their availability, and their stability.
NTOF	NTP Time Offset	SSM	If the time offset exceeds the configured threshold, there is likely a hardware problem with the oscillator of the local clock. If the problem persists, contact technical support to arrange a replacement.
NTSJ	Chosen Time Source Jitter	SSM	<p>This value indicates the reliability and stability of the time source that NTP on the local server is using as its reference.</p> <p>If an alarm is triggered, it can be an indication that the time source's oscillator is defective, or that there is a problem with the WAN link to the time source.</p>
NTSU	NTP Status	SSM	If the value of NTP Status is Not Running, contact technical support.
OPST	Overall Power Status	SSM	<p>An alarm is triggered if the power of a StorageGRID appliance deviates from the recommended operating voltage.</p> <p>Check the status of Power Supply A or B to determine which power supply is operating abnormally.</p> <p>If necessary, replace the power supply.</p>

Code	Name	Service	Recommended action
OQRT	Objects Quarantined	LDR	<p>After the objects are automatically restored by the StorageGRID system, the quarantined objects can be removed from the quarantine directory.</p> <ol style="list-style-type: none"> 1. Select SUPPORT > Tools > Grid topology. 2. Select site > Storage Node > LDR > Verification > Configuration > Main. 3. Select Delete Quarantined Objects. 4. Click Apply Changes. <p>The quarantined objects are removed, and the count is reset to zero.</p>
ORSU	Outbound Replication Status	BLDR, BARC	<p>An alarm indicates that outbound replication is not possible: storage is in a state where objects cannot be retrieved. An alarm is triggered if outbound replication is disabled manually. Select SUPPORT > Tools > Grid topology. Then select site > grid node > LDR > Replication > Configuration.</p> <p>An alarm is triggered if the LDR service is unavailable for replication. Select SUPPORT > Tools > Grid topology. Then select site > grid node > LDR > Storage.</p>
OSLF	Shelf Status	SSM	<p>An alarm is triggered if the status of one of the components in the storage shelf for a storage appliance is degraded. Storage shelf components include the IOMs, fans, power supplies, and drive drawers. If this alarm is triggered, see the maintenance instructions for your appliance.</p>
PMEM	Service Memory Usage (Percent)	BADC, BAMS, BARC, BCLB, BCMN, BLDR, BNMS, BSSM, BDDS	<p>Can have a value of Over Y% RAM, where Y represents the percentage of memory being used by the server.</p> <p>Figures under 80% are normal. Over 90% is considered a problem.</p> <p>If memory usage is high for a single service, monitor the situation and investigate.</p> <p>If the problem persists, contact technical support.</p>
PSAS	Power Supply A Status	SSM	<p>An alarm is triggered if power supply A in a StorageGRID appliance deviates from the recommended operating voltage.</p> <p>If necessary, replace power supply A.</p>

Code	Name	Service	Recommended action
PSBS	Power Supply B Status	SSM	<p>An alarm is triggered if power supply B in a StorageGRID appliance deviates from the recommended operating voltage.</p> <p>If necessary, replace the power supply B.</p>
RDTE	Tivoli Storage Manager State	BARC	<p>Only available for Archive Nodes with a Target Type of Tivoli Storage Manager (TSM).</p> <p>If the value of Tivoli Storage Manager State is Offline, check Tivoli Storage Manager Status and resolve any problems.</p> <p>Bring the component back online. Select SUPPORT > Tools > Grid topology. Then select site > grid node > ARC > Target > Configuration > Main, select Tivoli Storage Manager State > Online, and click Apply Changes.</p>
RDTU	Tivoli Storage Manager Status	BARC	<p>Only available for Archive Nodes with a Target Type of Tivoli Storage Manager (TSM).</p> <p>If the value of Tivoli Storage Manager Status is Configuration Error and the Archive Node has just been added to the StorageGRID system, ensure that the TSM middleware server is correctly configured.</p> <p>If the value of Tivoli Storage Manager Status is Connection Failure, or Connection Failure, Retrying, check the network configuration on the TSM middleware server, and the network connection between the TSM middleware server and the StorageGRID system.</p> <p>If the value of Tivoli Storage Manager Status is Authentication Failure, or Authentication Failure, Reconnecting, the StorageGRID system can connect to the TSM middleware server, but cannot authenticate the connection. Check that the TSM middleware server is configured with the correct user, password, and permissions, and restart the service.</p> <p>If the value of Tivoli Storage Manager Status is Session Failure, an established session has been lost unexpectedly. Check the network connection between the TSM middleware server and the StorageGRID system. Check the middleware server for errors.</p> <p>If the value of Tivoli Storage Manager Status is Unknown Error, contact technical support.</p>

Code	Name	Service	Recommended action
RIRF	Inbound Replications — Failed	BLDR, BARC	<p>An Inbound Replications — Failed alarm can occur during periods of high load or temporary network disruptions. After system activity reduces, this alarm should clear. If the count of failed replications continues to increase, look for network problems and verify that the source and destination LDR and ARC services are online and available.</p> <p>To reset the count, select SUPPORT > Tools > Grid topology, then select site > grid node > LDR > Replication > Configuration > Main. Select Reset Inbound Replication Failure Count, and click Apply Changes.</p>
RIRQ	Inbound Replications — Queued	BLDR, BARC	<p>Alarms can occur during periods of high load or temporary network disruption. After system activity reduces, this alarm should clear. If the count for queued replications continues to increase, look for network problems and verify that the source and destination LDR and ARC services are online and available.</p>
RORQ	Outbound Replications — Queued	BLDR, BARC	<p>The outbound replication queue contains object data being copied to satisfy ILM rules and objects requested by clients.</p> <p>An alarm can occur as a result of a system overload. Wait to see if the alarm clears when system activity declines. If the alarm recurs, add capacity by adding Storage Nodes.</p>
SAVP	Total Usable Space (Percent)	LDR	<p>If usable space reaches a low threshold, options include expanding the StorageGRID system or move object data to archive through an Archive Node.</p>

Code	Name	Service	Recommended action
SCAS	Status	CMN	<p>If the value of Status for the active grid task is Error, look up the grid task message. Select SUPPORT > Tools > Grid topology. Then select site > grid node > CMN > Grid Tasks > Overview > Main. The grid task message displays information about the error (for example, “check failed on node 12130011”).</p> <p>After you have investigated and corrected the problem, restart the grid task. Select SUPPORT > Tools > Grid topology. Then select site > grid node > CMN > Grid Tasks > Configuration > Main, and select Actions > Run.</p> <p>If the value of Status for a grid task being aborted is Error, retry aborting the grid task.</p> <p>If the problem persists, contact technical support.</p>
SCEP	Storage API Service Endpoints Certificate Expiry	CMN	<p>Triggered when the certificate used for accessing storage API endpoints is about to expire.</p> <ol style="list-style-type: none"> 1. Select CONFIGURATION > Security > Certificates. 2. On the Global tab, select S3 and Swift API certificate. 3. Upload a new S3 and Swift API certificate.
SCHR	Status	CMN	<p>If the value of Status for the historical grid task is Aborted, investigate the reason and run the task again if required.</p> <p>If the problem persists, contact technical support.</p>
SCSA	Storage Controller A	SSM	<p>An alarm is triggered if there is an issue with storage controller A in a StorageGRID appliance.</p> <p>If necessary, replace the component.</p>
SCSB	Storage Controller B	SSM	<p>An alarm is triggered if there is an issue with storage controller B in a StorageGRID appliance.</p> <p>If necessary, replace the component.</p> <p>Some appliance models do not have a storage controller B.</p>

Code	Name	Service	Recommended action
SHLH	Health	LDR	If the value of Health for an object store is Error, check and correct: <ul style="list-style-type: none"> problems with the volume being mounted file system errors
SLSA	CPU Load Average	SSM	The higher the value the busier the system. If the CPU Load Average persists at a high value, the number of transactions in the system should be investigated to determine whether this is due to heavy load at the time. View a chart of the CPU load average: Select SUPPORT > Tools > Grid topology . Then select site > grid node > SSM > Resources > Reports > Charts . If the load on the system is not heavy and the problem persists, contact technical support.
SMST	Log Monitor State	SSM	If the value of Log Monitor State is not Connected for a persistent period of time, contact technical support.
SMTT	Total Events	SSM	If the value of Total Events is greater than zero, check if there are known events (such as network failures) that can be the cause. Unless these errors have been cleared (that is, the count has been reset to 0), Total Events alarms can be triggered. When an issue is resolved, reset the counter to clear the alarm. Select NODES > site > grid node > Events > Reset event counts . <div style="display: flex; align-items: center; margin-top: 20px;"> ⓘ <p>To reset event counts, you must have the Grid Topology Page Configuration permission.</p> </div> If the value of Total Events is zero, or the number increases and the problem persists, contact technical support.
SNST	Status	CMN	An alarm indicates that there is a problem storing the grid task bundles. If the value of Status is Checkpoint Error or Quorum Not Reached, confirm that a majority of ADC services are connected to the StorageGRID system (50 percent plus one) and then wait a few minutes. If the problem persists, contact technical support.

Code	Name	Service	Recommended action
SOSS	Storage Operating System Status	SSM	<p>An alarm is triggered if SANtricity software indicates that there is a “Needs attention” issue with a component in a StorageGRID appliance.</p> <p>Select NODES. Then select appliance Storage Node > Hardware. Scroll down to view the status of each component. In SANtricity software, check other appliance components to isolate the issue.</p>
SSMA	SSM Status	SSM	<p>If the value of SSM Status is Error, select SUPPORT > Tools > Grid topology, then select site > grid node > SSM > Overview > Main and SSM > Overview > Alarms to determine the cause of the alarm.</p> <p>If the problem persists, contact technical support.</p>
SSME	SSM State	SSM	<p>If the value of SSM State is Standby, continue monitoring, and if the problem persists, contact technical support.</p> <p>If the value of SSM State is Offline, restart the service. If the problem persists, contact technical support.</p>
SSTS	Storage Status	BLDR	<p>If the value of Storage Status is Insufficient Usable Space, there is no more available storage on the Storage Node and data ingests are redirected to other available Storage Node. Retrieval requests can continue to be delivered from this grid node.</p> <p>Additional storage should be added. It is not impacting end user functionality, but the alarm persists until additional storage is added.</p> <p>If the value of Storage Status is Volume(s) Unavailable, a part of the storage is unavailable. Storage and retrieval from these volumes is not possible. Check the volume’s Health for more information: Select SUPPORT > Tools > Grid topology. Then select site > grid node > LDR > Storage > Overview > Main. The volume’s Health is listed under Object Stores.</p> <p>If the value of Storage Status is Error, contact technical support.</p> <p>Troubleshoot the Storage Status (SSTS) alarm</p>

Code	Name	Service	Recommended action
SVST	Status	SSM	<p>This alarm clears when other alarms related to a non-running service are resolved. Track the source service alarms to restore operation.</p> <p>Select SUPPORT > Tools > Grid topology. Then select site > grid node > SSM > Services > Overview > Main. When the status of a service is shown as Not Running, its state is Administratively Down. The service's status can be listed as Not Running for the following reasons:</p> <ul style="list-style-type: none"> • The service has been manually stopped (<code>/etc/init.d/<service> stop</code>). • There is an issue with the MySQL database and Server Manager shuts down the MI service. • A grid node has been added, but not started. • During installation, a grid node has not yet connected to the Admin Node. <p>If a service is listed as Not Running, restart the service (<code>/etc/init.d/<service> restart</code>).</p> <p>This alarm might also indicate that the metadata store (Cassandra database) for a Storage Node requires rebuilding.</p> <p>If the problem persists, contact technical support.</p> <p>Troubleshoot the Services: Status - Cassandra (SVST) alarm</p>
TMEM	Installed Memory	SSM	Nodes running with less than 24 GiB of installed memory can lead to performance problems and system instability. The amount of memory installed on the system should be increased to at least 24 GiB.
TPOP	Pending Operations	ADC	A queue of messages can indicate that the ADC service is overloaded. Too few ADC services can be connected to the StorageGRID system. In a large deployment, the ADC service can require adding computational resources, or the system can require additional ADC services.
UMEM	Available Memory	SSM	If the available RAM gets low, determine whether this is a hardware or software issue. If it is not a hardware issue, or if available memory falls below 50 MB (the default alarm threshold), contact technical support.

Code	Name	Service	Recommended action
VMFI	Entries Available	SSM	This is an indication that additional storage is required. Contact technical support.
VMFR	Space Available	SSM	If the value of Space Available gets too low (see alarm thresholds), it needs to be investigated as to whether there are log files growing out of proportion, or objects taking up too much disk space (see alarm thresholds) that need to be reduced or deleted. If the problem persists, contact technical support.
VMST	Status	SSM	An alarm is triggered if the value of Status for the mounted volume is Unknown. A value of Unknown or Offline can indicate that the volume cannot be mounted or accessed due to a problem with the underlying storage device.
VPRI	Verification Priority	BLDR, BARC	By default, the value of Verification Priority is Adaptive. If Verification Priority is set to High, an alarm is triggered because storage verification can slow normal operations of the service.
VSTU	Object Verification Status	BLDR	Select SUPPORT > Tools > Grid topology . Then select site > grid node > LDR > Storage > Overview > Main . Check the operating system for any signs of block-device or file system errors. If the value of Object Verification Status is Unknown Error, it usually indicates a low-level file system or hardware problem (I/O error) that prevents the Storage Verification task from accessing stored content. Contact technical support.
XAMS	Unreachable Audit Repositories	BADC, BARC, BCLB, BCMN, BLDR, BNMS	Check network connectivity to the server hosting the Admin Node. If the problem persists, contact technical support.

Alarms that generate SNMP notifications (legacy system)

The following table lists the legacy alarms that generate SNMP notifications. Unlike alerts, not all alarms generate SNMP notifications. Only the alarms listed generate SNMP notifications and only at the indicated severity or higher.



While the legacy alarm system continues to be supported, the alert system offers significant benefits and is easier to use.

Code	Name	Severity
ACMS	Available Metadata Services	Critical
AITE	Retrieve State	Minor
AITU	Retrieve Status	Major
AMQS	Audit Messages Queued	Notice
AOTE	Store State	Minor
AOTU	Store Status	Major
AROQ	Objects Queued	Minor
ARRF	Request Failures	Major
ARRV	Verification Failures	Major
ARVF	Store Failures	Major
ASXP	Audit Shares	Minor
AUMA	AMS Status	Minor
AUXS	Audit Export Status	Minor
BTOF	Offset	Notice
CAHP	Java Heap Usage Percent	Major
CAQH	Number Available Destinations	Notice
CASA	Data Store Status	Major
CDLP	Metadata Used Space (Percent)	Major
CLBE	CLB State	Critical
DNST	DNS Status	Critical
ECST	Verification Status	Major
HSTE	HTTP State	Major

Code	Name	Severity
HTAS	Auto-Start HTTP	Notice
LOST	Lost Objects	Major
MINQ	E-mail Notifications Queued	Notice
MINS	E-mail Notifications Status	Minor
NANG	Network Auto Negotiate Setting	Notice
NDUP	Network Duplex Setting	Minor
NLNK	Network Link Detect	Minor
NRER	Receive Errors	Notice
NSPD	Speed	Notice
NTER	Transmit Errors	Notice
NTFQ	NTP Frequency Offset	Minor
NTLK	NTP Lock	Minor
NTOF	NTP Time Offset	Minor
NTSJ	Chosen Time Source Jitter	Minor
NTSU	NTP Status	Major
OPST	Overall Power Status	Major
ORSU	Outbound Replication Status	Notice
PSAS	Power Supply A Status	Major
PSBS	Power Supply B Status	Major
RDTE	Tivoli Storage Manager State	Notice
RDTU	Tivoli Storage Manager Status	Major
SAVP	Total Usable Space (Percent)	Notice

Code	Name	Severity
SHLH	Health	Notice
SLSA	CPU Load Average	Notice
SMTT	Total Events	Notice
SNST	Status	
SOSS	Storage Operating System Status	Notice
SSTS	Storage Status	Notice
SVST	Status	Notice
TMEM	Installed Memory	Minor
UMEM	Available Memory	Minor
VMST	Status	Minor
VPRI	Verification Priority	Notice
VSTU	Object Verification Status	Notice

Log files reference

StorageGRID provides logs that are used to capture events, diagnostic messages, and error conditions. You might be asked to collect log files and forward them to technical support to assist with troubleshooting.

The logs are categorized as follows:

- [StorageGRID software logs](#)
- [Deployment and maintenance logs](#)
- [Logs for third-party software](#)
- [About the bycast.log](#)

 The details provided for each log type are for reference only. The logs are intended for advanced troubleshooting by technical support. Advanced techniques that involve reconstructing the problem history using the audit logs and the application log files are beyond the scope of these instructions.

To access the logs, you can collect log files and system data from one or more nodes as a single log file archive (**SUPPORT > Tools > Logs**). Or, if the primary Admin Node is unavailable or unable to reach a specific

node, you can access individual log files for each grid node as follows:

1. Enter the following command: `ssh admin@grid_node_IP`
2. Enter the password listed in the `Passwords.txt` file.
3. Enter the following command to switch to root: `su -`
4. Enter the password listed in the `Passwords.txt` file.

The StorageGRID log file archive contains the logs described for each category and additional files that contain metrics and debug command output.

Archive location	Description
audit	Audit messages generated during normal system operation.
base-os-logs	Base operating system information, including StorageGRID image versions.
bundles	Global configuration information (bundles).
cassandra	Cassandra database information and Reaper repair logs.
ec	VCSs information on the current node and EC group information by profile ID.
grid	General grid logs including debug (<code>broadcast.log</code>) and <code>servermanager</code> logs.
grid.xml	Grid configuration file shared across all nodes.
hagroups	High availability groups metrics and logs.
install	Gdu-server and install logs.
lumberjack.log	Debug messages related to log collection.
Lambda-arbitrator	Logs related to the S3 Select proxy request.
Metrics	Service logs for Grafana, Jaeger, node exporter, and Prometheus.
miscd	Miscd access and error logs.
mysql	The mariaDB database configuration and related logs.
net	Logs generated by networking-related scripts and the Dynip service.
nginx	Load balancer configuration files and logs. Also includes Grid Manager and Tenant Manager traffic logs.

Archive location	Description
nginx-gw	Load balancer configuration files and logs.
ntp	NTP configuration file and logs.
os	Node and grid state file, including services pid.
other	Log files under /var/local/log that are not collected in other folders.
perf	Performance information for CPU, networking, and disk I/O.
prometheus-data	Current Prometheus metrics, if the log collection includes Prometheus data.
provisioning	Logs related to grid provisioning process.
raft	Logs from Raft cluster used in platform services.
snmp	SNMP agent configuration and alarm allow/deny lists used for sending SNMP notifications.
sockets-data	Sockets data for network debug.
system-commands.txt	Output of StorageGRID container commands. Contains system information, such as networking and disk usage.

Related information

[Collect log files and system data](#)

StorageGRID software logs

You can use StorageGRID logs to troubleshoot issues.



If you want to send your logs to an external syslog server or change the destination of audit information such as the `broadcast.log` and `nms.log`, see [Configure audit messages and log destinations](#).

General StorageGRID logs

File name	Notes	Found on
/var/local/log/broadcast.log	The primary StorageGRID troubleshooting file. Select SUPPORT > Tools > Grid topology . Then select Site > Node > SSM > Events .	All nodes

File name	Notes	Found on
/var/local/log/bycast-err.log	Contains a subset of <code>bycast.log</code> (messages with severity ERROR and CRITICAL). CRITICAL messages are also displayed in the system. Select SUPPORT > Tools > Grid topology . Then select Site > Node > SSM > Events .	All nodes
/var/local/core/	<p>Contains any core dump files created if the program terminates abnormally. Possible causes include assertion failures, violations, or thread timeouts.</p> <p> The file <code>/var/local/core/kexec_cmd</code> usually exists on appliance nodes and does not indicate an error.</p>	All nodes

Server Manager logs

File name	Notes	Found on
/var/local/log/servermanager.log	Log file for the Server Manager application running on the server.	All nodes
/var/local/log/GridstatBackend.errlog	Log file for the Server Manager GUI backend application.	All nodes
/var/local/log/gridstat.errlog	Log file for the Server Manager GUI.	All nodes

Logs for StorageGRID services

File name	Notes	Found on
/var/local/log/acct.errlog		Storage Nodes running the ADC service
/var/local/log/adc.errlog	Contains the Standard Error (stderr) stream of the corresponding services. There is one log file per service. These files are generally empty unless there are problems with the service.	Storage Nodes running the ADC service
/var/local/log/ams.errlog		Admin Nodes
/var/local/log/arc.errlog		Archive Nodes

File name	Notes	Found on
/var/local/log/cassandra/system.log	Information for the metadata store (Cassandra database) that can be used if problems occur when adding new Storage Nodes, or if the nodetool repair task stalls.	Storage Nodes
/var/local/log/cassandra-reaper.log	Information for the Cassandra Reaper service, which performs repairs of the data in the Cassandra database.	Storage Nodes
/var/local/log/cassandra-reaper.errlog	Error information for the Cassandra Reaper service.	Storage Nodes
/var/local/log/chunk.errlog		Storage Nodes
/var/local/log/clb.errlog	Error information for the CLB service. Note: The CLB service is deprecated.	Gateway Nodes
/var/local/log/cmn.errlog		Admin Nodes
/var/local/log/cms.errlog	This log file might be present on systems that have been upgraded from an older version of StorageGRID. It contains legacy information.	Storage Nodes
/var/local/log/cts.errlog	This log file is only created if the Target Type is Cloud Tiering - Simple Storage Service (S3) .	Archive Nodes
/var/local/log/dds.errlog		Storage Nodes
/var/local/log/dmv.errlog		Storage Nodes
/var/local/log/dynip*	Contains logs related to the dynip service, which monitors the grid for dynamic IP changes and updates local configuration.	All nodes
/var/local/log/grafana.log	The log associated with the Grafana service, which is used for metrics visualization in the Grid Manager.	Admin Nodes
/var/local/log/hagroups.log	The log associated with high availability groups.	Admin Nodes and Gateway Nodes

File name	Notes	Found on
/var/local/log/hagroups_events.log	Tracks state changes, such as transition from BACKUP to MASTER or FAULT.	Admin Nodes and Gateway Nodes
/var/local/log/idnt.errlog		Storage Nodes running the ADC service
/var/local/log/jaeger.log	The log associated with the jaeger service, which is used for trace collection.	All nodes
/var/local/log/kstn.errlog		Storage Nodes running the ADC service
/var/local/log/lambda*	Contains logs for the S3 Select service.	Admin and Gateway Nodes Only certain Admin and Gateway Nodes contain this log. See the S3 Select requirements and limitations for Admin and Gateway Nodes .
/var/local/log/ldr.errlog		Storage Nodes
/var/local/log/miscd/*.log	Contains logs for the MISCD service (Information Service Control Daemon), which provides an interface for querying and managing services on other nodes and for managing environmental configurations on the node such as querying the state of services running on other nodes.	All nodes
/var/local/log/nginx/*.log	Contains logs for the nginx service, which acts as an authentication and secure communication mechanism for various grid services (such as Prometheus and Dynip) to be able to talk to services on other nodes over HTTPS APIs.	All nodes
/var/local/log/nginx-gw/*.log	Contains logs for the restricted admin ports on Admin Nodes and for the Load Balancer service, which provides load balancing of S3 and Swift traffic from clients to Storage Nodes.	Admin Nodes and Gateway Nodes

File name	Notes	Found on
/var/local/log/persistence*	Contains logs for the Persistence service, which manages files on the root disk that need to persist across a reboot.	All nodes
/var/local/log/prometheus.log	<p>For all nodes, contains the node exporter service log and the ad-exporter metrics service log.</p> <p>For Admin Nodes, also contains logs for the Prometheus and Alert Manager services.</p>	All nodes
/var/local/log/raft.log	Contains the output of the library used by the RSM service for the Raft protocol.	Storage Nodes with RSM service
/var/local/log/rms.errlog	Contains logs for the Replicated State Machine Service (RSM) service, which is used for S3 platform services.	Storage Nodes with RSM service
/var/local/log/ssm.errlog		All nodes
/var/local/log/update-s3vs-domains.log	Contains logs related to processing updates for the S3 virtual hosted domain names configuration. See the instructions for implementing S3 client applications.	Admin and Gateway Nodes
/var/local/log/update-snmp-firewall.*	Contain logs related to the firewall ports being managed for SNMP.	All nodes
/var/local/log/update-sysl.log	Contains logs related to changes made to the system syslog configuration.	All nodes
/var/local/log/update-traffic-classes.log	Contains logs related to changes to the traffic classifiers configuration.	Admin and Gateway Nodes
/var/local/log/update-utcn.log	Contains logs related to Untrusted Client Network mode on this node.	All nodes

NMS logs

File name	Notes	Found on
/var/local/log/nms.log	<ul style="list-style-type: none"> Captures notifications from the Grid Manager and the Tenant Manager. Captures events related to the operation of the NMS service, for example, alarm processing, email notifications, and configuration changes. Contains XML bundle updates resulting from configuration changes made in the system. Contains error messages related to the attribute downsampling done once a day. Contains Java web server error messages, for example, page generation errors and HTTP Status 500 errors. 	Admin Nodes
/var/local/log/nms.errlog	<p>Contains error messages related to MySQL database upgrades.</p> <p>Contains the Standard Error (stderr) stream of the corresponding services. There is one log file per service. These files are generally empty unless there are problems with the service.</p>	Admin Nodes
/var/local/log/nms.requestlog	Contains information about outgoing connections from the Management API to internal StorageGRID services.	Admin Nodes

Related information

[About the bycast.log](#)

[Use S3](#)

Deployment and maintenance logs

You can use the deployment and maintenance logs to troubleshoot issues.

File name	Notes	Found on
/var/local/log/install.log	Created during software installation. Contains a record of the installation events.	All nodes
/var/local/log/expansion-progress.log	Created during expansion operations. Contains a record of the expansion events.	Storage Nodes

File name	Notes	Found on
/var/local/log/gdu-server.log	Created by the GDU service. Contains events related to provisioning and maintenance procedures managed by the primary Admin Node.	Primary Admin Node
/var/local/log/send_admin_hw.log	Created during installation. Contains debugging information related to a node's communications with the primary Admin Node.	All nodes
/var/local/log/upgrade.log	Created during software upgrade. Contains a record of the software update events.	All nodes

Logs for third-party software

You can use the third-party software logs to troubleshoot issues.

Category	File name	Notes	Found on
Archiving	/var/local/log/dsierro.r.log	Error information for TSM Client APIs.	Archive Nodes
MySQL	/var/local/log/mysql.err /var/local/log/mysql-slow.log	Log files generated by MySQL. The file mysql.err captures database errors and events such as startups and shutdowns. The file mysql-slow.log (the slow query log) captures the SQL statements that took more than 10 seconds to execute.	Admin Nodes
Operating system	/var/local/log/messages	This directory contains log files for the operating system. The errors contained in these logs are also displayed in the Grid Manager. Select SUPPORT > Tools > Grid topology . Then select Topology > Site > Node > SSM > Events .	All nodes

Category	File name	Notes	Found on
NTP	/var/local/log/ntp.log /var/lib/ntp/var/log/ntpstats/	/var/local/log/ntp.log contains the log file for NTP error messages. The /var/lib/ntp/var/log/ntpstats/ directory contains NTP timing statistics. loopstats records loop filter statistics information. peerstats records peer statistics information.	All nodes
Samba	/var/local/log/samba/	The Samba log directory includes a log file for each Samba process (smb, nmb, and winbind) and every client hostname/IP.	Admin Node configured to export the audit share over CIFS

About the bycast.log

The file /var/local/log/broadcast.log is the primary troubleshooting file for the StorageGRID software. There is a broadcast.log file for every grid node. The file contains messages specific to that grid node.

The file /var/local/log/broadcast-err.log is a subset of broadcast.log. It contains messages of severity ERROR and CRITICAL.

Optionally, you can change the destination of audit logs and send audit information to an external syslog server. Local logs of audit records continue to be generated and stored when an external syslog server is configured. See [Configure audit messages and log destinations](#).

File rotation for broadcast.log

When the broadcast.log file reaches 1 GB, the existing file is saved, and a new log file is started.

The saved file is renamed broadcast.log.1, and the new file is named broadcast.log. When the new broadcast.log reaches 1 GB, broadcast.log.1 is renamed and compressed to become broadcast.log.2.gz, and broadcast.log is renamed broadcast.log.1.

The rotation limit for broadcast.log is 21 files. When the 22nd version of the broadcast.log file is created, the oldest file is deleted.

The rotation limit for broadcast-err.log is seven files.



If a log file has been compressed, you must not uncompress it to the same location in which it was written. Uncompressing the file to the same location can interfere with the log rotation scripts.

Optionally, you can change the destination of audit logs and send audit information to an external syslog

server. Local logs of audit records continue to be generated and stored when an external syslog server is configured. See [Configure audit messages and log destinations](#).

Related information

[Collect log files and system data](#)

Messages in `broadcast.log`

Messages in `broadcast.log` are written by the ADE (Asynchronous Distributed Environment). ADE is the runtime environment used by each grid node's services.

Example ADE message:

```
May 15 14:07:11 um-sec-rg1-agn3 ADE: |12455685      0357819531
SVMR EVHR 2019-05-05T27T17:10:29.784677| ERROR 0906 SVMR: Health
check on volume 3 has failed with reason 'TOUT'
```

ADE messages contain the following information:

Message segment	Value in example
Node ID	12455685
ADE process ID	0357819531
Module name	SVMR
Message identifier	EVHR
UTC system time	2019-05-05T27T17:10:29.784677 (YYYY-MM-DDTHH:MM:SS.uuuuuu)
Severity level	ERROR
Internal tracking number	0906
Message	SVMR: Health check on volume 3 has failed with reason 'TOUT'

Message severities in `broadcast.log`

The messages in `broadcast.log` are assigned severity levels.

For example:

- **NOTICE** — An event that should be recorded has occurred. Most log messages are at this level.
- **WARNING** — An unexpected condition has occurred.
- **ERROR** — A major error has occurred that will impact operations.
- **CRITICAL** — An abnormal condition has occurred that has stopped normal operations. You should address

the underlying condition immediately. Critical messages are also displayed in the Grid Manager. Select **SUPPORT > Tools > Grid topology**. Then select **Site > Node > SSM > Events**.

Error codes in `broadcast.log`

Most of the error messages in `broadcast.log` contain error codes.

The following table lists common non-numerical codes in `broadcast.log`. The exact meaning of a non-numerical code depends on the context in which it is reported.

Error code	Meaning
SUCS	No error
GERR	Unknown
CANC	Canceled
ABRT	Aborted
TOUT	Timeout
INVL	Invalid
NFND	Not found
VERS	Version
CONF	Configuration
FAIL	Failed
ICPL	Incomplete
DONE	Done
SUNV	Service unavailable

The following table lists the numerical error codes in `broadcast.log`.

Error number	Error code	Meaning
001	EPERM	Operation not permitted
002	ENOENT	No such file or directory
003	ESRCH	No such process

Error number	Error code	Meaning
004	EINTR	Interrupted system call
005	EIO	I/O error
006	ENXIO	No such device or address
007	E2BIG	Argument list too long
008	ENOEXEC	Exec format error
009	EBADF	Bad file number
010	ECHILD	No child processes
011	EAGAIN	Try again
012	ENOMEM	Out of memory
013	EACCES	Permission denied
014	EFAULT	Bad address
015	ENOTBLK	Block device required
016	EBUSY	Device or resource busy
017	EEXIST	File exists
018	EXDEV	Cross-device link
019	ENODEV	No such device
020	ENOTDIR	Not a directory
021	EISDIR	Is a directory
022	EINVAL	Invalid argument
023	ENFILE	File table overflow
024	EMFILE	Too many open files
025	ENOTTY	Not a typewriter

Error number	Error code	Meaning
026	ETXTBSY	Text file busy
027	EFBIG	File too large
028	ENOSPC	No space left on device
029	ESPIPE	Illegal seek
030	EROFS	Read-only file system
031	EMLINK	Too many links
032	EPIPE	Broken pipe
033	EDOM	Math argument out of domain of func
034	ERANGE	Math result not representable
035	EDEADLK	Resource deadlock would occur
036	ENAMETOOLONG	File name too long
037	ENOLCK	No record locks available
038	ENOSYS	Function not implemented
039	ENOTEMPTY	Directory not empty
040	ELOOP	Too many symbolic links encountered
041		
042	ENOMSG	No message of desired type
043	EIDRM	Identifier removed
044	ECHRNG	Channel number out of range
045	EL2NSYNC	Level 2 not synchronized
046	EL3HLT	Level 3 halted
047	EL3RST	Level 3 reset

Error number	Error code	Meaning
048	ELNRNG	Link number out of range
049	EUNATCH	Protocol driver not attached
050	ENOCSI	No CSI structure available
051	EL2HLT	Level 2 halted
052	EBADE	Invalid exchange
053	EBADR	Invalid request descriptor
054	EXFULL	Exchange full
055	ENOANO	No anode
056	EBADRQC	Invalid request code
057	EBADSLT	Invalid slot
058		
059	EBFONT	Bad font file format
060	ENOSTR	Device not a stream
061	ENODATA	No data available
062	ETIME	Timer expired
063	ENOSR	Out of streams resources
064	ENONET	Machine is not on the network
065	ENOPKG	Package not installed
066	EREMOTE	Object is remote
067	ENOLINK	Link has been severed
068	EADV	Advertise error
069	ESRMNT	Srmount error

Error number	Error code	Meaning
070	ECOMM	Communication error on send
071	EPROTO	Protocol error
072	EMULTIHOP	Multihop attempted
073	EDOTDOT	RFS specific error
074	EBADMSG	Not a data message
075	EOVERFLOW	Value too large for defined data type
076	ENOTUNIQ	Name not unique on network
077	EBADFD	File descriptor in bad state
078	EREMCHG	Remote address changed
079	ELIBACC	Cannot access a needed shared library
080	ELIBBAD	Accessing a corrupted shared library
081	ELIBSCN	
082	ELIBMAX	Attempting to link in too many shared libraries
083	ELIBEXEC	Cannot exec a shared library directly
084	EILSEQ	Illegal byte sequence
085	ERESTART	Interrupted system call should be restarted
086	ESTRPIPE	Streams pipe error
087	EUSERS	Too many users
088	ENOTSOCK	Socket operation on non-socket
089	EDESTADDRREQ	Destination address required
090	EMSGSIZE	Message too long
091	EPROTOTYPE	Protocol wrong type for socket

Error number	Error code	Meaning
092	ENOPROTOOPT	Protocol not available
093	EPROTONOSUPPORT	Protocol not supported
094	ESOCKTNOSUPPORT	Socket type not supported
095	EOPNOTSUPP	Operation not supported on transport endpoint
096	EPFNOSUPPORT	Protocol family not supported
097	EAFNOSUPPORT	Address family not supported by protocol
098	EADDRINUSE	Address already in use
099	EADDRNOTAVAIL	Cannot assign requested address
100	ENETDOWN	Network is down
101	ENETUNREACH	Network is unreachable
102	ENETRESET	Network dropped connection because of reset
103	ECONNABORTED	Software caused connection abort
104	ECONNRESET	Connection reset by peer
105	ENOBUFS	No buffer space available
106	EISCONN	Transport endpoint is already connected
107	ENOTCONN	Transport endpoint is not connected
108	ESHUTDOWN	Cannot send after transport endpoint shutdown
109	ETOOMANYREFS	Too many references: cannot splice
110	ETIMEDOUT	Connection timed out
111	ECONNREFUSED	Connection refused
112	EHOSTDOWN	Host is down
113	EHOSTUNREACH	No route to host

Error number	Error code	Meaning
114	EALREADY	Operation already in progress
115	EINPROGRESS	Operation now in progress
116		
117	EUCLEAN	Structure needs cleaning
118	ENOTNAM	Not a XENIX named type file
119	ENAVAIL	No XENIX semaphores available
120	EISNAM	Is a named type file
121	EREMOTEIO	Remote I/O error
122	EDQUOT	Quota exceeded
123	ENOMEDIUM	No medium found
124	EMEDIUMTYPE	Wrong medium type
125	ECANCELED	Operation Canceled
126	ENOKEY	Required key not available
127	EKEYEXPIRED	Key has expired
128	EKEYREVOKED	Key has been revoked
129	EKEYREJECTED	Key was rejected by service
130	EOWNERDEAD	For robust mutexes: Owner died
131	ENOTRECOVERABLE	For robust mutexes: State not recoverable

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