



Audit message format

StorageGRID

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Audit message format

Audit message format: Overview

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 aren't 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 " ".

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

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.

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 can't 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). Note: 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. Note: 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. 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 <code>T</code> 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. |

| Code | Type | Description |
|------|------|---|
| 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 an example 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) : "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]]
```

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.

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