



# **Review audit logs**

## **StorageGRID**

NetApp

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# Review audit logs

## Review audit logs: Overview

These instructions contain information about the structure and content of StorageGRID audit messages and audit logs. You can use this information to read and analyze the audit trail of system activity.

These instructions are for administrators responsible for producing reports of system activity and usage that require analysis of the StorageGRID system's audit messages.

To use the text log file, you must have access to the configured audit share on the Admin Node.

For information on configuring audit message levels and using an external syslog server, see [Configure audit messages and log destinations](#).

### Related information

- [Administer StorageGRID](#)

## Audit message flow and retention

All StorageGRID services generate audit messages during normal system operation. You should understand how these audit messages move through the StorageGRID system to the `audit.log` file.

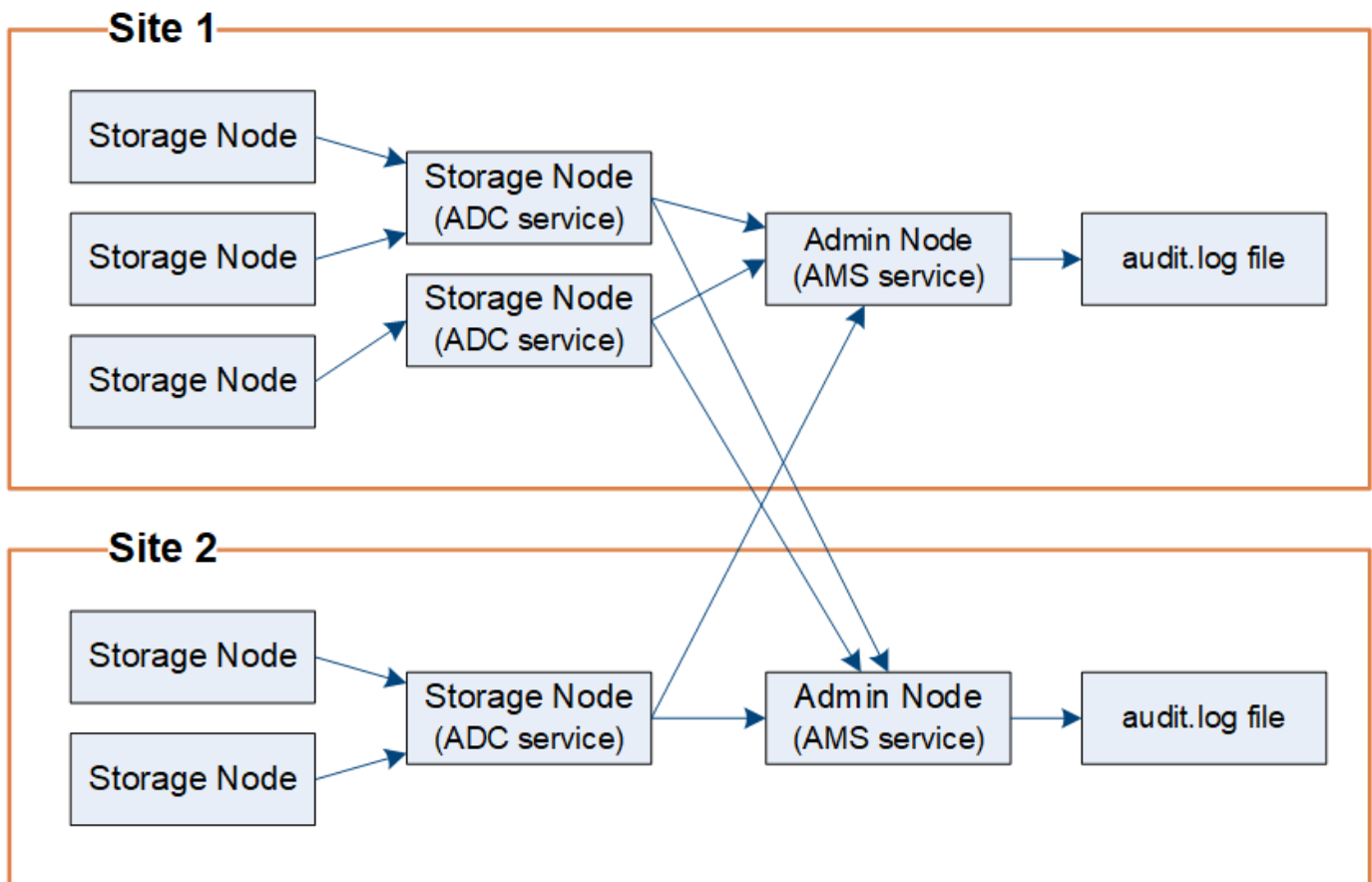
### Audit message flow

Audit messages are processed by Admin Nodes and by those Storage Nodes that have an Administrative Domain Controller (ADC) service.

As shown in the audit message flow diagram, each StorageGRID node sends its audit messages to one of the ADC services at the data center site. The ADC service is automatically enabled for the first three Storage Nodes installed at each site.

In turn, each ADC service acts as a relay and sends its collection of audit messages to every Admin Node in the StorageGRID system, which gives each Admin Node a complete record of system activity.

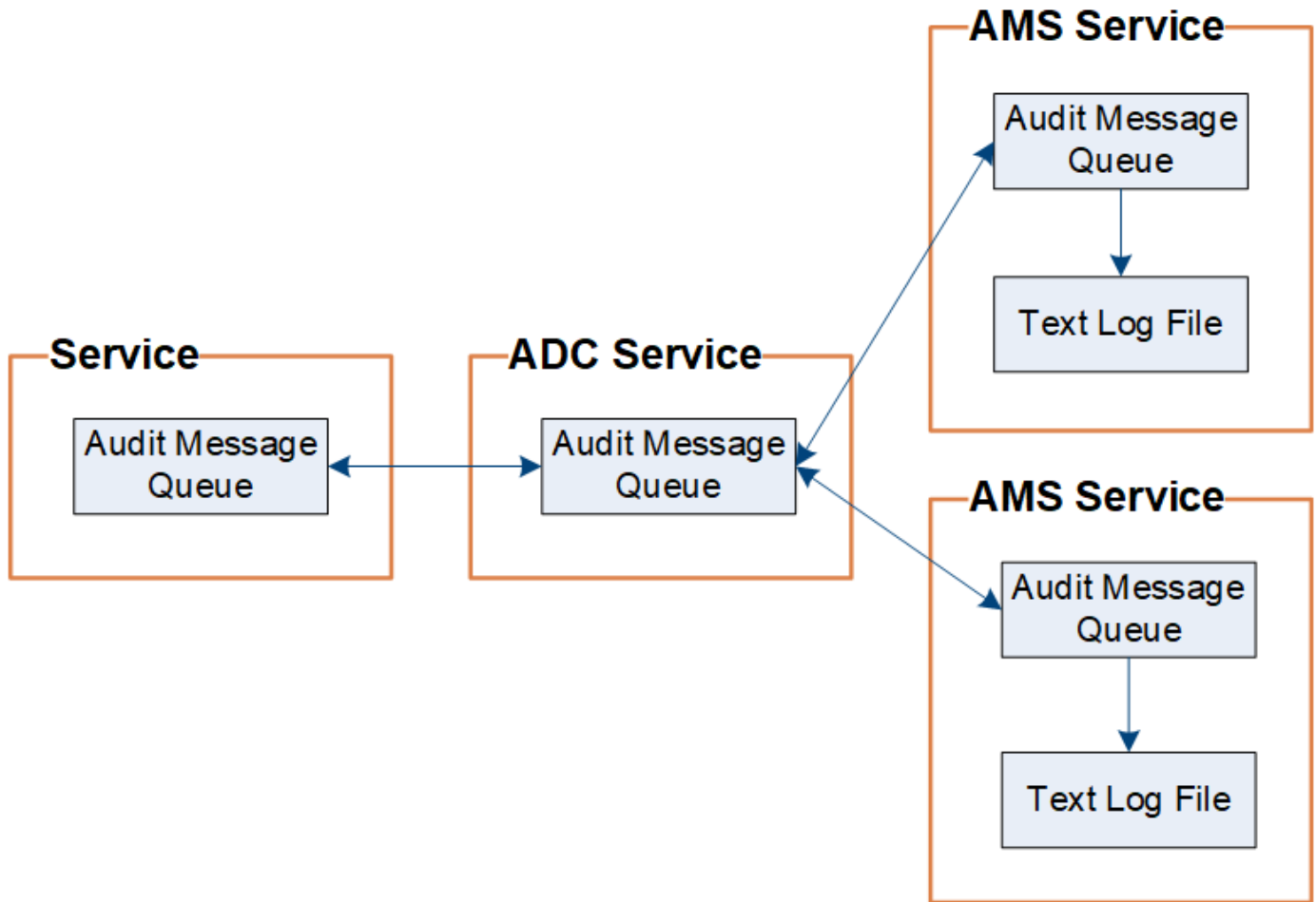
Each Admin Node stores audit messages in text log files; the active log file is named `audit.log`.



#### Audit message retention

StorageGRID uses a copy-and-delete process to ensure that no audit messages are lost before they can be written to the audit log.

When a node generates or relays an audit message, the message is stored in an audit message queue on the system disk of the grid node. A copy of the message is always held in an audit message queue until the message is written to the audit log file in the Admin Node's `/var/local/audit/export` directory. This helps prevent loss of an audit message during transport.



The audit message queue can temporarily increase due to network connectivity issues or insufficient audit capacity. As the queues increase, they consume more of the available space in each node's `/var/local/` directory. If the issue persists and a node's audit message directory becomes too full, the individual nodes will prioritize processing their backlog and become temporarily unavailable for new messages.

Specifically, you might see the following behaviors:

- If the `/var/local/audit/export` directory used by an Admin Node becomes full, the Admin Node will be flagged as unavailable to new audit messages until the directory is no longer full. S3 and Swift client requests are not affected. The XAMS (Unreachable Audit Repositories) alarm is triggered when an audit repository is unreachable.
- If the `/var/local/` directory used by a Storage Node with the ADC service becomes 92% full, the node will be flagged as unavailable to audit messages until the directory is only 87% full. S3 and Swift client requests to other nodes are not affected. The NRLY (Available Audit Relays) alarm is triggered when audit relays are unreachable.



If there are no available Storage Nodes with the ADC service, the Storage Nodes store the audit messages locally in the `/var/local/log/localaudit.log` file.

- If the `/var/local/` directory used by a Storage Node becomes 85% full, the node will start refusing S3 and Swift client requests with `503 Service Unavailable`.

The following types of issues can cause audit message queues to grow very large:

- The outage of an Admin Node or a Storage Node with the ADC service. If one of the system's nodes is down, the remaining nodes might become backlogged.
- A sustained activity rate that exceeds the audit capacity of the system.
- The `/var/local/` space on an ADC Storage Node becoming full for reasons unrelated to audit messages. When this happens, the node stops accepting new audit messages and prioritizes its current backlog, which can cause backlogs on other nodes.

#### Large audit queue alert and Audit Messages Queued (AMQS) alarm

To help you monitor the size of audit message queues over time, the **Large audit queue** alert and the legacy AMQS alarm are triggered when the number of messages in a Storage Node queue or Admin Node queue reaches certain thresholds.

If the **Large audit queue** alert or the legacy AMQS alarm is triggered, start by checking the load on the system—if there have been a significant number of recent transactions, the alert and the alarm should resolve over time and can be ignored.

If the alert or 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 for Client Writes and Client Reads to Error or Off. See "[Configure audit messages and log destinations](#)."

#### Duplicate messages

The StorageGRID system takes a conservative approach if a network or node failure occurs. For this reason, duplicate messages might exist in the audit log.

## Access audit log file

The audit share contains the active `audit.log` file and any compressed audit log files. For easy access to audit logs, you can configure client access to audit shares for both NFS and CIFS (CIFS is deprecated). You can also access audit log files directly from the command line of the Admin Node.

#### What you'll need

- You must have specific access permissions.
- You must have the `Passwords.txt` file.
- You must know the IP address of an Admin Node.

#### Steps

1. Log in to an Admin Node:
  - a. Enter the following command: `ssh admin@primary_Admin_Node_IP`
  - b. Enter the password listed in the `Passwords.txt` file.
2. Go to the directory containing the audit log files:
 

```
cd /var/local/audit/export
```
3. View the current or a saved audit log file, as required.

## Related information

[Administer StorageGRID](#)

## Audit log file rotation

Audit logs files are saved to an Admin Node's `/var/local/audit/export` directory. The active audit log files are named `audit.log`.



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](#).

Once a day, the active `audit.log` file is saved, and a new `audit.log` file is started. The name of the saved file indicates when it was saved, in the format `yyyy-mm-dd.txt`. If more than one audit log is created in a single day, the file names use the date the file was saved, appended by a number, in the format `yyyy-mm-dd.txt.n`. For example, `2018-04-15.txt` and `2018-04-15.txt.1` are the first and second log files created and saved on 15 April 2018.

After a day, the saved file is compressed and renamed, in the format `yyyy-mm-dd.txt.gz`, which preserves the original date. Over time, this results in the consumption of storage allocated for audit logs on the Admin Node. A script monitors the audit log space consumption and deletes log files as necessary to free space in the `/var/local/audit/export` directory. Audit logs are deleted based on the date they were created, with the oldest being deleted first. You can monitor the script's actions in the following file:  
`/var/local/log/manage-audit.log`.

This example shows the active `audit.log` file, the previous day's file (`2018-04-15.txt`), and the compressed file for the prior day (`2018-04-14.txt.gz`).

```
audit.log
2018-04-15.txt
2018-04-14.txt.gz
```

## Audit log file and message formats

You can use audit logs to gather information about your system and troubleshoot issues. You should understand the format of the audit log file and the general format used for audit messages.

### Audit log file format

The audit log files are found on every Admin Node and contain a collection of individual audit messages.

Each audit message contains the following:

- The Coordinated Universal Time (UTC) of the event that triggered the audit message (ATIM) in ISO 8601 format, followed by a space:

YYYY-MM-DDTHH:MM:SS.UUUUUU, where UUUUUU are microseconds.

- The audit message itself, enclosed within square brackets and beginning with AUDT.

The following example shows three audit messages in an audit log file (line breaks added for readability). These messages were generated when a tenant created an S3 bucket and added two objects to that bucket.

```
2019-08-07T18:43:30.247711
[AUDT: [RSLT (FC32) :SUCS] [CNID (UI64) :1565149504991681] [TIME (UI64) :73520] [SAI
P (IPAD) : "10.224.2.255"] [S3AI (CSTR) : "17530064241597054718"]
[SACC (CSTR) : "s3tenant"] [S3AK (CSTR) : "SGKH9100SCkNB8M3MTWNt-
PhoTDwB9JOk7PtyLkQmA=="] [SUSR (CSTR) : "urn:sgws:identity::175300642415970547
18:root"]
[SBAI (CSTR) : "17530064241597054718"] [SBAC (CSTR) : "s3tenant"] [S3BK (CSTR) : "buc
ket1"] [AVER (UI32) :10] [ATIM (UI64) :1565203410247711]
[ATYP (FC32) :SPUT] [ANID (UI32) :12454421] [AMID (FC32) :S3RQ] [ATID (UI64) :7074142
142472611085]]

2019-08-07T18:43:30.783597
[AUDT: [RSLT (FC32) :SUCS] [CNID (UI64) :1565149504991696] [TIME (UI64) :120713] [SA
IP (IPAD) : "10.224.2.255"] [S3AI (CSTR) : "17530064241597054718"]
[SACC (CSTR) : "s3tenant"] [S3AK (CSTR) : "SGKH9100SCkNB8M3MTWNt-
PhoTDwB9JOk7PtyLkQmA=="] [SUSR (CSTR) : "urn:sgws:identity::175300642415970547
18:root"]
[SBAI (CSTR) : "17530064241597054718"] [SBAC (CSTR) : "s3tenant"] [S3BK (CSTR) : "buc
ket1"] [S3KY (CSTR) : "fh-small-0"]
[CBID (UI64) :0x779557A069B2C037] [UUID (CSTR) : "94BA6949-38E1-4B0C-BC80-
EB44FB4FCC7F"] [CSIZ (UI64) :1024] [AVER (UI32) :10]
[ATIM (UI64) :1565203410783597] [ATYP (FC32) :SPUT] [ANID (UI32) :12454421] [AMID (F
C32) :S3RQ] [ATID (UI64) :8439606722108456022]]

2019-08-07T18:43:30.784558
[AUDT: [RSLT (FC32) :SUCS] [CNID (UI64) :1565149504991693] [TIME (UI64) :121666] [SA
IP (IPAD) : "10.224.2.255"] [S3AI (CSTR) : "17530064241597054718"]
[SACC (CSTR) : "s3tenant"] [S3AK (CSTR) : "SGKH9100SCkNB8M3MTWNt-
PhoTDwB9JOk7PtyLkQmA=="] [SUSR (CSTR) : "urn:sgws:identity::175300642415970547
18:root"]
[SBAI (CSTR) : "17530064241597054718"] [SBAC (CSTR) : "s3tenant"] [S3BK (CSTR) : "buc
ket1"] [S3KY (CSTR) : "fh-small-2000"]
[CBID (UI64) :0x180CBD8E678EED17] [UUID (CSTR) : "19CE06D0-D2CF-4B03-9C38-
E578D66F7ADD"] [CSIZ (UI64) :1024] [AVER (UI32) :10]
[ATIM (UI64) :1565203410784558] [ATYP (FC32) :SPUT] [ANID (UI32) :12454421] [AMID (F
C32) :S3RQ] [ATID (UI64) :13489590586043706682]]
```

In their default format, the audit messages in the audit log files are not easy to read or interpret. You can use the `audit-explain` tool to obtain simplified summaries of the audit messages in the audit log. You can use



the `audit-sum` tool to summarize how many write, read, and delete operations were logged and how long these operations took.

### Related information

[Use audit-explain tool](#)

[Use audit-sum tool](#)

### Use audit-explain tool

You can use the `audit-explain` tool to translate the audit messages in the audit log into an easy-to-read format.

#### What you'll need

- You must have specific access permissions.
- You must have the `Passwords.txt` file.
- You must know the IP address of the primary Admin Node.

#### About this task

The `audit-explain` tool, available on the primary Admin Node, provides simplified summaries of the audit messages in an audit log.



The `audit-explain` tool is primarily intended for use by technical support during troubleshooting operations. Processing `audit-explain` queries can consume a large amount of CPU power, which might impact StorageGRID operations.

This example shows typical output from the `audit-explain` tool. These four SPUT audit messages were generated when the S3 tenant with account ID 92484777680322627870 used S3 PUT requests to create a bucket named "bucket1" and add three objects to that bucket.

```
SPUT S3 PUT bucket bucket1 account:92484777680322627870 usec:124673
SPUT S3 PUT object bucket1/part1.txt tenant:92484777680322627870
cbid:9DCB157394F99FE5 usec:101485
SPUT S3 PUT object bucket1/part2.txt tenant:92484777680322627870
cbid:3CFBB07AB3D32CA9 usec:102804
SPUT S3 PUT object bucket1/part3.txt tenant:92484777680322627870
cbid:5373D73831ECC743 usec:93874
```

The `audit-explain` tool can process plain or compressed audit logs. For example:

```
audit-explain audit.log
```

```
audit-explain 2019-08-12.txt.gz
```

The `audit-explain` tool can also process multiple files at once. For example:

```
audit-explain audit.log 2019-08-12.txt.gz 2019-08-13.txt.gz
```

```
audit-explain /var/local/audit/export/*
```

Finally, the `audit-explain` tool can accept input from a pipe, which allows you to filter and preprocess the input using the `grep` command or other means. For example:

```
grep SPUT audit.log | audit-explain
```

```
grep bucket-name audit.log | audit-explain
```

Since audit logs can be very large and slow to parse, you can save time by filtering parts that you want to look at and running `audit-explain` on the parts, instead of the entire file.



The `audit-explain` tool does not accept compressed files as piped input. To process compressed files, provide their file names as command-line arguments, or use the `zcat` tool to decompress the files first. For example:

```
zcat audit.log.gz | audit-explain
```

Use the `help` (`-h`) option to see the available options. For example:

```
$ audit-explain -h
```

## Steps

1. Log in to the primary Admin Node:

- a. Enter the following command: `ssh admin@primary_Admin_Node_IP`
- b. Enter the password listed in the `Passwords.txt` file.

2. Enter the following command, where `/var/local/audit/export/audit.log` represents the name and the location of the file or files you want to analyze:

```
$ audit-explain /var/local/audit/export/audit.log
```

The `audit-explain` tool prints human-readable interpretations of all messages in the specified file or files.



To reduce line lengths and to aid readability, timestamps are not shown by default. If you want to see the timestamps, use the `timestamp` (`-t`) option.

Related information

[SPUT: S3 PUT](#)

Use audit-sum tool


You can use the `audit-sum` tool to count the write, read, head, and delete audit messages and to see the minimum, maximum, and average time (or size) for each operation type.

What you'll need

- You must have specific access permissions.
- You must have the `Passwords.txt` file.
- You must know the IP address of the primary Admin Node.

About this task

The `audit-sum` tool, available on the primary Admin Node, summarizes how many write, read, and delete operations were logged and how long these operations took.



The `audit-sum` tool is primarily intended for use by technical support during troubleshooting operations. Processing `audit-sum` queries can consume a large amount of CPU power, which might impact StorageGRID operations.

This example shows typical output from the `audit-sum` tool. This example shows how long protocol operations took.

| message group | count   | min(sec) | max(sec) |
|---------------|---------|----------|----------|
| average(sec)  |         |          |          |
| =====         | =====   | =====    | =====    |
| =====         |         |          |          |
| IDEL          | 274     |          |          |
| SDEL          | 213371  | 0.004    | 20.934   |
| 0.352         |         |          |          |
| SGET          | 201906  | 0.010    | 1740.290 |
| 1.132         |         |          |          |
| SHEA          | 22716   | 0.005    | 2.349    |
| 0.272         |         |          |          |
| SPUT          | 1771398 | 0.011    | 1770.563 |
| 0.487         |         |          |          |

The `audit-sum` tool provides counts and times for the following S3, Swift, and ILM audit messages in an audit log:

| Code | Description                      | Refer to   |
|------|----------------------------------|--|
| ARCT | Archive Retrieve from Cloud-Tier | <a href="#">ARCT: Archive Retrieve from Cloud-Tier</a> |

| Code | Description  | Refer to                                       |
|------|--|--|
| ASCT | Archive Store Cloud-Tier   | <a href="#">ASCT: Archive Store Cloud-Tier</a> |
| IDEL | ILM Initiated Delete: Logs when ILM starts the process of deleting an object.                      | <a href="#">IDEL: ILM Initiated Delete</a>     |
| SDEL | S3 DELETE: Logs a successful transaction to delete an object or bucket.                            | <a href="#">SDEL: S3 DELETE</a>                |
| SGET | S3 GET: Logs a successful transaction to retrieve an object or list the objects in a bucket.       | <a href="#">SGET: S3 GET</a>                   |
| SHEA | S3 HEAD: Logs a successful transaction to check for the existence of an object or bucket.          | <a href="#">SHEA: S3 HEAD</a>                  |
| SPUT | S3 PUT: Logs a successful transaction to create a new object or bucket.                            | <a href="#">SPUT: S3 PUT</a>                   |
| WDEL | Swift DELETE: Logs a successful transaction to delete an object or container.                      | <a href="#">WDEL: Swift DELETE</a>             |
| WGET | Swift GET: Logs a successful transaction to retrieve an object or list the objects in a container. | <a href="#">WGET: Swift GET</a>                |
| WHEA | Swift HEAD: Logs a successful transaction to check for the existence of an object or container.    | <a href="#">WHEA: Swift HEAD</a>               |
| WPUT | Swift PUT: Logs a successful transaction to create a new object or container.                      | <a href="#">WPUT: Swift PUT</a>                |

The `audit-sum` tool can process plain or compressed audit logs. For example:

```
audit-sum audit.log
```

```
audit-sum 2019-08-12.txt.gz
```

The `audit-sum` tool can also process multiple files at once. For example:

```
audit-sum audit.log 2019-08-12.txt.gz 2019-08-13.txt.gz
```

```
audit-sum /var/local/audit/export/*
```

Finally, the `audit-sum` tool can also accept input from a pipe, which allows you to filter and preprocess the input using the `grep` command or other means. For example:

```
grep WGET audit.log | audit-sum
```

```
grep bucket1 audit.log | audit-sum
```

```
grep SPUT audit.log | grep bucket1 | audit-sum
```



This tool does not accept compressed files as piped input. To process compressed files, provide their file names as command-line arguments, or use the `zcat` tool to decompress the files first. For example:

```
audit-sum audit.log.gz
```

```
zcat audit.log.gz | audit-sum
```

You can use command-line options to summarize operations on buckets separately from operations on objects or to group message summaries by bucket name, by time period, or by target type. By default, the summaries show the minimum, maximum, and average operation time, but you can use the `size` (`-s`) option to look at object size instead.

Use the `help` (`-h`) option to see the available options. For example:

```
$ audit-sum -h
```

## Steps

1. Log in to the primary Admin Node:
  - a. Enter the following command: `ssh admin@primary_Admin_Node_IP`
  - b. Enter the password listed in the `Passwords.txt` file.
2. If you want to analyze all messages related to write, read, head, and delete operations, follow these steps:
  - a. Enter the following command, where `/var/local/audit/export/audit.log` represents the name and the location of the file or files you want to analyze:

```
$ audit-sum /var/local/audit/export/audit.log
```

This example shows typical output from the `audit-sum` tool. This example shows how long protocol operations took.

| message group | count   | min(sec) | max(sec) |
|---------------|---------|----------|----------|
| average(sec)  |         |          |          |
| =====         | =====   | =====    | =====    |
| =====         |         |          |          |
| IDEL          | 274     |          |          |
| SDEL          | 213371  | 0.004    | 20.934   |
| 0.352         |         |          |          |
| SGET          | 201906  | 0.010    | 1740.290 |
| 1.132         |         |          |          |
| SHEA          | 22716   | 0.005    | 2.349    |
| 0.272         |         |          |          |
| SPUT          | 1771398 | 0.011    | 1770.563 |
| 0.487         |         |          |          |

In this example, SGET (S3 GET) operations are the slowest on average at 1.13 seconds, but SGET and SPUT (S3 PUT) operations both show long worst-case times of about 1,770 seconds.

- b. To show the slowest 10 retrieval operations, use the `grep` command to select only SGET messages and add the long output option (`-l`) to include object paths: `grep SGET audit.log | audit-sum -l`

The results include the type (object or bucket) and path, which allows you to `grep` the audit log for other messages relating to these particular objects.

```

Total:          201906 operations
Slowest:        1740.290 sec
Average:        1.132 sec
Fastest:        0.010 sec
Slowest operations:
    time(usec)      source ip      type      size(B) path
    =====
    1740289662      10.96.101.125      object    5663711385
backup/r9010aQ8JB-1566861764-4519.iso
    1624414429      10.96.101.125      object    5375001556
backup/r9010aQ8JB-1566861764-6618.iso
    1533143793      10.96.101.125      object    5183661466
backup/r9010aQ8JB-1566861764-4518.iso
    70839           10.96.101.125      object     28338
bucket3/dat.1566861764-6619
    68487           10.96.101.125      object     27890
bucket3/dat.1566861764-6615
    67798           10.96.101.125      object     27671
bucket5/dat.1566861764-6617
    67027           10.96.101.125      object     27230
bucket5/dat.1566861764-4517
    60922           10.96.101.125      object     26118
bucket3/dat.1566861764-4520
    35588           10.96.101.125      object     11311
bucket3/dat.1566861764-6616
    23897           10.96.101.125      object     10692
bucket3/dat.1566861764-4516

```

From this example output, you can see that the three slowest S3 GET requests were for objects about 5 GB in size, which is much larger than the other objects. The large size accounts for the slow worst-case retrieval times.

3. If you want to determine what sizes of objects are being ingested into and retrieved from your grid, use the size option (-s):

```
audit-sum -s audit.log
```

| message group<br>average (MB) | count   | min (MB) | max (MB) |
|-------------------------------|---------|----------|----------|
| =====                         | =====   | =====    | =====    |
| IDEL<br>1654.502              | 274     | 0.004    | 5000.000 |
| SDEL<br>1.695                 | 213371  | 0.000    | 10.504   |
| SGET<br>14.920                | 201906  | 0.000    | 5000.000 |
| SHEA<br>2.967                 | 22716   | 0.001    | 10.504   |
| SPUT<br>2.495                 | 1771398 | 0.000    | 5000.000 |

In this example, the average object size for SPUT is under 2.5 MB, but the average size for SGET is much larger. The number of SPUT messages is much higher than the number of SGET messages, indicating that most objects are never retrieved.

4. If you want to determine if retrievals were slow yesterday:

- a. Issue the command on the appropriate audit log and use the group-by-time option (`-gt`), followed by the time period (for example, 15M, 1H, 10S):

```
grep SGET audit.log | audit-sum -gt 1H
```



| message group<br>average(sec) | count   | min(sec) | max(sec) |
|-------------------------------|---------|----------|----------|
| =====                         | =====   | =====    | =====    |
| 2019-09-05T00<br>1.254        | 7591    | 0.010    | 1481.867 |
| 2019-09-05T01<br>1.115        | 4173    | 0.011    | 1740.290 |
| 2019-09-05T02<br>1.562        | 20142   | 0.011    | 1274.961 |
| 2019-09-05T03<br>1.254        | 57591   | 0.010    | 1383.867 |
| 2019-09-05T04<br>1.405        | 124171  | 0.013    | 1740.290 |
| 2019-09-05T05<br>1.562        | 420182  | 0.021    | 1274.511 |
| 2019-09-05T06<br>5.562        | 1220371 | 0.015    | 6274.961 |
| 2019-09-05T07<br>2.002        | 527142  | 0.011    | 1974.228 |
| 2019-09-05T08<br>1.105        | 384173  | 0.012    | 1740.290 |
| 2019-09-05T09<br>1.354        | 27591   | 0.010    | 1481.867 |

These results show that S3 GET traffic spiked between 06:00 and 07:00. The max and average times are both considerably higher at these times as well, and they did not ramp up gradually as the count increased. This suggests that capacity was exceeded somewhere, perhaps in the network or in the grid's ability to process requests.

- b. To determine what size objects were being retrieved each hour yesterday, add the size option (-s) to the command:

```
grep SGET audit.log | audit-sum -gt 1H -s
```

| message group<br>average(B) | count   | min(B) | max(B)         |
|-----------------------------|---------|--------|----------------|
| =====                       | =====   | =====  | =====          |
| 2019-09-05T00<br>1.976      | 7591    | 0.040  | 1481.867       |
| 2019-09-05T01<br>2.062      | 4173    | 0.043  | 1740.290       |
| 2019-09-05T02<br>2.303      | 20142   | 0.083  | 1274.961       |
| 2019-09-05T03<br>1.182      | 57591   | 0.912  | 1383.867       |
| 2019-09-05T04<br>1.528      | 124171  | 0.730  | 1740.290       |
| 2019-09-05T05<br>2.398      | 420182  | 0.875  | 4274.511       |
| 2019-09-05T06<br>51.328     | 1220371 | 0.691  | 5663711385.961 |
| 2019-09-05T07<br>2.147      | 527142  | 0.130  | 1974.228       |
| 2019-09-05T08<br>1.878      | 384173  | 0.625  | 1740.290       |
| 2019-09-05T09<br>1.354      | 27591   | 0.689  | 1481.867       |

These results indicate that some very large retrievals occurred when the overall retrieval traffic was at its maximum.

- c. To see more detail, use the `audit-explain` tool to review all the SGET operations during that hour:

```
grep 2019-09-05T06 audit.log | grep SGET | audit-explain | less
```

If the output of the `grep` command is expected to be many lines, add the `less` command to show the contents of the audit log file one page (one screen) at a time.

5. If you want to determine if SPUT operations on buckets are slower than SPUT operations for objects:

- a. Start by using the `-go` option, which groups messages for object and bucket operations separately:

```
grep SPUT sample.log | audit-sum -go
```

| message group<br>average(sec) | count | min(sec) | max(sec) |
|-------------------------------|-------|----------|----------|
| =====                         | ===== | =====    | =====    |
| SPUT.bucket<br>0.125          | 1     | 0.125    | 0.125    |
| SPUT.object<br>0.236          | 12    | 0.025    | 1.019    |

The results show that SPUT operations for buckets have different performance characteristics than SPUT operations for objects.

- b. To determine which buckets have the slowest SPUT operations, use the `-gb` option, which groups messages by bucket:

```
grep SPUT audit.log | audit-sum -gb
```

| message group<br>average(sec)    | count   | min(sec) | max(sec) |
|----------------------------------|---------|----------|----------|
| =====                            | =====   | =====    | =====    |
| SPUT.cho-non-versioning<br>1.571 | 71943   | 0.046    | 1770.563 |
| SPUT.cho-versioning<br>1.415     | 54277   | 0.047    | 1736.633 |
| SPUT.cho-west-region<br>1.329    | 80615   | 0.040    | 55.557   |
| SPUT.ldt002<br>0.361             | 1564563 | 0.011    | 51.569   |

- c. To determine which buckets have the largest SPUT object size, use both the `-gb` and the `-s` options:

```
grep SPUT audit.log | audit-sum -gb -s
```

| message group<br>average (B)      | count   | min (B) | max (B)  |
|-----------------------------------|---------|---------|----------|
| =====                             | =====   | =====   | =====    |
| SPUT.cho-non-versioning<br>21.672 | 71943   | 2.097   | 5000.000 |
| SPUT.cho-versioning<br>21.120     | 54277   | 2.097   | 5000.000 |
| SPUT.cho-west-region<br>14.433    | 80615   | 2.097   | 800.000  |
| SPUT.ldt002<br>0.352              | 1564563 | 0.000   | 999.972  |

## Related information

[Use audit-explain tool](#)

## Audit message format

Audit messages exchanged within the StorageGRID system include standard information common to all messages and specific content describing the event or activity being reported.

If the summary information provided by the `audit-explain` and `audit-sum` tools is insufficient, refer to this section to understand the general format of all audit messages.

The following is an example audit message as it might appear in the audit log file:

```
2014-07-17T03:50:47.484627
[AUDT:[RSLT(FC32):VRGN][AVER(UI32):10][ATIM(UI64):1405569047484627][ATYP(FC32):SYSU][ANID(UI32):11627225][AMID(FC32):ARNI][ATID(UI64):9445736326500603516]]
```

Each audit message contains a string of attribute elements. The entire string is enclosed in brackets ([ ]), and each attribute element in the string has the following characteristics:

- Enclosed in brackets [ ]
- Introduced by the string `AUDT`, which indicates an audit message
- Without delimiters (no commas or spaces) before or after
- Terminated by a line feed character `\n`

Each element includes an attribute code, a data type, and a value that are reported in this format:

```
[ATTR(type):value] [ATTR(type):value] ...  
[ATTR(type):value]\n
```

The number of attribute elements in the message depends on the event type of the message. The attribute elements are not listed in any particular order.

The following list describes the attribute elements:

- `ATTR` is a four-character code for the attribute being reported. There are some attributes that are common to all audit messages and others that are event-specific.
- `type` is a four-character identifier of the programming data type of the value, such as `UI64`, `FC32`, and so on. The type is enclosed in parentheses ( ).
- `value` is the content of the attribute, typically a numeric or text value. Values always follow a colon (:). Values of data type `CSTR` are surrounded by double quotes " ".

### Related information

[Use audit-explain tool](#)

[Use audit-sum tool](#)

[Audit messages](#)

[Common elements in audit messages](#)

[Data types](#)

[Audit message examples](#)

### Data types

Different data types are used to store information in audit messages.

| Type | Description   |
|------|---|
| UI32 | Unsigned long integer (32 bits); it can store the numbers 0 to 4,294,967,295.                                 |
| UI64 | Unsigned double long integer (64 bits); it can store the numbers 0 to 18,446,744,073,709,551,615.             |
| FC32 | Four-character constant; a 32-bit unsigned integer value represented as four ASCII characters such as "ABCD." |
| IPAD | Used for IP addresses.  |

| Type | Description   |
|------|---|
| CSTR | <p>A variable-length array of UTF-8 characters. Characters can be escaped with the following conventions:</p> <ul style="list-style-type: none"> <li>• Backslash is \.</li> <li>• Carriage return is \r.</li> <li>• Double quotes is \".</li> <li>• Line feed (new line) is \n.</li> <li>• Characters can be replaced by their hexadecimal equivalents (in the format \xHH, where HH is the hexadecimal value representing the character).</li> </ul> |

## Event-specific data

Each audit message in the audit log records data specific to a system event.

Following the opening [AUDT: container that identifies the message itself, the next set of attributes provide information about the event or action described by the audit message. These attributes are highlighted in the following example:

```
2018-12-05T08:24:45.921845 [AUDT:*[RSLT\(\FC32\):SUCS\]*
\[\TIME\(\UI64\):11454\]\[SAIP\(\IPAD\):"10.224.0.100"\]\[S3AI\(\CSTR\):"60025621595611246499"\]
\[SACC\(\CSTR\):"account"\]\[S3AK\(\CSTR\):"SGKH4_Nc8SO1H6w3w0nCOFCGgk__E6dYzKlumRs
KJA=="\]\[SUSR\(\CSTR\):"urn:sgws:identity::60025621595611246499:root"\]
\[SBAI\(\CSTR\):"60025621595611246499"\]\[SBAC\(\CSTR\):"account"\]\[S3BK\(\CSTR\):"bucket"\]
\[S3KY\(\CSTR\):"object"\]\[CBID\(\UI64\):0xCC128B9B9E428347\]\[UUID\(\CSTR\):"B975D2CE-E4DA-
4D14-8A23-1CB4B83F2CD8"\]\[CSIZ\(\UI64\):30720\][AVER(\UI32):10]
\[\ATIM(\UI64):1543998285921845\]\[ATYP\(\FC32\):SHEA\]\[ANID(\UI32):12281045\]\[AMID(\FC32):S3RQ]
\[\ATID(\UI64):15552417629170647261\]
```

The ATYP element (underlined in the example) identifies which event generated the message. This example message includes the SHEA message code ([ATYP(FC32):SHEA]), indicating it was generated by a successful S3 HEAD request.

## Related information

[Common elements in audit messages](#)

[Audit messages](#)

## Common elements in audit messages

All audit messages contain the common elements.

| Code | Type | Description   |
|------|------|---|
| AMID | FC32 | Module ID: A four-character identifier of the module ID that generated the message. This indicates the code segment within which the audit message was generated.   |
| ANID | UI32 | Node ID: The grid node ID assigned to the service that generated the message. Each service is allocated a unique identifier at the time the StorageGRID system is configured and installed. This ID cannot be changed.  |
| ASES | UI64 | Audit Session Identifier: In previous releases, this element indicated the time at which the audit system was initialized after the service started up. This time value was measured in microseconds since the operating system epoch (00:00:00 UTC on 1 January, 1970).<br><br><b>Note:</b> This element is obsolete and no longer appears in audit messages.  |
| ASQN | UI64 | Sequence Count: In previous releases, this counter was incremented for each generated audit message on the grid node (ANID) and reset to zero at service restart.<br><br><b>Note:</b> This element is obsolete and no longer appears in audit messages.   |
| ATID | UI64 | Trace ID: An identifier that is shared by the set of messages that were triggered by a single event.  |
| ATIM | UI64 | Timestamp: The time the event was generated that triggered the audit message, measured in microseconds since the operating system epoch (00:00:00 UTC on 1 January, 1970). Note that most available tools for converting the timestamp to local date and time are based on milliseconds.<br><br>Rounding or truncation of the logged timestamp might be required. The human-readable time that appears at the beginning of the audit message in the <code>audit.log</code> file is the ATIM attribute in ISO 8601 format. The date and time are represented as <code>YYYY-MMDDTHH:MM:SS.UUUUUU</code> , where the T is a literal string character indicating the beginning of the time segment of the date. <code>UUUUUU</code> are microseconds. |
| ATYP | FC32 | Event Type: A four-character identifier of the event being logged. This governs the "payload" content of the message: the attributes that are included.   |
| AVER | UI32 | Version: The version of the audit message. As the StorageGRID software evolves, new versions of services might incorporate new features in audit reporting. This field enables backward compatibility in the AMS service to process messages from older versions of services.   |
| RSLT | FC32 | Result: The result of event, process, or transaction. If is not relevant for a message, NONE is used rather than SUCS so that the message is not accidentally filtered.   |

## Audit message examples

You can find detailed information in each audit message. All audit messages use the same format.

The following is a sample audit message as it might appear in the `audit.log` file:

```
2014-07-17T21:17:58.959669
[AUDT:[RSLT(FC32):SUCS][TIME(UI64):246979][S3AI(CSTR):"bc644d
381a87d6cc216adcd963fb6f95dd25a38aa2cb8c9a358e8c5087a6af5f"][
S3AK(CSTR):"UJXDKKQOXB7YARDS71Q2"][S3BK(CSTR):"s3small11"][S3K
Y(CSTR):"hello1"][CBID(UI64):0x50C4F7AC2BC8EDF7][CSIZ(UI64):0
][AVER(UI32):10][ATIM(UI64):1405631878959669][ATYP(FC32):SPUT
][ANID(UI32):12872812][AMID(FC32):S3RQ][ATID(UI64):1579224144
102530435]]
```

The audit message contains information about the event being recorded, as well as information about the audit message itself.

To identify which event is recorded by the audit message, look for the ATYP attribute (highlighted below):

```
2014-07-17T21:17:58.959669
[AUDT:[RSLT(FC32):SUCS][TIME(UI64):246979][S3AI(CSTR):"bc644d
381a87d6cc216adcd963fb6f95dd25a38aa2cb8c9a358e8c5087a6af5f"][
S3AK(CSTR):"UJXDKKQOXB7YARDS71Q2"][S3BK(CSTR):"s3small11"][S3K
Y(CSTR):"hello1"][CBID(UI64):0x50C4F7AC2BC8EDF7][CSIZ(UI64):0
][AVER(UI32):10][ATIM(UI64):1405631878959669][ATYP\ (FC32)\ : SP
UT][ANID(UI32):12872812][AMID(FC32):S3RQ][ATID(UI64):1579224
144102530435]]
```

The value of the ATYP attribute is SPUT. SPUT represents an S3 PUT transaction, which logs the ingest of an object to a bucket.

The following audit message also shows the bucket to which the object is associated:

```
2014-07-17T21:17:58.959669
[AUDT:[RSLT(FC32):SUCS][TIME(UI64):246979][S3AI(CSTR):"bc644d
381a87d6cc216adcd963fb6f95dd25a38aa2cb8c9a358e8c5087a6af5f"][
S3AK(CSTR):"UJXDKKQOXB7YARDS71Q2"][S3BK\ (CSTR)\ : "s3small11"][S3
KY(CSTR):"hello1"][CBID(UI64):0x50C4F7AC2BC8EDF7][CSIZ(UI64):
0][AVER(UI32):10][ATIM(UI64):1405631878959669][ATYP(FC32):SPU
T][ANID(UI32):12872812][AMID(FC32):S3RQ][ATID(UI64):157922414
4102530435]]
```

To discover when the PUT event occurred, note the Universal Coordinated Time (UTC) timestamp at the



beginning of the audit message. This value is a human-readable version of the ATIM attribute of the audit message itself:

**2014-07-17T21:17:58.959669**

```
[AUDT:[RSLT(FC32):SUCS][TIME(UI64):246979][S3AI(CSTR):"bc644d381a87d6cc216adcd963fb6f95dd25a38aa2cb8c9a358e8c5087a6af5f"] [S3AK(CSTR):"UJXDKKQOXB7YARDS71Q2"] [S3BK(CSTR):"s3small11"] [S3KY(CSTR):"hello1"] [CBID(UI64):0x50C4F7AC2BC8EDF7] [CSIZ(UI64):0] [AVER(UI32):10] [ATIM\ (UI64\):1405631878959669] [ATYP(FC32):SPUT] [ANID(UI32):12872812] [AMID(FC32):S3RQ] [ATID(UI64):1579224144102530435]]
```

ATIM records the time, in microseconds, since the beginning of the UNIX epoch. In the example, the value 1405631878959669 translates to Thursday, 17-Jul-2014 21:17:59 UTC.

#### Related information

[SPUT: S3 PUT](#)

[Common elements in audit messages](#)

## Audit messages and the object lifecycle

Audit messages are generated each time an object is ingested, retrieved, or deleted. You can identify these transactions in the audit log by locating API-specific (S3 or Swift) audit messages.

Audit messages are linked through identifiers specific to each protocol.

| Protocol                    | Code  |
|-----------------------------|---|
| Linking S3 operations       | S3BK (S3 Bucket) and/or S3KY (S3 Key)             |
| Linking Swift operations    | WCON (Swift Container) and/or WOBJ (Swift Object) |
| Linking internal operations | CBID (Object's Internal Identifier)               |

### Timing of audit messages

Because of factors such as timing differences between grid nodes, object size, and network delays, the order of audit messages generated by the different services can vary from that shown in the examples in this section.

### Information lifecycle management policy configuration

With the default ILM policy (Baseline 2 Copy), object data is copied once for a total of two copies. If the ILM policy requires more than two copies, there will be an additional set of CBRE, CBSE, and SCMT messages for each extra copy. For more information about ILM policies, see information about managing objects with information lifecycle management.

## Archive Nodes

The series of audit messages generated when an Archive Node sends object data to an external archival storage system is similar to that for Storage Nodes except that there is no SCMT (Store Object Commit) message, and the ATCE (Archive Object Store Begin) and ASCE (Archive Object Store End) messages are generated for each archived copy of object data.

The series of audit messages generated when an Archive Node retrieves object data from an external archival storage system is similar to that for Storage Nodes except that the ARCB (Archive Object Retrieve Begin) and ARCE (Archive Object Retrieve End) messages are generated for each retrieved copy of object data.

The series of audit messages generated when an Archive Node deletes object data from an external archival storage system is similar to that for Storage Nodes except that there is no SREM (Object Store Remove) message, and there is an AREM (Archive Object Remove) message for each delete request.

### Related information

[Manage objects with ILM](#)

## Object ingest transactions

You can identify client ingest transactions in the audit log by locating API-specific (S3 or Swift) audit messages.

Not all audit messages generated during an ingest transaction are listed in the following tables. Only the messages required to trace the ingest transaction are included.

### S3 ingest audit messages

| Code | Name               | Description  | Trace            | See                                    |
|------|--------------------|--|------------------|--|
| SPUT | S3 PUT transaction | An S3 PUT ingest transaction has completed successfully. | CBID, S3BK, S3KY | <a href="#">SPUT: S3 PUT</a>           |
| ORLM | Object Rules Met   | The ILM policy has been satisfied for this object.       | CBID             | <a href="#">ORLM: Object Rules Met</a> |

### Swift ingest audit messages

| Code | Name                  | Description  | Trace            | See                                    |
|------|-----------------------|--|------------------|--|
| WPUT | Swift PUT transaction | A Swift PUT ingest transaction has successfully completed. | CBID, WCON, WOBJ | <a href="#">WPUT: Swift PUT</a>        |
| ORLM | Object Rules Met      | The ILM policy has been satisfied for this object.         | CBID             | <a href="#">ORLM: Object Rules Met</a> |

## Example: S3 object ingest

The series of audit messages below is an example of the audit messages generated and saved to the audit log when an S3 client ingests an object to a Storage Node (LDR service).

In this example, the active ILM policy includes the stock ILM rule, Make 2 Copies.



Not all audit messages generated during a transaction are listed in the example below. Only those related to the S3 ingest transaction (SPUT) are listed.

This example assumes that an S3 bucket has been previously created.

### SPUT: S3 PUT

The SPUT message is generated to indicate that an S3 PUT transaction has been issued to create an object in a specific bucket.

```
2017-07-
17T21:17:58.959669[AUDT:[RSLT(FC32):SUCS][TIME(UI64):25771][SAIP(IPAD):"10
.96.112.29"]][S3AI(CSTR):"70899244468554783528"]][SACC(CSTR):"test"]][S3AK(CS
TR):"SGKHyalRU_5cLflqajtaFmxJn946lAWRJfBF33gAOg==" ][SUSR(CSTR):"urn:sgws:i
dentity::70899244468554783528:root"]][SBAI(CSTR):"70899244468554783528"]][SB
AC(CSTR):"test"]][S3BK(CSTR):"example"]][S3KY(CSTR):"testobject-0-
3"]][CBID\ (UI64\):0x8EF52DF8025E63A8][CSIZ(UI64):30720][AVER(UI32):10][ATIM
(UI64):150032627859669][ATYP\ (FC32\):SPUT][ANID(UI32):12086324][AMID(FC32)
:S3RQ][ATID(UI64):14399932238768197038]]
```

### ORLM: Object Rules Met

The ORLM message indicates that the ILM policy has been satisfied for this object. The message includes the object's CBID and the name of the ILM rule that was applied.

For replicated objects, the LOCS field includes the LDR node ID and volume ID of the object locations.

```
2019-07-
17T21:18:31.230669[AUDT:[CBID\ (UI64\):0x50C4F7AC2BC8EDF7][RULE(CSTR):"Make
2 Copies"]][STAT(FC32):DONE][CSIZ(UI64):0][UUID(CSTR):"0B344E18-98ED-4F22-
A6C8-A93ED68F8D3F"]][LOCS(CSTR):"CLDI 12828634 2148730112, CLDI 12745543
2147552014"]][RSLT(FC32):SUCS][AVER(UI32):10][ATYP\ (FC32\):ORLM][ATIM(UI64)
:1563398230669][ATID(UI64):15494889725796157557][ANID(UI32):13100453][AMID
(FC32):BCMS]]
```

For erasure-coded objects, the LOCS field includes the Erasure Coding profile ID and the Erasure Coding group ID

```
2019-02-23T01:52:54.647537
[AUDT:[CBID(UI64):0xFA8ABE5B5001F7E2][RULE(CSTR):"EC_2_plus_1"][STAT(FC32):DONE][CSIZ(UI64):10000][UUID(CSTR):"E291E456-D11A-4701-8F51-D2F7CC9AFECA"][LOCS(CSTR):"CLEC 1 A471E45D-A400-47C7-86AC-12E77F229831"][RSLT(FC32):SUCS][AVER(UI32):10][ATIM(UI64):1550929974537]\[ATYP\ (FC32\):ORLM\][ANID(UI32):12355278][AMID(FC32):ILMX][ATID(UI64):4168559046473725560]]
```

The PATH field includes S3 bucket and key information or Swift container and object information, depending on which API was used.

```
2019-09-15.txt:2018-01-24T13:52:54.131559
[AUDT:[CBID(UI64):0x82704DFA4C9674F4][RULE(CSTR):"Make 2 Copies"][STAT(FC32):DONE][CSIZ(UI64):3145729][UUID(CSTR):"8C1C9CAC-22BB-4880-9115-CE604F8CE687"][PATH(CSTR):"frisbee_Bucket1/GridDataTests151683676324774_1_1vf9d"][LOCS(CSTR):"CLDI 12525468, CLDI 12222978"][RSLT(FC32):SUCS][AVER(UI32):10][ATIM(UI64):1568555574559][ATYP(FC32):ORLM][ANID(UI32):12525468][AMID(FC32):OBDI][ATID(UI64):344833886538369336]]
```

## Object delete transactions

You can identify object delete transactions in the audit log by locating API-specific (S3 and Swift) audit messages.

Not all audit messages generated during a delete transaction are listed in the following tables. Only messages required to trace the delete transaction are included.

### S3 delete audit messages

| Code | Name      | Description                                      | Trace      | See                             |
|------|-----------|--|------------|---------------------------------|
| SDEL | S3 Delete | Request made to delete the object from a bucket. | CBID, S3KY | <a href="#">SDEL: S3 DELETE</a> |

### Swift delete audit messages

| Code | Name         | Description   | Trace      | See                                |
|------|--------------|---|------------|------------------------------------|
| WDEL | Swift Delete | Request made to delete the object from a container, or the container. | CBID, WOBJ | <a href="#">WDEL: Swift DELETE</a> |

## Example: S3 object deletion

When an S3 client deletes an object from a Storage Node (LDR service), an audit message is generated and saved to the audit log.



Not all audit messages generated during a delete transaction are listed in the example below. Only those related to the S3 delete transaction (SDEL) are listed.

### SDEL: S3 Delete

Object deletion begins when the client sends a DELETE Object request to an LDR service. The message contains the bucket from which to delete the object and the object's S3 Key, which is used to identify the object.

```
2017-07-
17T21:17:58.959669[AUDT:[RSLT(FC32):SUCS][TIME(UI64):14316][SAIP(IPAD):"10
.96.112.29"][S3AI(CSTR):"70899244468554783528"][SACC(CSTR):"test"][S3AK(CS
TR):"SGKHyalRU_5cLflqajtaFmxJn946lAWRJfBF33gAOg=="][SUSR(CSTR):"urn:sgws:i
dentity::70899244468554783528:root"][SBAI(CSTR):"70899244468554783528"][SB
AC(CSTR):"test"]\[S3BK\ (CSTR\):"example"\]\[S3KY\ (CSTR\):"testobject-0-
7"\][CBID\ (UI64\):0x339F21C5A6964D89][CSIZ(UI64):30720][AVER(UI32):10][ATI
M(UI64):150032627859669][ATYP\ (FC32\):SDEL][ANID(UI32):12086324][AMID(FC32
):S3RQ][ATID(UI64):4727861330952970593]]
```

## Object retrieve transactions

You can identify object retrieve transactions in the audit log by locating API-specific (S3 and Swift) audit messages.

Not all audit messages generated during a retrieve transaction are listed in the following tables. Only messages required to trace the retrieve transaction are included.

### S3 retrieval audit messages

| Code | Name   | Description                                       | Trace            | See                          |
|------|--------|---|------------------|------------------------------|
| SGET | S3 GET | Request made to retrieve an object from a bucket. | CBID, S3BK, S3KY | <a href="#">SGET: S3 GET</a> |

### Swift retrieval audit messages

| Code | Name      | Description  | Trace            | See                             |
|------|-----------|--|------------------|---------------------------------|
| WGET | Swift GET | Request made to retrieve an object from a container. | CBID, WCON, WOBJ | <a href="#">WGET: Swift GET</a> |

### Example: S3 object retrieval

When an S3 client retrieves an object from a Storage Node (LDR service), an audit message is generated and saved to the audit log.

Note that not all audit messages generated during a transaction are listed in the example below. Only those related to the S3 retrieval transaction (SGET) are listed.

#### SGET: S3 GET

Object retrieval begins when the client sends a GET Object request to an LDR service. The message contains the bucket from which to retrieve the object and the object's S3 Key, which is used to identify the object.

```
2017-09-20T22:53:08.782605
[AUDT:[RSLT(FC32):SUCS][TIME(UI64):47807][SAIP(IPAD):"10.96.112.26"][S3AI(
CSTR):"43979298178977966408"][SACC(CSTR):"s3-account-
a"][S3AK(CSTR):"SGKHt7GzEcu0yXhFhT_rL5mep4nJt1w75GBh-
O_FEW=="][SUSR(CSTR):"urn:sgws:identity::43979298178977966408:root"][SBAI(
CSTR):"43979298178977966408"][SBAC(CSTR):"s3-account-
a"]\[S3BK(CSTR):"bucket-
anonymous"\]\[S3KY(CSTR):"Hello.txt"\][CBID(UI64):0x83D70C6F1F662B02][CS
IZ(UI64):12][AVER(UI32):10][ATIM(UI64):1505947988782605]\[ATYP(FC32):SGE
T\][ANID(UI32):12272050][AMID(FC32):S3RQ][ATID(UI64):17742374343649889669]
]
```

If the bucket policy allows, a client can anonymously retrieve objects, or can retrieve objects from a bucket that is owned by a different tenant account. The audit message contains information about the bucket owner's tenant account so that you can track these anonymous and cross-account requests.

In the following example message, the client sends a GET Object request for an object stored in a bucket that they do not own. The values for SBAI and SBAC record the bucket owner's tenant account ID and name, which differs from the tenant account ID and name of the client recorded in S3AI and SACC.

```
2017-09-20T22:53:15.876415
[AUDT:[RSLT(FC32):SUCS][TIME(UI64):53244][SAIP(IPAD):"10.96.112.26"]\[S3AI
(CSTR):"17915054115450519830"\]\[SACC(CSTR):"s3-account-
b"\]\[S3AK(CSTR):"SGKHpoblWlP_kBkqSCbTi754Ls81BUog67I2L1SiUg=="][SUSR(CSTR)
:"urn:sgws:identity::17915054115450519830:root"]\[SBAI(CSTR):"4397929817
8977966408"\]\[SBAC(CSTR):"s3-account-a"\]\[S3BK(CSTR):"bucket-
anonymous"]\[S3KY(CSTR):"Hello.txt"]\[CBID(UI64):0x83D70C6F1F662B02][CSIZ(UI
64):12][AVER(UI32):10][ATIM(UI64):1505947995876415][ATYP(FC32):SGET][ANID(
UI32):12272050][AMID(FC32):S3RQ][ATID(UI64):6888780247515624902]]
```

### Example: S3 Select on an object

When an S3 client issues an S3 Select query on an object, audit messages are generated and saved to the audit log.

Note that not all audit messages generated during a transaction are listed in the example below. Only those related to the S3 Select transaction (SelectObjectContent) are listed.

Each query results in two audit messages: one that performs the authorization of the S3 Select request (the S3SR field is set to "select") and a subsequent standard GET operation that retrieves the data from storage during processing.

```
2021-11-08T15:35:30.750038
[AUDT:[RSLT(FC32):SUCS][CNID(UI64):1636385730715700][TIME(UI64):29173][SAIP(IPAD):"192.168.7.44"][S3AI(CSTR):"63147909414576125820"][SACC(CSTR):"Tenant1636027116"][S3AK(CSTR):"AUFD1XNVZ905F3TW7KSU"][SUSR(CSTR):"urn:sgws:identity::63147909414576125820:root"][SBAI(CSTR):"63147909414576125820"][SBAC(CSTR):"Tenant1636027116"][S3BK(CSTR):"619c0755-9e38-42e0-a614-05064f74126d"][S3KY(CSTR):"SUB-EST2020_ALL.csv"][CBID(UI64):0x0496F0408A721171][UUID(CSTR):"D64B1A4A-9F01-4EE7-B133-08842A099628"][CSIZ(UI64):0][S3SR(CSTR):"select"][AVER(UI32):10][ATIM(UI64):1636385730750038][ATYP(FC32):SPOS][ANID(UI32):12601166][AMID(FC32):S3RQ][ATID(UI64):1363009709396895985]]
```

```
2021-11-08T15:35:32.604886
[AUDT:[RSLT(FC32):SUCS][CNID(UI64):1636383069486504][TIME(UI64):430690][SAIP(IPAD):"192.168.7.44"][HTRH(CSTR):"{\"x-forwarded-for\":\"unix:\"}"]][S3AI(CSTR):"63147909414576125820"][SACC(CSTR):"Tenant1636027116"][S3AK(CSTR):"AUFD1XNVZ905F3TW7KSU"][SUSR(CSTR):"urn:sgws:identity::63147909414576125820:root"][SBAI(CSTR):"63147909414576125820"][SBAC(CSTR):"Tenant1636027116"][S3BK(CSTR):"619c0755-9e38-42e0-a614-05064f74126d"][S3KY(CSTR):"SUB-EST2020_ALL.csv"][CBID(UI64):0x0496F0408A721171][UUID(CSTR):"D64B1A4A-9F01-4EE7-B133-08842A099628"][CSIZ(UI64):10185581][MTME(UI64):1636380348695262][AVER(UI32):10][ATIM(UI64):1636385732604886][ATYP(FC32):SGET][ANID(UI32):12733063][AMID(FC32):S3RQ][ATID(UI64):16562288121152341130]]
```

## Metadata update messages

Audit messages are generated when an S3 client updates an object's metadata.

### S3 metadata update audit messages

| Code | Name                | Description  | Trace            | See                                       |
|------|---------------------|--|------------------|---|
| SUPD | S3 Metadata Updated | Generated when an S3 client updates the metadata for an ingested object. | CBID, S3KY, HTRH | <a href="#">SUPD: S3 Metadata Updated</a> |

### Example: S3 metadata update

The example shows a successful transaction to update the metadata for an existing S3 object.

#### SUPD: S3 Metadata Update

The S3 client makes a request (SUPD) to update the specified metadata (`x-amz-meta-*`) for the S3 object (S3KY). In this example, request headers are included in the field HTRH because it has been configured as an audit protocol header (**CONFIGURATION > Monitoring > Audit and syslog server**).

```
2017-07-11T21:54:03.157462
[AUDT:[RSLT(FC32):SUCS][TIME(UI64):17631][SAIP(IPAD):"10.96.100.254"]
[HTRH(CSTR):{"\accept-encoding\":"identity","\authorization\":"AWS
LIUF17FGJARQHPY2E761:jul/hnZs/uNY+aVvV0lTSYhEGts=","\
\content-length\":"0","\date\":"Tue, 11 Jul 2017 21:54:03
GMT","\host\":"10.96.99.163:18082","\
\user-agent\":"aws-cli/1.9.20 Python/2.7.6 Linux/3.13.0-119-generic
botocore/1.3.20","\
\x-amz-copy-source\":"testbkt1/testobj1","\x-amz-metadata-
directive\":"REPLACE","\x-amz-meta-city\":"Vancouver"}]
[S3AI(CSTR):"20956855414285633225"][SACC(CSTR):"acct1"][S3AK(CSTR):"SGKHyy
v9ZQqWRbJSQc5vI7mgioJwrdplShE02AUaww=="]
[SUSR(CSTR):"urn:sgws:identity::20956855414285633225:root"]
[SBAI(CSTR):"20956855414285633225"][SBAC(CSTR):"acct1"][S3BK(CSTR):"testbk
t1"]
[S3KY(CSTR):"testobj1"][CBID(UI64):0xCB1D5C213434DD48][CSIZ(UI64):10][AVER
(UI32):10]
[ATIM(UI64):1499810043157462][ATYP(FC32):SUPD][ANID(UI32):12258396][AMID(F
C32):S3RQ]
[ATID(UI64):8987436599021955788]]
```

### Related information

[Configure audit messages and log destinations](#)

## Audit messages

Detailed descriptions of audit messages returned by the system are listed in the following sections. Each audit message is first listed in a table that groups related messages by the



class of activity that the message represents. These groupings are useful both for understanding the types of activities that are audited, and for selecting the desired type of audit message filtering.

The audit messages are also listed alphabetically by their four-character codes. This alphabetic listing enables you to find information about specific messages.

The four-character codes used throughout this chapter are the ATYP values found in the audit messages as shown in the following sample message:

```
2014-07-17T03:50:47.484627
\[AUDT:[RSLT(FC32):VRGN][AVER(UI32):10][ATIM(UI64):1405569047484627][ATYP\
(FC32\):SYSU][ANID(UI32):11627225][AMID(FC32):ARNI][ATID(UI64):94457363265
00603516]]
```

For information on setting audit message levels, changing log destinations, and using an external syslog server for your audit information, see [Configure audit messages and log destinations](#)

## Audit message categories

You should be familiar with the various categories within which audit messages are grouped. These groups are organized based on the class of activity that the message represents.

### System audit messages

You should be familiar with audit messages belonging to the system audit category. These are events related to the auditing system itself, grid node states, system-wide task activity (grid tasks), and service backup operations, so that you can address potential issues.

| Code | Message title and description  | See   |
|------|--|---|
| ECMC | Missing Erasure Coded Data Fragment: Indicates that a missing erasure coded data fragment has been detected. | <a href="#">ECMC: Missing Erasure Coded Data Fragment</a> |
| ECOC | Corrupt Erasure Coded Data Fragment: Indicates that a corrupt erasure coded data fragment has been detected. | <a href="#">ECOC: Corrupt Erasure Coded Data Fragment</a> |
| ETAF | Security Authentication Failed: A connection attempt using Transport Layer Security (TLS) failed.            | <a href="#">ETAF: Security Authentication Failed</a>      |

| Code | Message title and description   | See   |
|------|---|---|
| GNRG | GNDS Registration: A service updated or registered information about itself in the StorageGRID system.                                    | <a href="#">GNRG: GNDS Registration</a>           |
| GNUR | GNDS Unregistration: A service has unregistered itself from the StorageGRID system.   | <a href="#">GNUR: GNDS Unregistration</a>         |
| GTED | Grid Task Ended: The CMN service finished processing the grid task.   | <a href="#">GTED: Grid Task Ended</a>             |
| GTST | Grid Task Started: The CMN service started to process the grid task.  | <a href="#">GTST: Grid Task Started</a>           |
| GTSU | Grid Task Submitted: A grid task was submitted to the CMN service.  | <a href="#">GTSU: Grid Task Submitted</a>         |
| IDEL | ILM Initiated Delete: This audit message is generated when ILM starts the process of deleting an object.                                  | <a href="#">IDEL: ILM Initiated Delete</a>        |
| LKCU | Overwritten Object Cleanup. This audit message is generated when an overwritten object is automatically removed to free up storage space. | <a href="#">LKCU: Overwritten Object Cleanup</a>  |
| LLST | Location Lost: This audit message is generated when a location is lost.   | <a href="#">LLST: Location Lost</a>               |
| OLST | Object Lost: A requested object cannot be located within the StorageGRID system.  | <a href="#">OLST: System Detected Lost Object</a> |
| ORLM | Object Rules Met: Object data is stored as specified by the ILM rules.  | <a href="#">ORLM: Object Rules Met</a>            |
| SADD | Security Audit Disable: Audit message logging was turned off.   | <a href="#">SADD: Security Audit Disable</a>      |

| Code | Message title and description   | See   |
|------|---|---|
| SADE | Security Audit Enable: Audit message logging has been restored.                                 | <a href="#">SADE: Security Audit Enable</a>       |
| SVRF | Object Store Verify Fail: A content block failed verification checks.                           | <a href="#">SVRF: Object Store Verify Fail</a>    |
| SVRU | Object Store Verify Unknown: Unexpected object data detected in the object store.               | <a href="#">SVRU: Object Store Verify Unknown</a> |
| SYSD | Node Stop: A shutdown was requested.  | <a href="#">SYSD: Node Stop</a>                   |
| SYST | Node Stopping: A service initiated a graceful stop.   | <a href="#">SYST: Node Stopping</a>               |
| SYSU | Node Start: A service started; the nature of the previous shutdown is indicated in the message. | <a href="#">SYSU: Node Start</a>                  |
| VLST | User Initiated Volume Lost: The <code>/proc/CMSI/Volume_Lost</code> command was run.            | <a href="#">VLST: User Initiated Volume Lost</a>  |

#### Related information

[LKCU: Overwritten Object Cleanup](#)

#### Object storage audit messages

You should be familiar with audit messages belonging to the object storage audit category. These are events related to the storage and management of objects within the StorageGRID system. These include object storage and retrievals, grid-node to grid-node transfers, and verifications.

| Code | Description  | See   |
|------|--|---|
| APCT | Archive Purge from Cloud-Tier: Archived object data is deleted from an external archival storage system, which connects to the StorageGRID through the S3 API. | <a href="#">APCT: Archive Purge from Cloud-Tier</a> |

| Code | Description  | See   |
|------|--|---|
| ARCB | Archive Object Retrieve Begin: The ARC service begins the retrieval of object data from the external archival storage system.  | <a href="#">ARCB: Archive Object Retrieve Begin</a>             |
| ARCE | Archive Object Retrieve End: Object data has been retrieved from an external archival storage system, and the ARC service reports the status of the retrieval operation. | <a href="#">ARCE: Archive Object Retrieve End</a>               |
| ARCT | Archive Retrieve from Cloud-Tier: Archived object data is retrieved from an external archival storage system, which connects to the StorageGRID through the S3 API.      | <a href="#">ARCT: Archive Retrieve from Cloud-Tier</a>          |
| AREM | Archive Object Remove: A content block was successfully or unsuccessfully deleted from the external archival storage system.   | <a href="#">AREM: Archive Object Remove</a>                     |
| ASCE | Archive Object Store End: A content block has been written to the external archival storage system, and the ARC service reports the status of the write operation.       | <a href="#">ASCE: Archive Object Store End</a>                  |
| ASCT | Archive Store Cloud-Tier: Object data is stored to an external archival storage system, which connects to the StorageGRID through the S3 API.                            | <a href="#">ASCT: Archive Store Cloud-Tier</a>                  |
| ATCE | Archive Object Store Begin: Writing a content block to an external archival storage has started.   | <a href="#">ATCE: Archive Object Store Begin</a>                |
| AVCC | Archive Validate Cloud-Tier Configuration: The account and bucket settings provided were successfully or unsuccessfully validated.                                       | <a href="#">AVCC: Archive Validate Cloud-Tier Configuration</a> |

| Code | Description   | See                                       |
|------|---|---|
| CBSE | Object Send End: The source entity completed a grid-node to grid-node data transfer operation.              | <a href="#">CBSE: Object Send End</a>     |
| CBRE | Object Receive End: The destination entity completed a grid-node to grid-node data transfer operation.      | <a href="#">CBRE: Object Receive End</a>  |
| SCMT | Object Store Commit: A content block was completely stored and verified, and can now be requested.          | <a href="#">SCMT: Object Store Commit</a> |
| SREM | Object Store Remove: A content block was deleted from a grid node, and can no longer be requested directly. | <a href="#">SREM: Object Store Remove</a> |

### Client read audit messages

Client read audit messages are logged when an S3 or Swift client application makes a request to retrieve an object.

| Code | Description  | Used by      | See                             |
|------|--|--------------|---------------------------------|
| SGET | <p>S3 GET: Logs a successful transaction to retrieve an object or list the objects in a bucket.</p> <p><b>Note:</b> If the transaction operates on a subresource, the audit message will include the field S3SR.</p> | S3 client    | <a href="#">SGET: S3 GET</a>    |
| SHEA | S3 HEAD: Logs a successful transaction to check for the existence of an object or bucket.  | S3 client    | <a href="#">SHEA: S3 HEAD</a>   |
| WGET | Swift GET: Logs a successful transaction to retrieve an object or list the objects in a container.   | Swift client | <a href="#">WGET: Swift GET</a> |

| Code | Description   | Used by      | See                              |
|------|---|--------------|----------------------------------|
| WHEA | Swift HEAD: Logs a successful transaction to check for the existence of an object or container. | Swift client | <a href="#">WHEA: Swift HEAD</a> |

### Client write audit messages

Client write audit messages are logged when an S3 or Swift client application makes a request to create or modify an object.

| Code | Description  | Used by                     | See                                    |
|------|--|-----------------------------|--|
| OVWR | Object Overwrite: Logs a transaction to overwrite one object with another object.  | S3 clients<br>Swift clients | <a href="#">OVWR: Object Overwrite</a> |
| SDEL | S3 DELETE: Logs a successful transaction to delete an object or bucket.<br><br><b>Note:</b> If the transaction operates on a subresource, the audit message will include the field S3SR. | S3 client                   | <a href="#">SDEL: S3 DELETE</a>        |
| SPOS | S3 POST: Logs a successful transaction to restore an object from AWS Glacier storage to a Cloud Storage Pool.  | S3 client                   | <a href="#">SPOS: S3 POST</a>          |
| SPUT | S3 PUT: Logs a successful transaction to create a new object or bucket.<br><br><b>Note:</b> If the transaction operates on a subresource, the audit message will include the field S3SR. | S3 client                   | <a href="#">SPUT: S3 PUT</a>           |

| Code | Description   | Used by      | See                                       |
|------|---|--------------|---|
| SUPD | S3 Metadata Updated: Logs a successful transaction to update the metadata for an existing object or bucket. | S3 client    | <a href="#">SUPD: S3 Metadata Updated</a> |
| WDEL | Swift DELETE: Logs a successful transaction to delete an object or container.                               | Swift client | <a href="#">WDEL: Swift DELETE</a>        |
| WPUT | Swift PUT: Logs a successful transaction to create a new object or container.                               | Swift client | <a href="#">WPUT: Swift PUT</a>           |

### Management audit message

The Management category logs user requests to the Management API.

| Code | Message title and description                         | See  |
|------|---|--|
| MGAU | Management API audit message: A log of user requests. | <a href="#">MGAU: Management audit message</a> |

### Audit message reference

#### APCT: Archive Purge from Cloud-Tier

This message is generated when archived object data is deleted from an external archival storage system, which connects to the StorageGRID through the S3 API.

| Code | Field                     | Description   |
|------|---------------------------|---|
| CBID | Content Block ID          | The unique identifier for the content block that was deleted.                 |
| CSIZ | Content Size              | The size of the object in bytes. Always returns 0.                            |
| RSLT | Result Code               | Returns successful (SUCS) or the error reported by the backend.               |
| SUID | Storage Unique Identifier | Unique identifier (UUID) of the cloud-tier from which the object was deleted. |

### ARCB: Archive Object Retrieve Begin

This message is generated when a request is made to retrieve archived object data and the retrieval process begins. Retrieval requests are processed immediately, but can be reordered to improve efficiency of retrieval from linear media such as tape.

| Code | Field            | Description  |
|------|------------------|--|
| CBID | Content Block ID | The unique identifier of the Content Block to be retrieved from the external archival storage system.  |
| RSLT | Result           | Indicates the result of starting the archive retrieval process. Currently defined value is: SUCS: The content request was received and queued for retrieval. |

This audit message marks the time of an archive retrieval. It allows you to match the message with a corresponding ARCE end message to determine the duration of archive retrieval, and whether the operation was successful.

### ARCE: Archive Object Retrieve End

This message is generated when an attempt by the Archive Node to retrieve object data from an external archival storage system completes. If successful, the message indicates that the requested object data has been completely read from the archive location, and was successfully verified. After the object data has been retrieved and verified, it is delivered to the requesting service.

| Code | Field             | Description   |
|------|-------------------|---|
| CBID | Content Block ID  | The unique identifier of the Content Block to be retrieved from the external archival storage system.   |
| VLID | Volume Identifier | The identifier of the volume on which the data was archived. If an archive location for the content is not found, a Volume ID of 0 is returned. |



| Code | Field            | Description   |
|------|------------------|---|
| RSLT | Retrieval Result | <p>The completion status of the archive retrieval process:</p> <ul style="list-style-type: none"> <li>• SUCS: successful</li> <li>• VRFL: failed (object verification failure)</li> <li>• ARUN: failed (external archival storage system unavailable)</li> <li>• CANC: failed (retrieval operation canceled)</li> <li>• GERR: failed (general error)</li> </ul> |

Matching this message with the corresponding ARCB message can indicate the time taken to perform the archive retrieval. This message indicates whether the retrieval was successful, and in the case of failure, the cause of the failure to retrieve the content block.

#### **ARCT: Archive Retrieve from Cloud-Tier**

This message is generated when archived object data is retrieved from an external archival storage system, which connects to the StorageGRID through the S3 API.

| Code | Field                     | Description   |
|------|---------------------------|---|
| CBID | Content Block ID          | The unique identifier for the content block that was retrieved.                       |
| CSIZ | Content Size              | The size of the object in bytes. The value is only accurate for successful retrieves. |
| RSLT | Result Code               | Returns successful (SUCS) or the error reported by the backend.                       |
| SUID | Storage Unique Identifier | Unique identifier (UUID) of the external archival storage system.                     |
| TIME | Time                      | Total processing time for the request in microseconds.                                |

#### **AREM: Archive Object Remove**

The Archive Object Remove audit message indicates that a content block was successfully or unsuccessfully deleted from an Archive Node. If the result is successful, the Archive Node has successfully informed the external archival storage system that StorageGRID has released an object location. Whether the object is removed from the

external archive storage system depends on the type of system and its configuration.

| Code | Field             | Description   |
|------|-------------------|---|
| CBID | Content Block ID  | The unique identifier of the Content Block to be retrieved from the external archival media system.   |
| VLID | Volume Identifier | The identifier of the volume on which the object data was archived.   |
| RSLT | Result            | The completion status of the archive removal process: <ul style="list-style-type: none"><li>• SUCS: successful</li><li>• ARUN: failed (external archival storage system unavailable)</li><li>• GERR: failed (general error)</li></ul> |

#### ASCE: Archive Object Store End

This message indicates that writing a content block to an external archival storage system has ended.

| Code | Field                    | Description   |
|------|--------------------------|---|
| CBID | Content Block Identifier | The identifier of the content block stored on the external archival storage system.   |
| VLID | Volume Identifier        | The unique identifier of the archive volume to which the object data is written.  |
| VREN | Verification Enabled     | Indicates if verification is performed for content blocks. Currently defined values are: <ul style="list-style-type: none"><li>• VENA: verification is enabled</li><li>• VDSA: verification is disabled</li></ul> |
| MCLS | Management Class         | A string identifying the TSM Management Class to which the content block is assigned if applicable.   |

| Code | Field  | Description   |
|------|--------|---|
| RSLT | Result | <p>Indicates the result of the archive process. Currently defined values are:</p> <ul style="list-style-type: none"> <li>• SUCS: successful (archiving process succeeded)</li> <li>• OFFL: failed (archiving is offline)</li> <li>• VRFL: failed (object verification failed)</li> <li>• ARUN: failed (external archival storage system unavailable)</li> <li>• GERR: failed (general error)</li> </ul> |

This audit message means that the specified content block has been written to the external archival storage system. If the write fails, the result provides basic troubleshooting information about where the failure occurred. More detailed information about archive failures can be found by examining Archive Node attributes in the StorageGRID system.

#### **ASCT: Archive Store Cloud-Tier**

This message is generated when archived object data is stored to an external archival storage system, which connects to StorageGRID through the S3 API.

| Code | Field                     | Description   |
|------|---------------------------|---|
| CBID | Content Block ID          | The unique identifier for the content block that was retrieved.       |
| CSIZ | Content Size              | The size of the object in bytes.                                      |
| RSLT | Result Code               | Returns successful (SUCS) or the error reported by the backend.       |
| SUID | Storage Unique Identifier | Unique identifier (UUID) of the cloud-tier the content was stored to. |
| TIME | Time                      | Total processing time for the request in microseconds.                |

#### **ATCE: Archive Object Store Begin**

This message indicates that writing a content block to an external archival storage has started.

| Code | Field             | Description   |
|------|-------------------|---|
| CBID | Content Block ID  | The unique identifier of the content block to be archived.  |
| VLID | Volume Identifier | The unique identifier of the volume to which the content block is written. If the operation fails, a volume ID of 0 is returned.  |
| RSLT | Result            | <p>Indicates the result of the transfer of the content block. Currently defined values are:</p> <ul style="list-style-type: none"> <li>• SUCS: success (content block stored successfully)</li> <li>• EXIS: ignored (content block was already stored)</li> <li>• ISFD: failed (insufficient disk space)</li> <li>• STER: failed (error storing the CBID)</li> <li>• OFFL: failed (archiving is offline)</li> <li>• GERR: failed (general error)</li> </ul> |

#### **AVCC: Archive Validate Cloud-Tier Configuration**

This message is generated when the configuration settings are validated for a Cloud Tiering - Simple Storage Service (S3) target type.

| Code | Field                     | Description  |
|------|---------------------------|--|
| RSLT | Result Code               | Returns successful (SUCS) or the error reported by the backend.            |
| SUID | Storage Unique Identifier | UUID associated with the external archival storage system being validated. |

#### **CBRB: Object Receive Begin**

During normal system operations, content blocks are continuously transferred between different nodes as data is accessed, replicated and retained. When transfer of a content block from one node to another is initiated, this message is issued by the destination entity.

| Code | Field                       | Description  |
|------|-----------------------------|--|
| CNID | Connection Identifier       | The unique identifier of the node-to-node session/connection.  |
| CBID | Content Block Identifier    | The unique identifier of the content block being transferred.  |
| CTDR | Transfer Direction          | Indicates if the CBID transfer was push-initiated or pull-initiated:<br><br>PUSH: The transfer operation was requested by the sending entity.<br><br>PULL: The transfer operation was requested by the receiving entity. |
| CTSR | Source Entity               | The node ID of the source (sender) of the CBID transfer.   |
| CTDS | Destination Entity          | The node ID of the destination (receiver) of the CBID transfer.  |
| CTSS | Start Sequence Count        | Indicates the first sequence count requested. If successful, the transfer begins from this sequence count.   |
| CTES | Expected End Sequence Count | Indicates the last sequence count requested. If successful, the transfer is considered complete when this sequence count has been received.  |
| RSLT | Transfer Start Status       | Status at the time the transfer was started:<br><br>SUCS: Transfer started successfully.   |

This audit message means a node-to-node data transfer operation was initiated on a single piece of content, as identified by its Content Block Identifier. The operation requests data from "Start Sequence Count" to "Expected End Sequence Count". Sending and receiving nodes are identified by their node IDs. This information can be used to track system data flow, and when combined with storage audit messages, to verify replica counts.

#### **CBRE: Object Receive End**

When transfer of a content block from one node to another is completed, this message is issued by the destination entity.

| <b>Code</b> | <b>Field</b>              | <b>Description</b>   |
|-------------|---------------------------|--|
| CNID        | Connection Identifier     | The unique identifier of the node-to-node session/connection.  |
| CBID        | Content Block Identifier  | The unique identifier of the content block being transferred.  |
| CTDR        | Transfer Direction        | Indicates if the CBID transfer was push-initiated or pull-initiated:<br><br>PUSH: The transfer operation was requested by the sending entity.<br><br>PULL: The transfer operation was requested by the receiving entity. |
| CTSR        | Source Entity             | The node ID of the source (sender) of the CBID transfer.   |
| CTDS        | Destination Entity        | The node ID of the destination (receiver) of the CBID transfer.  |
| CTSS        | Start Sequence Count      | Indicates the sequence count on which the transfer started.  |
| CTAS        | Actual End Sequence Count | Indicates the last sequence count successfully transferred. If the Actual End Sequence Count is the same as the Start Sequence Count, and the Transfer Result was not successful, no data was exchanged.                 |

| Code | Field           | Description  |
|------|-----------------|--|
| RSLT | Transfer Result | <p>The result of the transfer operation (from the perspective of the sending entity):</p> <p>SUCS: transfer successfully completed; all requested sequence counts were sent.</p> <p>CONL: connection lost during transfer</p> <p>CTMO: connection timed-out during establishment or transfer</p> <p>UNRE: destination node ID unreachable</p> <p>CRPT: transfer ended due to reception of corrupt or invalid data (might indicate tampering)</p> |

This audit message means a node-to-node data transfer operation was completed. If the Transfer Result was successful, the operation transferred data from "Start Sequence Count" to "Actual End Sequence Count". Sending and receiving nodes are identified by their node IDs. This information can be used to track system data flow and to locate, tabulate, and analyze errors. When combined with storage audit messages, it can also be used to verify replica counts.

### **CBSB: Object Send Begin**

During normal system operations, content blocks are continuously transferred between different nodes as data is accessed, replicated and retained. When transfer of a content block from one node to another is initiated, this message is issued by the source entity.

| Code | Field                    | Description   |
|------|--------------------------|---|
| CNID | Connection Identifier    | The unique identifier of the node-to-node session/connection.   |
| CBID | Content Block Identifier | The unique identifier of the content block being transferred.   |
| CTDR | Transfer Direction       | <p>Indicates if the CBID transfer was push-initiated or pull-initiated:</p> <p>PUSH: The transfer operation was requested by the sending entity.</p> <p>PULL: The transfer operation was requested by the receiving entity.</p> |

| Code | Field                       | Description   |
|------|-----------------------------|---|
| CTSR | Source Entity               | The node ID of the source (sender) of the CBID transfer.  |
| CTDS | Destination Entity          | The node ID of the destination (receiver) of the CBID transfer.   |
| CTSS | Start Sequence Count        | Indicates the first sequence count requested. If successful, the transfer begins from this sequence count.                                  |
| CTES | Expected End Sequence Count | Indicates the last sequence count requested. If successful, the transfer is considered complete when this sequence count has been received. |
| RSLT | Transfer Start Status       | Status at the time the transfer was started:<br><br>SUCS: transfer started successfully.  |

This audit message means a node-to-node data transfer operation was initiated on a single piece of content, as identified by its Content Block Identifier. The operation requests data from "Start Sequence Count" to "Expected End Sequence Count". Sending and receiving nodes are identified by their node IDs. This information can be used to track system data flow, and when combined with storage audit messages, to verify replica counts.

### CBSE: Object Send End

When transfer of a content block from one node to another is completed, this message is issued by the source entity.

| Code | Field                    | Description   |
|------|--------------------------|---|
| CNID | Connection Identifier    | The unique identifier of the node-to-node session/connection. |
| CBID | Content Block Identifier | The unique identifier of the content block being transferred. |



| Code | Field                     | Description  |
|------|---------------------------|--|
| CTDR | Transfer Direction        | <p>Indicates if the CBID transfer was push-initiated or pull-initiated:</p> <p>PUSH: The transfer operation was requested by the sending entity.</p> <p>PULL: The transfer operation was requested by the receiving entity.</p>  |
| CTSR | Source Entity             | The node ID of the source (sender) of the CBID transfer.   |
| CTDS | Destination Entity        | The node ID of the destination (receiver) of the CBID transfer.  |
| CTSS | Start Sequence Count      | Indicates the sequence count on which the transfer started.  |
| CTAS | Actual End Sequence Count | Indicates the last sequence count successfully transferred. If the Actual End Sequence Count is the same as the Start Sequence Count, and the Transfer Result was not successful, no data was exchanged.   |
| RSLT | Transfer Result           | <p>The result of the transfer operation (from the perspective of the sending entity):</p> <p>SUCS: Transfer successfully completed; all requested sequence counts were sent.</p> <p>CONL: connection lost during transfer</p> <p>CTMO: connection timed-out during establishment or transfer</p> <p>UNRE: destination node ID unreachable</p> <p>CRPT: transfer ended due to reception of corrupt or invalid data (might indicate tampering)</p> |

This audit message means a node-to-node data transfer operation was completed. If the Transfer Result was successful, the operation transferred data from "Start Sequence Count" to "Actual End Sequence Count". Sending and receiving nodes are identified by their node IDs. This information can be used to track system

data flow and to locate, tabulate, and analyze errors. When combined with storage audit messages, it can also be used to verify replica counts.

#### **ECMC: Missing Erasure Coded Data Fragment**

This audit message indicates that the system has detected a missing erasure-coded data fragment.

| <b>Code</b> | <b>Field</b> | <b>Description</b>   |
|-------------|--------------|--|
| VCMC        | VCS ID       | The name of the VCS that contains the missing chunk.   |
| MCID        | Chunk ID     | The identifier of the missing erasure-coded fragment.  |
| RSLT        | Result       | This field has the value 'NONE'. RSLT is a mandatory message field, but is not relevant for this particular message. 'NONE' is used rather than 'SUCS' so that this message is not filtered. |

#### **ECOC: Corrupt Erasure Coded Data Fragment**

This audit message indicates that the system has detected a corrupt erasure-coded data fragment.

| <b>Code</b> | <b>Field</b> | <b>Description</b>   |
|-------------|--------------|--|
| VCCO        | VCS ID       | The name of the VCS that contains the corrupt chunk.   |
| VLID        | Volume ID    | The RangeDB Volume that contains the corrupt erasure-coded fragment.   |
| CCID        | Chunk ID     | The identifier of the corrupt erasure-coded fragment.  |
| RSLT        | Result       | This field has the value 'NONE'. RSLT is a mandatory message field, but is not relevant for this particular message. 'NONE' is used rather than 'SUCS' so that this message is not filtered. |

## ETAF: Security Authentication Failed

This message is generated when a connection attempt using Transport Layer Security (TLS) has failed.

| Code | Field                 | Description  |
|------|-----------------------|--|
| CNID | Connection Identifier | The unique system identifier for the TCP/IP connection over which the authentication failed.   |
| RUID | User Identity         | A service dependent identifier representing the identity of the remote user.   |
| RSLT | Reason Code           | <p>The reason for the failure:</p> <p>SCNI: Secure connection establishment failed.</p> <p>CERM: Certificate was missing.</p> <p>CERT: Certificate was invalid.</p> <p>CERE: Certificate was expired.</p> <p>CERR: Certificate was revoked.</p> <p>CSGN: Certificate signature was invalid.</p> <p>CSGU: Certificate signer was unknown.</p> <p>UCRM: User credentials were missing.</p> <p>UCRI: User credentials were invalid.</p> <p>UCRU: User credentials were disallowed.</p> <p>TOUT: Authentication timed out.</p> |

When a connection is established to a secure service that uses TLS, the credentials of the remote entity are verified using the TLS profile and additional logic built into the service. If this authentication fails due to invalid, unexpected, or disallowed certificates or credentials, an audit message is logged. This enables queries for unauthorized access attempts and other security-related connection problems.

The message could result from a remote entity having an incorrect configuration, or from attempts to present invalid or disallowed credentials to the system. This audit message should be monitored to detect attempts to gain unauthorized access to the system.

## GNRG: GNDS Registration

The CMN service generates this audit message when a service has updated or registered information about itself in the StorageGRID system.

| Code  | Field                | Description  |
|-------|----------------------|--|
| RSLT  | Result               | The result of the update request: <ul style="list-style-type: none"><li>• SUCS: Successful</li><li>• SUNV: Service Unavailable</li><li>• GERR: Other failure</li></ul> |
| GNID  | Node ID              | The node ID of the service that initiated the update request.  |
| GNTPT | Device Type          | The grid node's device type (for example, BLDR for an LDR service).  |
| GNDV  | Device Model version | The string identifying the grid node's device model version in the DMDL bundle.  |
| GNGP  | Group                | The group to which the grid node belongs (in the context of link costs and service-query ranking).   |
| GNIA  | IP Address           | The grid node's IP address.  |

This message is generated whenever a grid node updates its entry in the Grid Nodes Bundle.

## GNUR: GNDS Unregistration

The CMN service generates this audit message when a service has unregistered information about itself from the StorageGRID system.

| Code | Field   | Description  |
|------|---------|--|
| RSLT | Result  | The result of the update request: <ul style="list-style-type: none"><li>• SUCS: Successful</li><li>• SUNV: Service Unavailable</li><li>• GERR: Other failure</li></ul> |
| GNID | Node ID | The node ID of the service that initiated the update request.  |

### GTED: Grid Task Ended

This audit message indicates that the CMN service has finished processing the specified grid task and has moved the task to the Historical table. If the result is SUCS, ABRT, or ROLF, there will be a corresponding Grid Task Started audit message. The other results indicate that processing of this grid task never started.

| Code | Field   | Description  |
|------|---------|--|
| TSID | Task ID | <p>This field uniquely identifies a generated grid task and allows the grid task to be managed over its lifecycle.</p> <p><b>Note:</b> The Task ID is assigned at the time that a grid task is generated, not the time that it is submitted. It is possible for a given grid task to be submitted multiple times, and in this case the Task ID field is not sufficient to uniquely link the Submitted, Started, and Ended audit messages.</p>  |
| RSLT | Result  | <p>The final status result of the grid task:</p> <ul style="list-style-type: none"><li>• SUCS: The grid task completed successfully.</li><li>• ABRT: The grid task was aborted without a rollback error.</li><li>• ROLF: The grid task was aborted and was unable to complete the rollback process.</li><li>• CANC: The grid task was canceled by the user before it was started.</li><li>• EXPR: The grid task expired before it was started.</li><li>• IVLD: The grid task was invalid.</li><li>• AUTH: The grid task was unauthorized.</li><li>• DUPL: The grid task was rejected as a duplicate.</li></ul> |

### GTST: Grid Task Started

This audit message indicates that the CMN service has started to process the specified grid task. The audit message immediately follows the Grid Task Submitted message for

grid tasks initiated by the internal Grid Task Submission service and selected for automatic activation. For grid tasks submitted into the Pending table, this message is generated when the user starts the grid task.

| Code | Field   | Description  |
|------|---------|--|
| TSID | Task ID | <p>This field uniquely identifies a generated grid task and allows the task to be managed over its lifecycle.</p> <p><b>Note:</b> The Task ID is assigned at the time that a grid task is generated, not the time that it is submitted. It is possible for a given grid task to be submitted multiple times, and in this case the Task ID field is not sufficient to uniquely link the Submitted, Started, and Ended audit messages.</p> |
| RSLT | Result  | <p>The result. This field has only one value:</p> <ul style="list-style-type: none"> <li>• SUCS: The grid task was started successfully.</li> </ul>  |

#### GTSU: Grid Task Submitted

This audit message indicates that a grid task has been submitted to the CMN service.

| Code | Field        | Description   |
|------|--------------|---|
| TSID | Task ID      | <p>Uniquely identifies a generated grid task and allows the task to be managed over its lifecycle.</p> <p><b>Note:</b> The Task ID is assigned at the time that a grid task is generated, not the time that it is submitted. It is possible for a given grid task to be submitted multiple times, and in this case the Task ID field is not sufficient to uniquely link the Submitted, Started, and Ended audit messages.</p> |
| TTYP | Task Type    | The type of grid task.  |
| TVER | Task Version | A number indicating the version of the grid task.   |

| Code | Field                  | Description   |
|------|------------------------|---|
| TDSC | Task Description       | A human-readable description of the grid task.  |
| VATS | Valid After Timestamp  | The earliest time (UINT64 microseconds from January 1, 1970 - UNIX time) at which the grid task is valid.   |
| VBTS | Valid Before Timestamp | The latest time (UINT64 microseconds from January 1, 1970 - UNIX time) at which the grid task is valid.   |
| TSRC | Source                 | <p>The source of the task:</p> <ul style="list-style-type: none"> <li>• TXTB: The grid task was submitted through the StorageGRID system as a signed text block.</li> <li>• GRID: The grid task was submitted through the internal Grid Task Submission Service.</li> </ul> |
| ACTV | Activation Type        | <p>The type of activation:</p> <ul style="list-style-type: none"> <li>• AUTO: The grid task was submitted for automatic activation.</li> <li>• PEND: The grid task was submitted into the pending table. This is the only possibility for the TXTB source.</li> </ul>       |
| RSLT | Result                 | <p>The result of the submission:</p> <ul style="list-style-type: none"> <li>• SUCS: The grid task was submitted successfully.</li> <li>• FAIL: The task has been moved directly to the historical table.</li> </ul>   |

#### IDEL: ILM Initiated Delete

This message is generated when ILM starts the process of deleting an object.

The IDEL message is generated in either of these situations:

- **For objects in compliant S3 buckets:** This message is generated when ILM starts the process of auto-

deleting an object because its retention period has expired (assuming the auto-delete setting is enabled and legal hold is off).

- **For objects in non-compliant S3 buckets or Swift containers.** This message is generated when ILM starts the process of deleting an object because no placement instructions in the active ILM policy currently apply to the object.

| Code | Field                                      | Description   |
|------|--|---|
| CBID | Content Block Identifier                   | The CBID of the object.   |
| CMPA | Compliance: Auto delete                    | For objects in compliant S3 buckets only. 0 (false) or 1 (true), indicating whether a compliant object should be deleted automatically when its retention period ends, unless the bucket is under a legal hold.   |
| CMPL | Compliance: Legal hold                     | For objects in compliant S3 buckets only. 0 (false) or 1 (true), indicating whether the bucket is currently under a legal hold.   |
| CMPR | Compliance: Retention period               | For objects in compliant S3 buckets only. The length of the object's retention period in minutes.   |
| CTME | Compliance: Ingest time                    | For objects in compliant S3 buckets only. The object's ingest time. You can add the retention period in minutes to this value to determine when the object can be deleted from the bucket.  |
| DMRK | Delete Marker Version ID                   | The version ID of the delete marker created when deleting an object from a versioned bucket. Operations on buckets do not include this field.   |
| CSIZ | Content size                               | The size of the object in bytes.  |
| LOCS | Locations                                  | The storage location of object data within the StorageGRID system. The value for LOCS is "" if the object has no locations (for example, it has been deleted).<br><br>CLEC: for erasure-coded objects, the erasure coding profile ID and the erasure coding group ID that is applied to the object's data.<br><br>CLDI: for replicated objects, the LDR node ID and the volume ID of the object's location.<br><br>CLNL: ARC node ID of the object's location if the object data is archived. |
| PATH | S3 Bucket/Key or Swift Container/Object ID | The S3 bucket name and S3 key name, or the Swift container name and Swift object identifier.  |
| RSLT | Result                                     | The result of the ILM operation.<br><br>SUCS: The ILM operation was successful.   |



| Code | Field                         | Description   |
|------|-------------------------------|---|
| RULE | Rules Label                   | <ul style="list-style-type: none"> <li>• If an object in a compliant S3 bucket is being deleted automatically because its retention period has expired, this field is blank.</li> <li>• If the object is being deleted because there are no more placement instructions that currently apply to the object, this field shows the human-readable label of the last ILM rule that applied to the object.</li> </ul> |
| SGRP | Site (Group)                  | If present, the object was deleted at the site specified, which is not the site where the object was ingested.  |
| UUID | Universally Unique Identifier | The identifier of the object within the StorageGRID system.   |
| VSID | Version ID                    | The version ID of the specific version of an object that was deleted. Operations on buckets and objects in unversioned buckets do not include this field.   |

### LKCU: Overwritten Object Cleanup

This message is generated when StorageGRID removes an overwritten object that previously required cleanup to free up storage space. An object is overwritten when an S3 or Swift client writes an object to a path already containing a object. The removal process occurs automatically and in the background.

| Code | Field                                      | Description  |
|------|--|--|
| CSIZ | Content size                               | The size of the object in bytes.   |
| LTYP | Type of cleanup                            | <i>Internal use only.</i>  |
| LUID | Removed Object UUID                        | The identifier of the object that was removed.   |
| PATH | S3 Bucket/Key or Swift Container/Object ID | The S3 bucket name and S3 key name, or the Swift container name and Swift object identifier.                     |
| SEGC | Container UUID                             | UUID of the container for the segmented object. This value is available only if the object is segmented.         |
| UUID | Universally Unique Identifier              | The identifier of the object that still exists. This value is available only if the object has not been deleted. |

## LLST: Location Lost

This message is generated whenever a location for an object copy (replicated or erasure coded) cannot be found.

| Code | Field                     | Description  |
|------|---------------------------|--|
| CBIL | CBID                      | The affected CBID.   |
| NOID | Source Node ID            | The node ID on which the locations were lost.  |
| UUID | Universally Unique ID     | The identifier of the affected object in the StorageGRID system.   |
| ECPR | Erasure Coding Profile    | For erasure-coded object data. The ID of the Erasure Coding profile used.  |
| LTYP | Location Type             | CLDI (Online): For replicated object data<br><br>CLEC (Online): For erasure-coded object data<br><br>CLNL (Nearline): For archived replicated object data  |
| PCLD | Path to replicated object | The complete path to the disk location of the lost object data. Only returned when LTYP has a value of CLDI (that is, for replicated objects).<br><br>Takes the form<br><code>/var/local/rangedb/2/p/13/13/00oJs6X%{h{U}SeUFxE@</code> |
| RSLT | Result                    | Always NONE. RSLT is a mandatory message field, but is not relevant for this message. NONE is used rather than SUCS so that this message is not filtered.  |
| TSRC | Triggering Source         | USER: User triggered<br><br>SYST: System triggered   |

## MGAU: Management audit message

The Management category logs user requests to the Management API. Every request that is not a GET or HEAD request to the API logs a response with the username, IP, and type of request to the API.

| Code | Field                    | Description  |
|------|--------------------------|--|
| MDIP | Destination IP Address   | The server (destination) IP address.   |
| MDNA | Domain name              | The host domain name.  |
| MPAT | Request PATH             | The request path.  |
| MPQP | Request query parameters | The query parameters for the request.  |
| MRBD | Request body             | <p>The content of the request body. While the response body is logged by default, the request body is logged in certain cases when the response body is empty. Because the following information is not available in the response body, it is taken from the request body for the following POST methods:</p> <ul style="list-style-type: none"><li>• Username and account ID in <b>POST authorize</b></li><li>• New subnets configuration in <b>POST /grid/grid-networks/update</b></li><li>• New NTP servers in <b>POST /grid/ntp-servers/update</b></li><li>• Decommissioned server IDs in <b>POST /grid/servers/decommission</b></li></ul> <p><b>Note:</b> Sensitive information is either deleted (for example, an S3 access key) or masked with asterisks (for example, a password).</p> |

| Code | Field             | Description   |
|------|-------------------|---|
| MRMD | Request method    | The HTTP request method: <ul style="list-style-type: none"> <li>• POST</li> <li>• PUT</li> <li>• DELETE</li> <li>• PATCH</li> </ul>   |
| MRSC | Response code     | The response code.  |
| MRSP | Response body     | The content of the response (the response body) is logged by default.<br><br><b>Note:</b> Sensitive information is either deleted (for example, an S3 access key) or masked with asterisks (for example, a password). |
| MSIP | Source IP address | The client (source) IP address.   |
| MUUN | User URN          | The URN (uniform resource name) of the user who sent the request.   |
| RSLT | Result            | Returns successful (SUCS) or the error reported by the backend.   |

#### OLST: System Detected Lost Object

This message is generated when the DDS service cannot locate any copies of an object within the StorageGRID system.

| Code | Field                                      | Description  |
|------|--|--|
| CBID | Content Block Identifier                   | The CBID of the lost object.   |
| NOID | Node ID                                    | If available, the last known direct or nearline location of the lost object. It is possible to have just the Node ID without a Volume ID if the volume information is not available. |
| PATH | S3 Bucket/Key or Swift Container/Object ID | If available, the S3 bucket name and S3 key name, or the Swift container name and Swift object identifier.   |

| Code | Field                 | Description   |
|------|-----------------------|---|
| RSLT | Result                | This field has the value NONE. RSLT is a mandatory message field, but is not relevant for this message. NONE is used rather than SUCS so that this message is not filtered. |
| UUID | Universally Unique ID | The identifier of the lost object within the StorageGRID system.  |
| VOLI | Volume ID             | If available, the Volume ID of the Storage Node or Archive Node for the last known location of the lost object.   |

### ORLM: Object Rules Met

This message is generated when the object is successfully stored and copied as specified by the ILM rules.



The ORLM message is not generated when an object is successfully stored by the default Make 2 Copies rule if another rule in the policy uses the Object Size advanced filter.

| Code | Field                    | Description  |
|------|--------------------------|--|
| BUID | Bucket Header            | Bucket ID field. Used for internal operations. Appears only if STAT is PRGD.   |
| CBID | Content Block Identifier | The CBID of the object.  |
| CSIZ | Content size             | The size of the object in bytes.   |
| LOCS | Locations                | <p>The storage location of object data within the StorageGRID system. The value for LOCS is "" if the object has no locations (for example, it has been deleted).</p> <p>CLEC: for erasure-coded objects, the erasure coding profile ID and the erasure coding group ID that is applied to the object's data.</p> <p>CLDI: for replicated objects, the LDR node ID and the volume ID of the object's location.</p> <p>CLNL: ARC node ID of the object's location if the object data is archived.</p> |

| Code | Field                                      | Description  |
|------|--|--|
| PATH | S3 Bucket/Key or Swift Container/Object ID | The S3 bucket name and S3 key name, or the Swift container name and Swift object identifier.   |
| RSLT | Result                                     | The result of the ILM operation.<br><br>SUCS: The ILM operation was successful.  |
| RULE | Rules Label                                | The human-readable label given to the ILM rule applied to this object.   |
| SEGC | Container UUID                             | UUID of the container for the segmented object. This value is available only if the object is segmented.   |
| SGCB | Container CBID                             | CBID of the container for the segmented object. This value is available only for segmented and multipart objects.  |
| STAT | Status                                     | The status of ILM operation.<br><br>DONE: ILM operations against the object have completed.<br><br>DFER: The object has been marked for future ILM re-evaluation.<br><br>PRGD: The object has been deleted from the StorageGRID system.<br><br>NLOC: The object data can no longer be found in the StorageGRID system. This status might indicate that all copies of object data are missing or damaged. |
| UUID | Universally Unique Identifier              | The identifier of the object within the StorageGRID system.  |

The ORLM audit message can be issued a number of times for a single object. For instance, it is issued whenever one of the following events take place:

- ILM rules for the object are satisfied forever.
- ILM rules for the object are satisfied for this epoch.
- ILM rules have deleted the object.
- The background verification process detects that a copy of replicated object data is corrupt. The StorageGRID system performs an ILM evaluation to replace the corrupt object.

#### Related information

- [Object ingest transactions](#)
- [Object delete transactions](#)

## OVWR: Object Overwrite

This message is generated when an external (client-requested) operation causes one object to be overwritten by another object.

| Code | Field                               | Description  |
|------|-------------------------------------|--|
| CBID | Content Block Identifier (new)      | The CBID for the new object.   |
| CSIZ | Previous Object Size                | The size, in bytes, of the object being overwritten.   |
| OCBD | Content Block Identifier (previous) | The CBID for the previous object.  |
| UUID | Universally Unique ID (new)         | The identifier of the new object within the StorageGRID system.  |
| OID  | Universally Unique ID (previous)    | The identifier for the previous object within the StorageGRID system.  |
| PATH | S3 or Swift Object Path             | The S3 or Swift object path used for both the previous and new object  |
| RSLT | Result Code                         | Result of the Object Overwrite transaction. Result is always:<br><br>SUCS: Successful  |
| SGRP | Site (Group)                        | If present, the overwritten object was deleted at the site specified, which is not the site where the overwritten object was ingested. |

## SADD: Security Audit Disable

This message indicates that the originating service (node ID) has turned off audit message logging; audit messages are no longer being collected or delivered.

| Code | Field         | Description   |
|------|---------------|---|
| AETM | Enable Method | The method used to disable the audit.                             |
| AEUN | User Name     | The user name that executed the command to disable audit logging. |

| Code | Field  | Description   |
|------|--------|---|
| RSLT | Result | This field has the value NONE. RSLT is a mandatory message field, but is not relevant for this message. NONE is used rather than SUCS so that this message is not filtered. |

The message implies that logging was previously enabled, but has now been disabled. This is typically used only during bulk ingest to improve system performance. Following the bulk activity, auditing is restored (SADE) and the capability to disable auditing is then permanently blocked.

#### **SADE: Security Audit Enable**

This message indicates that the originating service (node ID) has restored audit message logging; audit messages are again being collected and delivered.

| Code | Field         | Description   |
|------|---------------|---|
| AETM | Enable Method | The method used to enable the audit.  |
| AEUN | User Name     | The user name that executed the command to enable audit logging.  |
| RSLT | Result        | This field has the value NONE. RSLT is a mandatory message field, but is not relevant for this message. NONE is used rather than SUCS so that this message is not filtered. |

The message implies that logging was previously disabled (SADD), but has now been restored. This is typically only used during bulk ingest to improve system performance. Following the bulk activity, auditing is restored and the capability to disable auditing is then permanently blocked.

#### **SCMT: Object Store Commit**

Grid content is not made available or recognized as stored until it has been committed (meaning it has been stored persistently). Persistently stored content has been completely written to disk, and has passed related integrity checks. This message is issued when a content block is committed to storage.

| Code | Field                    | Description  |
|------|--------------------------|--|
| CBID | Content Block Identifier | The unique identifier of the content block committed to permanent storage. |



| Code | Field       | Description  |
|------|-------------|--|
| RSLT | Result Code | Status at the time the object was stored to disk:<br><br>SUCS: Object successfully stored. |

This message means a given content block has been completely stored and verified, and can now be requested. It can be used to track data flow within the system.

### SDEL: S3 DELETE

When an S3 client issues a DELETE transaction, a request is made to remove the specified object or bucket. This message is issued by the server if the transaction is successful.

| Code | Field                      | Description  |
|------|----------------------------|--|
| CBID | Content Block Identifier   | The unique identifier of the content block requested. If the CBID is unknown, this field is set to 0. Operations on buckets do not include this field.   |
| CNCH | Consistency Control Header | The value of the Consistency-Control HTTP request header, if present in the request.   |
| CNID | Connection Identifier      | The unique system identifier for the TCP/IP connection.  |
| CSIZ | Content Size               | The size of the deleted object in bytes. Operations on buckets do not include this field.  |
| DMRK | Delete Marker Version ID   | The version ID of the delete marker created when deleting an object from a versioned bucket. Operations on buckets do not include this field.  |
| HTRH | HTTP Request Header        | List of logged HTTP request header names and values as selected during configuration.<br><br><b>Note:</b> X-Forwarded-For is automatically included if it is present in the request and if the X-Forwarded-For value is different from the request sender IP address (SAIP audit field). |
| MTME | Last Modified Time         | The Unix timestamp, in microseconds, indicating when the object was last modified.   |
| RSLT | Result Code                | Result of the DELETE transaction. Result is always:<br><br>SUCS: Successful  |

| Code | Field                                   | Description  |
|------|---|--|
| S3AI | S3 tenant account ID (request sender)   | The tenant account ID of the user who sent the request. An empty value indicates anonymous access.   |
| S3AK | S3 Access Key ID (request sender)       | The hashed S3 access key ID for the user that sent the request. An empty value indicates 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.   |
| S3SR | S3 Subresource                          | The bucket or object subresource being operated on, if applicable.   |
| SACC | S3 tenant account name (request sender) | The name of the tenant account for the user who sent the request. Empty for anonymous requests.  |
| SAIP | IP address (request sender)             | The IP address of the client application that made the request.  |
| SBAC | S3 tenant account name (bucket owner)   | The tenant account name for the bucket owner. Used to identify cross-account or anonymous access.  |
| SBAI | S3 tenant account ID (bucket owner)     | The tenant account ID of the owner of the target bucket. Used to identify cross-account or anonymous access.   |
| SGRP | Site (Group)                            | If present, the object was deleted at the site specified, which is not the site where the object was ingested.   |
| SUSR | S3 User URN (request sender)            | The tenant account ID and the user name of the user making the request. The user can either be a local user or an LDAP user. For example: <code>urn:sgws:identity::03393893651506583485:root</code><br><br>Empty for anonymous requests. |
| TIME | Time                                    | Total processing time for the request in microseconds.   |
| TLIP | Trusted Load Balancer IP Address        | If the request was routed by a trusted Layer 7 load balancer, the IP address of the load balancer.   |

| Code | Field                         | Description   |
|------|-------------------------------|---|
| UUID | Universally Unique Identifier | The identifier of the object within the StorageGRID system.   |
| VSID | Version ID                    | The version ID of the specific version of an object that was deleted. Operations on buckets and objects in unversioned buckets do not include this field. |

## SGET: S3 GET

When an S3 client issues a GET transaction, a request is made to retrieve an object or list the objects in a bucket. This message is issued by the server if the transaction is successful.

| Code | Field                      | Description   |
|------|----------------------------|---|
| CBID | Content Block Identifier   | The unique identifier of the content block requested. If the CBID is unknown, this field is set to 0. Operations on buckets do not include this field.  |
| CNCH | Consistency Control Header | The value of the Consistency-Control HTTP request header, if present in the request.  |
| CNID | Connection Identifier      | The unique system identifier for the TCP/IP connection.   |
| CSIZ | Content Size               | The size of the retrieved object in bytes. Operations on buckets do not include this field.   |
| HTRH | HTTP Request Header        | <p>List of logged HTTP request header names and values as selected during configuration.</p> <p><b>Note:</b> X-Forwarded-For is automatically included if it is present in the request and if the X-Forwarded-For value is different from the request sender IP address (SAIP audit field).</p> |

| Code | Field                                   | Description  |
|------|---|--|
| RANG | Range Read                              | For range read operations only. Indicates the range of bytes that was read by this request. The value after the slash (/) shows the size of the entire object. |
| RSLT | Result Code                             | Result of the GET transaction. Result is always:<br><br>SUCS: Successful   |
| S3AI | S3 tenant account ID (request sender)   | The tenant account ID of the user who sent the request. An empty value indicates anonymous access.   |
| S3AK | S3 Access Key ID (request sender)       | The hashed S3 access key ID for the user that sent the request. An empty value indicates 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.   |
| S3SR | S3 Subresource                          | The bucket or object subresource being operated on, if applicable.   |
| SACC | S3 tenant account name (request sender) | The name of the tenant account for the user who sent the request. Empty for anonymous requests.  |
| SAIP | IP address (request sender)             | The IP address of the client application that made the request.  |
| SBAC | S3 tenant account name (bucket owner)   | The tenant account name for the bucket owner. Used to identify cross-account or anonymous access.  |
| SBAI | S3 tenant account ID (bucket owner)     | The tenant account ID of the owner of the target bucket. Used to identify cross-account or anonymous access.   |

| Code | Field                            | Description   |
|------|----------------------------------|---|
| SUSR | S3 User URN (request sender)     | The tenant account ID and the user name of the user making the request. The user can either be a local user or an LDAP user. For example:<br><code>urn:sgws:identity::03393893651506583485:root</code><br><br>Empty for anonymous requests. |
| TIME | Time                             | Total processing time for the request in microseconds.  |
| TLIP | Trusted Load Balancer IP Address | If the request was routed by a trusted Layer 7 load balancer, the IP address of the load balancer.  |
| UUID | Universally Unique Identifier    | The identifier of the object within the StorageGRID system.   |
| VSID | Version ID                       | The version ID of the specific version of an object that was requested. Operations on buckets and objects in unversioned buckets do not include this field.   |

## SHEA: S3 HEAD

When an S3 client issues a HEAD transaction, a request is made to check for the existence of an object or bucket and retrieve the metadata about an object. This message is issued by the server if the transaction is successful.

| Code | Field                    | Description  |
|------|--------------------------|--|
| CBID | Content Block Identifier | The unique identifier of the content block requested. If the CBID is unknown, this field is set to 0. Operations on buckets do not include this field. |
| CNID | Connection Identifier    | The unique system identifier for the TCP/IP connection.  |
| CSIZ | Content Size             | The size of the checked object in bytes. Operations on buckets do not include this field.  |

| Code | Field                                   | Description   |
|------|---|---|
| HTRH | HTTP Request Header                     | <p>List of logged HTTP request header names and values as selected during configuration.</p> <p><b>Note:</b> X-Forwarded-For is automatically included if it is present in the request and if the X-Forwarded-For value is different from the request sender IP address (SAIP audit field).</p> |
| RSLT | Result Code                             | <p>Result of the GET transaction. Result is always:</p> <p>SUCS: Successful</p>   |
| S3AI | S3 tenant account ID (request sender)   | The tenant account ID of the user who sent the request. An empty value indicates anonymous access.  |
| S3AK | S3 Access Key ID (request sender)       | The hashed S3 access key ID for the user that sent the request. An empty value indicates 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.  |
| SACC | S3 tenant account name (request sender) | The name of the tenant account for the user who sent the request. Empty for anonymous requests.   |
| SAIP | IP address (request sender)             | The IP address of the client application that made the request.   |
| SBAC | S3 tenant account name (bucket owner)   | The tenant account name for the bucket owner. Used to identify cross-account or anonymous access.   |
| SBAI | S3 tenant account ID (bucket owner)     | The tenant account ID of the owner of the target bucket. Used to identify cross-account or anonymous access.  |

| Code | Field                            | Description   |
|------|----------------------------------|---|
| SUSR | S3 User URN (request sender)     | The tenant account ID and the user name of the user making the request. The user can either be a local user or an LDAP user. For example:<br><code>urn:sgws:identity::03393893651506583485:root</code><br><br>Empty for anonymous requests. |
| TIME | Time                             | Total processing time for the request in microseconds.  |
| TLIP | Trusted Load Balancer IP Address | If the request was routed by a trusted Layer 7 load balancer, the IP address of the load balancer.  |
| UUID | Universally Unique Identifier    | The identifier of the object within the StorageGRID system.   |
| VSID | Version ID                       | The version ID of the specific version of an object that was requested. Operations on buckets and objects in unversioned buckets do not include this field.   |

## SPOS: S3 POST

When an S3 client issues a POST Object request, this message is issued by the server if the transaction is successful.

| Code | Field                      | Description   |
|------|----------------------------|---|
| CBID | Content Block Identifier   | The unique identifier of the content block requested. If the CBID is unknown, this field is set to 0. |
| CNCH | Consistency Control Header | The value of the Consistency-Control HTTP request header, if present in the request.                  |
| CNID | Connection Identifier      | The unique system identifier for the TCP/IP connection.   |
| CSIZ | Content Size               | The size of the retrieved object in bytes.  |

| Code | Field                                   | Description   |
|------|---|---|
| HTRH | HTTP Request Header                     | <p>List of logged HTTP request header names and values as selected during configuration.</p> <p><b>Note:</b> X-Forwarded-For is automatically included if it is present in the request and if the X-Forwarded-For value is different from the request sender IP address (SAIP audit field).</p> |
| RSLT | Result Code                             | <p>Result of the POST Object restore request. Result is always:</p> <p>SUCS: Successful</p>   |
| S3AI | S3 tenant account ID (request sender)   | The tenant account ID of the user who sent the request. An empty value indicates anonymous access.  |
| S3AK | S3 Access Key ID (request sender)       | The hashed S3 access key ID for the user that sent the request. An empty value indicates 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.  |
| S3SR | S3 Subresource                          | <p>The bucket or object subresource being operated on, if applicable.</p> <p>Set to “select” for an S3 Select operation.</p>  |
| SACC | S3 tenant account name (request sender) | The name of the tenant account for the user who sent the request. Empty for anonymous requests.   |
| SAIP | IP address (request sender)             | The IP address of the client application that made the request.   |
| 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   |
|------|-------------------------------------|---|
| SBAI | S3 tenant account ID (bucket owner) | The tenant account ID of the owner of the target bucket. Used to identify cross-account or anonymous access.  |
| SRCF | Subresource Configuration           | Restore information.  |
| SUSR | S3 User URN (request sender)        | The tenant account ID and the user name of the user making the request. The user can either be a local user or an LDAP user. For example:<br><code>urn:sgws:identity::03393893651506583485:root</code><br><br>Empty for anonymous requests. |
| TIME | Time                                | Total processing time for the request in microseconds.  |
| TLIP | Trusted Load Balancer IP Address    | If the request was routed by a trusted Layer 7 load balancer, the IP address of the load balancer.  |
| UUID | Universally Unique Identifier       | The identifier of the object within the StorageGRID system.   |
| VSID | Version ID                          | The version ID of the specific version of an object that was requested. Operations on buckets and objects in unversioned buckets do not include this field.   |

### SPUT: S3 PUT

When an S3 client issues a PUT transaction, a request is made to create a new object or bucket. This message is issued by the server if the transaction is successful.

| Code | Field                    | Description  |
|------|--------------------------|--|
| CBID | Content Block Identifier | The unique identifier of the content block requested. If the CBID is unknown, this field is set to 0. Operations on buckets do not include this field. |

| Code | Field                         | Description   |
|------|-------------------------------|---|
| CMPS | Compliance Settings           | The compliance settings used when creating the bucket, if present in the PUT Bucket request (truncated to the first 1024 characters)  |
| CNCH | Consistency Control Header    | The value of the Consistency-Control HTTP request header, if present in the request.  |
| CNID | Connection Identifier         | The unique system identifier for the TCP/IP connection.   |
| CSIZ | Content Size                  | The size of the retrieved object in bytes. Operations on buckets do not include this field.   |
| HTRH | HTTP Request Header           | <p>List of logged HTTP request header names and values as selected during configuration.</p> <p><b>Note:</b> X-Forwarded-For is automatically included if it is present in the request and if the X-Forwarded-For value is different from the request sender IP address (SAIP audit field).</p> |
| LKEN | Object Lock Enabled           | Value of the request header x-amz-bucket-object-lock-enabled, if present in the PUT Bucket request.   |
| LKLH | Object Lock Legal Hold        | Value of the request header x-amz-object-lock-legal-hold, if present in the PUT Object request.   |
| LKMD | Object Lock Retention Mode    | Value of the request header x-amz-object-lock-mode, if present in the PUT Object request.   |
| LKRU | Object Lock Retain Until Date | Value of the request header x-amz-object-lock-retain-until-date, if present in the PUT Object request.  |

| Code | Field                                   | Description  |
|------|---|--|
| MTME | Last Modified Time                      | The Unix timestamp, in microseconds, indicating when the object was last modified.                           |
| RSLT | Result Code                             | Result of the PUT transaction.<br>Result is always:<br><br>SUCS: Successful                                  |
| S3AI | S3 tenant account ID (request sender)   | The tenant account ID of the user who sent the request. An empty value indicates anonymous access.           |
| S3AK | S3 Access Key ID (request sender)       | The hashed S3 access key ID for the user that sent the request. An empty value indicates anonymous access.   |
| S3BK | S3 Bucket                               | The S3 bucket name.  |
| S3KY | S3KY                                    | The S3 key name, not including the bucket name. Operations on buckets do not include this field.             |
| S3SR | S3 Subresource                          | The bucket or object subresource being operated on, if applicable.   |
| SACC | S3 tenant account name (request sender) | The name of the tenant account for the user who sent the request. Empty for anonymous requests.              |
| SAIP | IP address (request sender)             | The IP address of the client application that made the request.  |
| SBAC | S3 tenant account name (bucket owner)   | The tenant account name for the bucket owner. Used to identify cross-account or anonymous access.            |
| SBAI | S3 tenant account ID (bucket owner)     | The tenant account ID of the owner of the target bucket. Used to identify cross-account or anonymous access. |
| SRCF | Subresource Configuration               | The new subresource configuration (truncated to the first 1024 characters).                                  |

| Code | Field                            | Description   |
|------|----------------------------------|---|
| SUSR | S3 User URN (request sender)     | The tenant account ID and the user name of the user making the request. The user can either be a local user or an LDAP user. For example:<br><code>urn:sgws:identity::03393893651506583485:root</code><br><br>Empty for anonymous requests. |
| TIME | Time                             | Total processing time for the request in microseconds.  |
| TLIP | Trusted Load Balancer IP Address | If the request was routed by a trusted Layer 7 load balancer, the IP address of the load balancer.  |
| ULID | Upload ID                        | Included only in SPUT messages for Complete Multipart Upload operations. Indicates that all parts have been uploaded and assembled.   |
| UUID | Universally Unique Identifier    | The identifier of the object within the StorageGRID system.   |
| VSID | Version ID                       | The version ID of a new object created in a versioned bucket. Operations on buckets and objects in unversioned buckets do not include this field.   |
| VSST | Versioning State                 | The new versioning state of a bucket. Two states are used: "enabled" or "suspended." Operations on objects do not include this field.   |

### SREM: Object Store Remove

This message is issued when content is removed from persistent storage and is no longer accessible through regular APIs.

| Code | Field                    | Description   |
|------|--------------------------|---|
| CBID | Content Block Identifier | The unique identifier of the content block deleted from permanent storage.  |
| RSLT | Result Code              | Indicates the result of the content removal operations. The only defined value is:<br><br>SUCS: Content removed from persistent storage |

This audit message means a given content block has been deleted from a node and can no longer be requested directly. The message can be used to track the flow of deleted content within the system.

### **SUPD: S3 Metadata Updated**

This message is generated by the S3 API when an S3 client updates the metadata for an ingested object. The message is issued by the server if the metadata update is successful.

| Code | Field                      | Description  |
|------|----------------------------|--|
| CBID | Content Block Identifier   | The unique identifier of the content block requested. If the CBID is unknown, this field is set to 0. Operations on buckets do not include this field. |
| CNCH | Consistency Control Header | The value of the Consistency-Control HTTP request header, if present in the request, when updating a bucket's compliance settings.                     |
| CNID | Connection Identifier      | The unique system identifier for the TCP/IP connection.  |
| CSIZ | Content Size               | The size of the retrieved object in bytes. Operations on buckets do not include this field.  |

| Code | Field                                   | Description   |
|------|---|---|
| HTRH | HTTP Request Header                     | <p>List of logged HTTP request header names and values as selected during configuration.</p> <p><b>Note:</b> X-Forwarded-For is automatically included if it is present in the request and if the X-Forwarded-For value is different from the request sender IP address (SAIP audit field).</p> |
| RSLT | Result Code                             | <p>Result of the GET transaction. Result is always:</p> <p>SUCS: successful</p>   |
| S3AI | S3 tenant account ID (request sender)   | The tenant account ID of the user who sent the request. An empty value indicates anonymous access.  |
| S3AK | S3 Access Key ID (request sender)       | The hashed S3 access key ID for the user that sent the request. An empty value indicates 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.  |
| SACC | S3 tenant account name (request sender) | The name of the tenant account for the user who sent the request. Empty for anonymous requests.   |
| SAIP | IP address (request sender)             | The IP address of the client application that made the request.   |
| SBAC | S3 tenant account name (bucket owner)   | The tenant account name for the bucket owner. Used to identify cross-account or anonymous access.   |
| SBAI | S3 tenant account ID (bucket owner)     | The tenant account ID of the owner of the target bucket. Used to identify cross-account or anonymous access.  |

| Code | Field                            | Description   |
|------|----------------------------------|---|
| SUSR | S3 User URN (request sender)     | The tenant account ID and the user name of the user making the request. The user can either be a local user or an LDAP user. For example:<br><code>urn:sgws:identity::03393893651506583485:root</code><br><br>Empty for anonymous requests. |
| TIME | Time                             | Total processing time for the request in microseconds.  |
| TLIP | Trusted Load Balancer IP Address | If the request was routed by a trusted Layer 7 load balancer, the IP address of the load balancer.  |
| UUID | Universally Unique Identifier    | The identifier of the object within the StorageGRID system.   |
| VSID | Version ID                       | The version ID of the specific version of an object whose metadata was updated. Operations on buckets and objects in unversioned buckets do not include this field.   |

### SVRF: Object Store Verify Fail

This message is issued whenever a content block fails the verification process. Each time replicated object data is read from or written to disk, several verification and integrity checks are performed to ensure the data sent to the requesting user is identical to the data originally ingested into the system. If any of these checks fail, the system automatically quarantines the corrupt replicated object data to prevent it from being retrieved again.

| Code | Field                    | Description   |
|------|--------------------------|---|
| CBID | Content Block Identifier | The unique identifier of the content block which failed verification. |

| Code | Field       | Description  |
|------|-------------|--|
| RSLT | Result Code | <p>Verification failure type:</p> <p>CRCF: Cyclic redundancy check (CRC) failed.</p> <p>HMAC: Hash-based message authentication code (HMAC) check failed.</p> <p>EHSB: Unexpected encrypted content hash.</p> <p>PHSH: Unexpected original content hash.</p> <p>SEQC: Incorrect data sequence on disk.</p> <p>PERR: Invalid structure of disk file.</p> <p>DERR: Disk error.</p> <p>FNAM: Bad file name.</p> |

**Note:** This message should be monitored closely. Content verification failures can indicate attempts to tamper with content or impending hardware failures.

To determine what operation triggered the message, see the value of the AMID (Module ID) field. For example, an SVFY value indicates that the message was generated by the Storage Verifier module, that is, background verification, and STOR indicates that the message was triggered by content retrieval.

### SVRU: Object Store Verify Unknown

The LDR service's Storage component continuously scans all copies of replicated object data in the object store. This message is issued when an unknown or unexpected copy of replicated object data is detected in the object store and moved to the quarantine directory.

| Code | Field     | Description   |
|------|-----------|---|
| FPTH | File Path | The file path of the unexpected object copy.  |
| RSLT | Result    | This field has the value 'NONE'. RSLT is a mandatory message field, but is not relevant for this message. 'NONE' is used rather than 'SUCS' so that this message is not filtered. |



**Note:** The SVRU: Object Store Verify Unknown audit message should be monitored closely. It means unexpected copies of object data were detected in the object store. This situation should be investigated immediately to determine how these copies were created, because it can indicate attempts to tamper with content or impending hardware failures.

### **SYSD: Node Stop**

When a service is stopped gracefully, this message is generated to indicate the shutdown was requested. Typically this message is sent only after a subsequent restart, because the audit message queue is not cleared prior to shutdown. Look for the SYST message, sent at the beginning of the shutdown sequence, if the service has not restarted.

| Code | Field          | Description   |
|------|----------------|---|
| RSLT | Clean Shutdown | The nature of the shutdown:<br><br>SUCS: System was cleanly shutdown. |

The message does not indicate if the host server is being stopped, only the reporting service. The RSLT of a SYSD cannot indicate a "dirty" shutdown, because the message is generated only by "clean" shutdowns.

### **SYST: Node Stopping**

When a service is gracefully stopped, this message is generated to indicate the shutdown was requested and that the service has initiated its shutdown sequence. SYST can be used to determine if the shutdown was requested, before the service is restarted (unlike SYSD, which is typically sent after the service restarts.)

| Code | Field          | Description   |
|------|----------------|---|
| RSLT | Clean Shutdown | The nature of the shutdown:<br><br>SUCS: System was cleanly shutdown. |

The message does not indicate if the host server is being stopped, only the reporting service. The RSLT code of a SYST message cannot indicate a "dirty" shutdown, because the message is generated only by "clean" shutdowns.

### **SYSU: Node Start**

When a service is restarted, this message is generated to indicate if the previous shutdown was clean (commanded) or disorderly (unexpected).

| Code | Field          | Description   |
|------|----------------|---|
| RSLT | Clean Shutdown | <p>The nature of the shutdown:</p> <p>SUCS: System was cleanly shut down.</p> <p>DSDN: System was not cleanly shut down.</p> <p>VRGN: System was started for the first time after server installation (or re-installation).</p> |

The message does not indicate if the host server was started, only the reporting service. This message can be used to:

- Detect discontinuity in the audit trail.
- Determine if a service is failing during operation (as the distributed nature of the StorageGRID system can mask these failures). Server Manager restarts a failed service automatically.

#### VLST: User Initiated Volume Lost

This message is issued whenever the `/proc/CMSI/Volume_Lost` command is run.

| Code | Field                   | Description   |
|------|-------------------------|---|
| VOLL | Volume Identifier Lower | The lower end of the affected volume range or a single volume.  |
| VOLU | Volume Identifier Upper | The upper end of the affected volume range. Equal to VOLL if a single volume.   |
| NOID | Source Node ID          | The node ID on which the locations were lost.   |
| LTyp | Location Type           | 'CLDI' (Online) or 'CLNL' (Nearline). If not specified, defaults to 'CLDI'.   |
| RSLT | Result                  | Always 'NONE'. RSLT is a mandatory message field, but is not relevant for this message. 'NONE' is used rather than 'SUCS' so that this message is not filtered. |

#### WDEL: Swift DELETE

When a Swift client issues a DELETE transaction, a request is made to remove the

specified object or container. This message is issued by the server if the transaction is successful.

| Code | Field                            | Description  |
|------|----------------------------------|--|
| CBID | Content Block Identifier         | The unique identifier of the content block requested. If the CBID is unknown, this field is set to 0. Operations on containers do not include this field.  |
| CSIZ | Content Size                     | The size of the deleted object in bytes. Operations on containers do not include this field.   |
| HTRH | HTTP Request Header              | List of logged HTTP request header names and values as selected during configuration.<br><br><b>Note:</b> X-Forwarded-For is automatically included if it is present in the request and if the X-Forwarded-For value is different from the request sender IP address (SAIP audit field). |
| MTME | Last Modified Time               | The Unix timestamp, in microseconds, indicating when the object was last modified.   |
| RSLT | Result Code                      | Result of the DELETE transaction. Result is always:<br><br>SUCS: Successful  |
| SAIP | IP address of requesting client  | The IP address of the client application that made the request.  |
| SGRP | Site (Group)                     | If present, the object was deleted at the site specified, which is not the site where the object was ingested.   |
| TIME | Time                             | Total processing time for the request in microseconds.   |
| TLIP | Trusted Load Balancer IP Address | If the request was routed by a trusted Layer 7 load balancer, the IP address of the load balancer.   |
| UUID | Universally Unique Identifier    | The identifier of the object within the StorageGRID system.  |
| WACC | Swift Account ID                 | The unique account ID as specified by the StorageGRID system.  |
| WCON | Swift Container                  | The Swift container name.  |
| WOBJ | Swift Object                     | The Swift object identifier. Operations on containers do not include this field.   |

| Code | Field              | Description  |
|------|--------------------|--|
| WUSR | Swift Account User | The Swift account username that uniquely identifies the client performing the transaction. |

### WGET: Swift GET

When a Swift client issues a GET transaction, a request is made to retrieve an object, list the objects in a container, or list the containers in an account. This message is issued by the server if the transaction is successful.

| Code | Field                            | Description  |
|------|----------------------------------|--|
| CBID | Content Block Identifier         | The unique identifier of the content block requested. If the CBID is unknown, this field is set to 0. Operations on accounts and containers do not include this field.   |
| CSIZ | Content Size                     | The size of the retrieved object in bytes. Operations on accounts and containers do not include this field.  |
| HTRH | HTTP Request Header              | List of logged HTTP request header names and values as selected during configuration.<br><br><b>Note:</b> X-Forwarded-For is automatically included if it is present in the request and if the X-Forwarded-For value is different from the request sender IP address (SAIP audit field). |
| RSLT | Result Code                      | Result of the GET transaction. Result is always<br><br>SUCS: successful  |
| SAIP | IP address of requesting client  | The IP address of the client application that made the request.  |
| TIME | Time                             | Total processing time for the request in microseconds.   |
| TLIP | Trusted Load Balancer IP Address | If the request was routed by a trusted Layer 7 load balancer, the IP address of the load balancer.   |

| Code | Field                         | Description   |
|------|-------------------------------|---|
| UUID | Universally Unique Identifier | The identifier of the object within the StorageGRID system.                                   |
| WACC | Swift Account ID              | The unique account ID as specified by the StorageGRID system.                                 |
| WCON | Swift Container               | The Swift container name. Operations on accounts do not include this field.                   |
| WOBJ | Swift Object                  | The Swift object identifier. Operations on accounts and containers do not include this field. |
| WUSR | Swift Account User            | The Swift account username that uniquely identifies the client performing the transaction.    |

#### WHEA: Swift HEAD

When a Swift client issues a HEAD transaction, a request is made to check for the existence of an account, container, or object, and retrieve any relevant metadata. This message is issued by the server if the transaction is successful.

| Code | Field                    | Description   |
|------|--------------------------|---|
| CBID | Content Block Identifier | The unique identifier of the content block requested. If the CBID is unknown, this field is set to 0. Operations on accounts and containers do not include this field.  |
| CSIZ | Content Size             | The size of the retrieved object in bytes. Operations on accounts and containers do not include this field.   |
| HTRH | HTTP Request Header      | <p>List of logged HTTP request header names and values as selected during configuration.</p> <p><b>Note:</b> X-Forwarded-For is automatically included if it is present in the request and if the X-Forwarded-For value is different from the request sender IP address (SAIP audit field).</p> |

| Code | Field                            | Description  |
|------|----------------------------------|--|
| RSLT | Result Code                      | Result of the HEAD transaction.<br>Result is always:<br><br>SUCS: successful                       |
| SAIP | IP address of requesting client  | The IP address of the client application that made the request.                                    |
| TIME | Time                             | Total processing time for the request in microseconds.   |
| TLIP | Trusted Load Balancer IP Address | If the request was routed by a trusted Layer 7 load balancer, the IP address of the load balancer. |
| UUID | Universally Unique Identifier    | The identifier of the object within the StorageGRID system.  |
| WACC | Swift Account ID                 | The unique account ID as specified by the StorageGRID system.                                      |
| WCON | Swift Container                  | The Swift container name.<br>Operations on accounts do not include this field.                     |
| WOBJ | Swift Object                     | The Swift object identifier.<br>Operations on accounts and containers do not include this field.   |
| WUSR | Swift Account User               | The Swift account username that uniquely identifies the client performing the transaction.         |

#### WPUT: Swift PUT

When a Swift client issues a PUT transaction, a request is made to create a new object or container. This message is issued by the server if the transaction is successful.

| Code | Field                    | Description  |
|------|--------------------------|--|
| CBID | Content Block Identifier | The unique identifier of the content block requested. If the CBID is unknown, this field is set to 0.<br>Operations on containers do not include this field. |

| Code | Field                            | Description   |
|------|----------------------------------|---|
| CSIZ | Content Size                     | The size of the retrieved object in bytes. Operations on containers do not include this field.  |
| HTRH | HTTP Request Header              | <p>List of logged HTTP request header names and values as selected during configuration.</p> <p><b>Note:</b> X-Forwarded-For is automatically included if it is present in the request and if the X-Forwarded-For value is different from the request sender IP address (SAIP audit field).</p> |
| MTME | Last Modified Time               | The Unix timestamp, in microseconds, indicating when the object was last modified.  |
| RSLT | Result Code                      | <p>Result of the PUT transaction. Result is always:</p> <p>SUCS: successful</p>   |
| SAIP | IP address of requesting client  | The IP address of the client application that made the request.   |
| TIME | Time                             | Total processing time for the request in microseconds.  |
| TLIP | Trusted Load Balancer IP Address | If the request was routed by a trusted Layer 7 load balancer, the IP address of the load balancer.  |
| UUID | Universally Unique Identifier    | The identifier of the object within the StorageGRID system.   |
| WACC | Swift Account ID                 | The unique account ID as specified by the StorageGRID system.   |
| WCON | Swift Container                  | The Swift container name.   |
| WOBJ | Swift Object                     | The Swift object identifier. Operations on containers do not include this field.  |

| Code | Field              | Description  |
|------|--------------------|--|
| WUSR | Swift Account User | The Swift account username that uniquely identifies the client performing the transaction. |



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