

## Iceberg support for Atlas

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# Contents

<b>Iceberg support for Atlas.....</b>	<b>4</b>
How Atlas works with Iceberg.....	4
Using the Spark shell.....	5
Using the Hive shell.....	20
Using the Impala shell.....	27

## Iceberg support for Atlas

Atlas integration with Iceberg helps you identify the Iceberg tables to scan data and provide lineage support. Learn how Atlas works with Iceberg and what schema evolution, partition specification, partition evolution are with examples.

### How Atlas works with Iceberg

You can use Atlas to find, organize, and manage different aspects of data about your Iceberg tables and how they relate to each other. This enables a range of data stewardship and regulatory compliance use cases.

The Atlas connectors distinguish between Hive and Iceberg tables. The Iceberg table is available in a typedef format which implies that the underlying data can be retrieved by querying the Iceberg table. All attributes of the Hive table are available in the Iceberg table and this equivalence is achieved by creating the Iceberg table as a sub-type of the underlying Hive table. Optionally, the Iceberg table can also be queried by Hive or Impala engine. For more information about Iceberg and related concepts, see [Apache Iceberg features](#) and [Apache Iceberg in CDP](#).

Both Iceberg and Hive tables have equality in Atlas in terms of data tagging. Data evolution and transformation are features unique to Iceberg tables. Iceberg adds tables to compute engines including Spark, Hive, and Impala using a high-performance table format that works just like a SQL table. Also, the lineage support for Iceberg table is available. For example, when a Hive table is converted to Iceberg format, the lineage is displayed for the conversion process in Atlas UI.



**Attention:** Whenever a classification is applied on Iceberg entities, Tag-based policies are supported for Iceberg entities.

- Migration of Hive tables to Iceberg is achieved with the following:
  - Using in-place migration by running a Hive query with the ALTER TABLE statement and setting the table properties.
  - Executing CTAS command from Hive table to the Iceberg table.
- Schema evolution allows you to easily change a table's current schema to accommodate data that changes over time. Schema evolution enables you to update the schema that is used to write new data while maintaining backward compatibility with the schemas of your old data. Later the data can be read together assuming all of the data has one schema.
  - Iceberg tables supports the following schema evolution changes:
    - Add – add a new column to the table or to a nested struct
    - Drop– remove an existing column from the table or a nested struct
    - Rename– rename an existing column or field in a nested struct
    - Update– widen the type of a column, struct field, map key, map value, or list element
    - Reorder – change the order of columns or fields in a nested struct
  - Partition specification allows you to initiate queries faster by grouping similar rows together when writing.

As an example, queries for log entries from a logs table usually include a time range, like the following query for logs between 10 A.M. and 12 A.M.

```
SELECT level, message FROM logs
```

```
WHERE event_time BETWEEN '2018-12-01 10:00:00' AND '2018-12-01 12:00:00'
```

Configuring the logs table to partition by the date of event\_time groups log events into files with the same event date. Iceberg keeps track of that date and uses it to skip files for other dates that do not have useful data.

- Partition evolution across Iceberg table partitioning can be updated in an existing table because queries do not reference partition values directly.

When you evolve a partition specification, the old data written with an earlier specification remains unchanged. New data is written using the new specification in a new layout. The metadata for each of the partition versions is stored separately.

Due to this nature of partition evolution, when you start writing queries, you get split planning. This is where each partition layout plans files separately using the filter it derives for that specific partition layout.

### Related Information

[Using the Spark shell](#)

[Using the Hive shell](#)

[Using the Impala shell](#)

## Using the Spark shell

Using Spark, you can create an Iceberg table followed by schema evolution, partition specification, and partition evolution.

### Before you begin

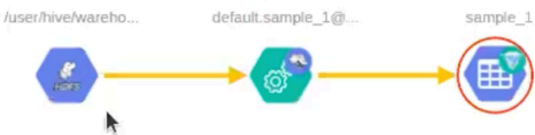
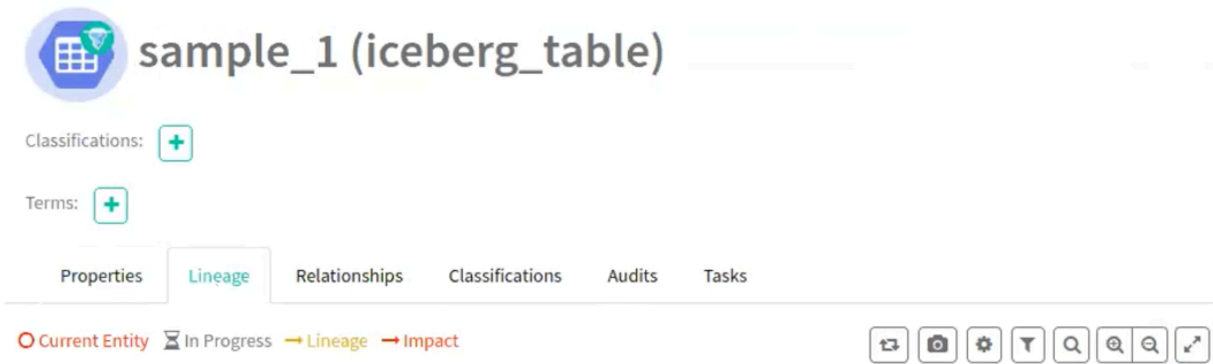
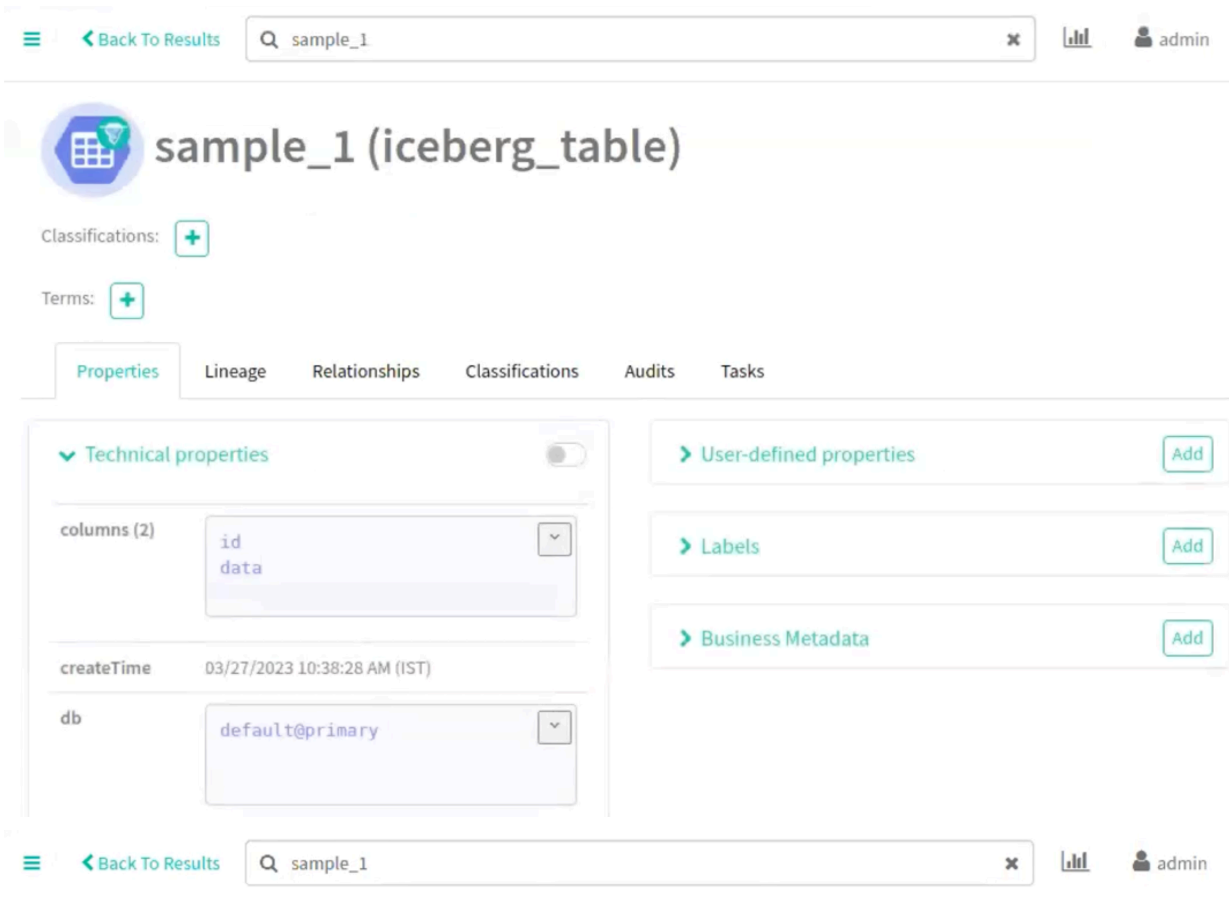
You must configure the Spark shell as such you have included the valid Spark runtime version.

Run the following command in your Spark shell to create a new Iceberg table

### Procedure

1. `spark.sql("CREATE TABLE spark_catalog.default.sample_1 ( id bigint COMMENT 'unique id', data string) USING iceberg");`

- 2. Navigate accordingly in the Atlas UI to view the changes.
- The following images provide information about Iceberg table creation process.



The screenshot displays the Cloudera Atlas interface for the entity 'sample\_1'. The 'Lineage' tab is active, showing a data flow from a Hive warehouse (represented by a blue hexagon icon) to a Spark job (represented by a green hexagon icon) and finally to the 'sample\_1' table (represented by a blue circle icon). A legend at the top indicates the flow types: 'Current Entity' (red circle), 'In Progress' (grey hourglass), 'Lineage' (yellow arrow), and 'Impact' (red arrow). A detailed view of the 'iceberg\_table' is shown on the right, listing its properties:

iceberg_table	
guid	3b7b9d10-d773-4281-a318-7d30c6886c9f
typeName	iceberg_table
name	sample_1
qualifiedName	default.sample_1@primary
owner	spark
createTime	1679893708000
status	ACTIVE
classifications	N/A

Run the following command in your Spark shell to create a Schema Evolution in a new table. For example - sample\_2.

3. `spark.sql("CREATE TABLE spark_catalog.default.sample_2 ( id bigint COMMENT 'unique id', data string) USING iceberg");`

4. Navigate accordingly in the Atlas UI to view the changes.

The following image provide information about Iceberg schema evolution process.

sample\_2 (iceberg\_table)

Classifications: [+](#)

Terms: [+](#)

Properties **Lineage** Relationships Classifications Audits Tasks

Graph ☒ Table

Key	Value	Show Empty Values
columns (2)	data id	<input type="checkbox"/>
db	default@primary	<input type="checkbox"/>
outputFromProcesses (1)	default.sample_2@primary:1679893777000	<input type="checkbox"/>

Run the following command in your Spark shell to include a column:

5. `spark.sql("ALTER TABLE spark_catalog.default.sample_2 ADD COLUMN (add_col_1 string)");`

6. Navigate accordingly in the Atlas UI to view the changes.

The following images provide information about Iceberg schema creation process.

The screenshot shows the Apache Atlas user interface for an entity named 'sample\_2 (iceberg\_table)'. At the top, there is a navigation bar with a 'Back To Results' link, a search bar labeled 'Search entities', and a user profile icon labeled 'admin'. Below the navigation bar, the entity name 'sample\_2 (iceberg\_table)' is displayed with a table icon. Underneath, there are sections for 'Classifications' and 'Terms', each with a plus icon. A horizontal tab bar contains 'Properties', 'Lineage', 'Relationships', 'Classifications', 'Audits', and 'Tasks'. The 'Properties' tab is selected, showing a list of technical properties: 'columns (3)' with values 'data', 'add\_col\_1', and 'id'; 'createTime' with value '03/27/2023 10:39:37 AM (IST)'; 'db' with value 'default@primary'; and 'lastAccessTime' with value '01/07/1970 05:29:24 PM (IST)'. To the right of the technical properties, there are three expandable sections: 'User-defined properties', 'Labels', and 'Business Metadata', each with an 'Add' button.

[Back To Results](#)

admin

Users	Timestamp	Actions
spark	03/27/2023 10:39:57 AM (IST)	Entity Updated

Name: sample\_2

Technical properties

comment	N/A
createTime	03/27/2023 10:39:37 AM (IST)
lastAccessTime	01/07/1970 05:29:24 PM (IST)
name	sample_2
owner	spark
parameters	{ owner: "spark", }
qualifiedName	default.sample_2@primary
retention	2147483647
tableType	EXTERNAL_TABLE

Relationship properties

columns (3)	id data add_col_1
db	default
partitionKeys	N/A
sd	default.sample_2@primary_storage

Run the following command in your Spark shell to include the second column:

7. `spark.sql("ALTER TABLE spark_catalog.default.sample_2 ADD COLUMN (add_col_2 string)");`

8. Navigate accordingly in the Atlas UI to view the changes.

The following image provide information about Iceberg schema creation process.

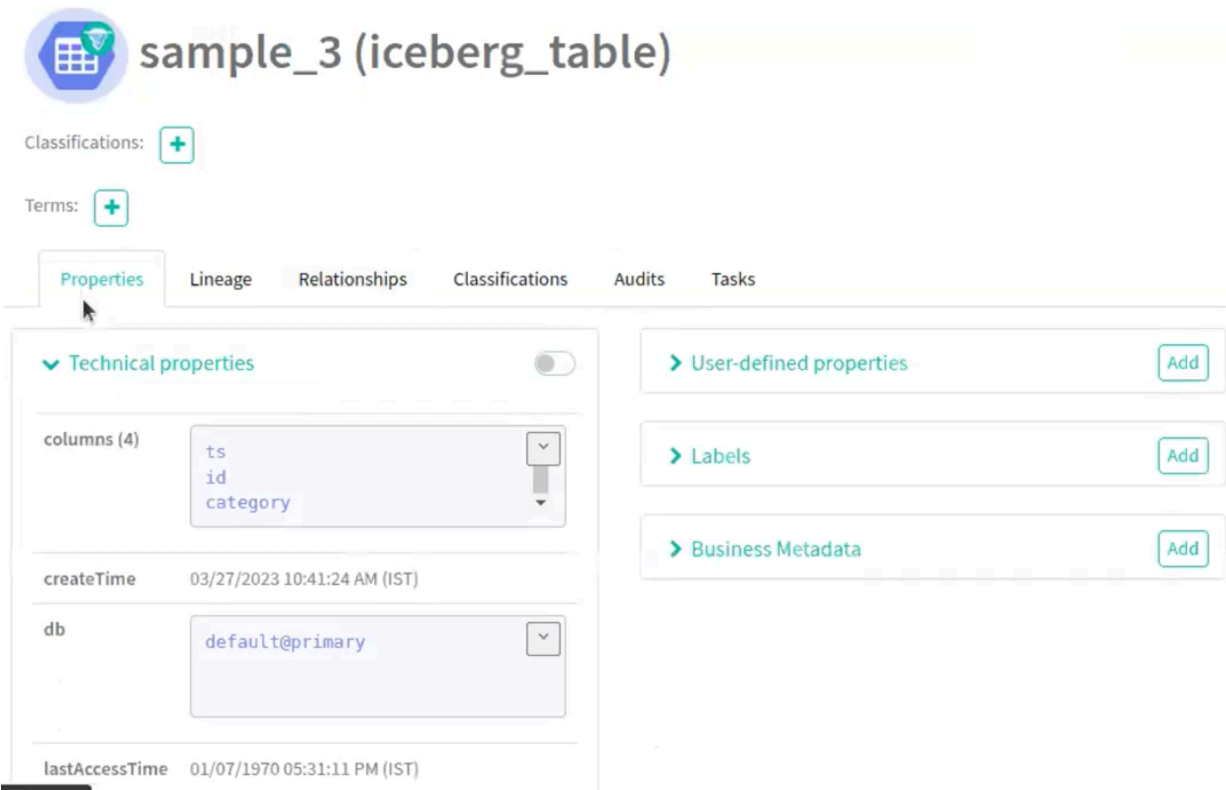
The screenshot displays the Cloudera Atlas user interface for an entity named 'sample\_2 (iceberg\_table)'. At the top, there is a navigation bar with a 'Back To Results' link, a search bar for entities, and a user profile for 'admin'. Below the entity title, there are tabs for 'Properties', 'Lineage', 'Relationships', 'Classifications', 'Audits', and 'Tasks'. The 'Audits' tab is currently selected, showing a table with columns 'Users', 'Timestamp', and 'Actions'. A single audit entry is visible for user 'spark' at '03/27/2023 10:40:27 AM (IST)' with the action 'Entity Updated'. Below the audit table, the 'Name: sample\_2' is displayed. Two panels show 'Technical properties' and 'Relationship properties'. The 'Technical properties' panel lists 'comment' (N/A), 'createTime' (03/27/2023 10:39:37 AM (IST)), 'lastAccessTime' (01/07/1970 05:29:24 PM (IST)), and 'name' (sample\_2). The 'Relationship properties' panel shows 'columns (4)' with a list of 'id', 'data', 'add\_col\_1', and 'add\_col\_2', and 'db' set to 'default'.

Run the following command in your Spark shell to create a Partition Specification in a new table (sample\_3):

9. `spark.sql("CREATE TABLE spark_catalog.default.sample_3 (id bigint,data string,category string,ts timestamp) USING iceberg PARTITIONED BY (bucket(16, id), days(ts), category)");`

10. Navigate accordingly in the Atlas UI to view the changes.

The following images provide information about Iceberg partition specification process.



createTime	03/27/2023 10:41:24 AM (IST)
db	default@primary
lastAccessTime	01/07/1970 05:31:11 PM (IST)
name	sample_3
owner	spark
parameters	{ owner: "spark", "current-schema": "
partitionSpec (3)	category, id_bucket, ts_day
qualifiedName	default.sample_3@primary
retention	2147483647
sd	default.sample_3@primary_stora

Run the following command in your Spark shell to create a Partition Evolution in a new table (sample\_3):

11. spark.sql("ALTER TABLE spark\_catalog.default.sample\_3 ADD PARTITION FIELD years(ts)");

12. Navigate accordingly in the Atlas UI to view the changes.

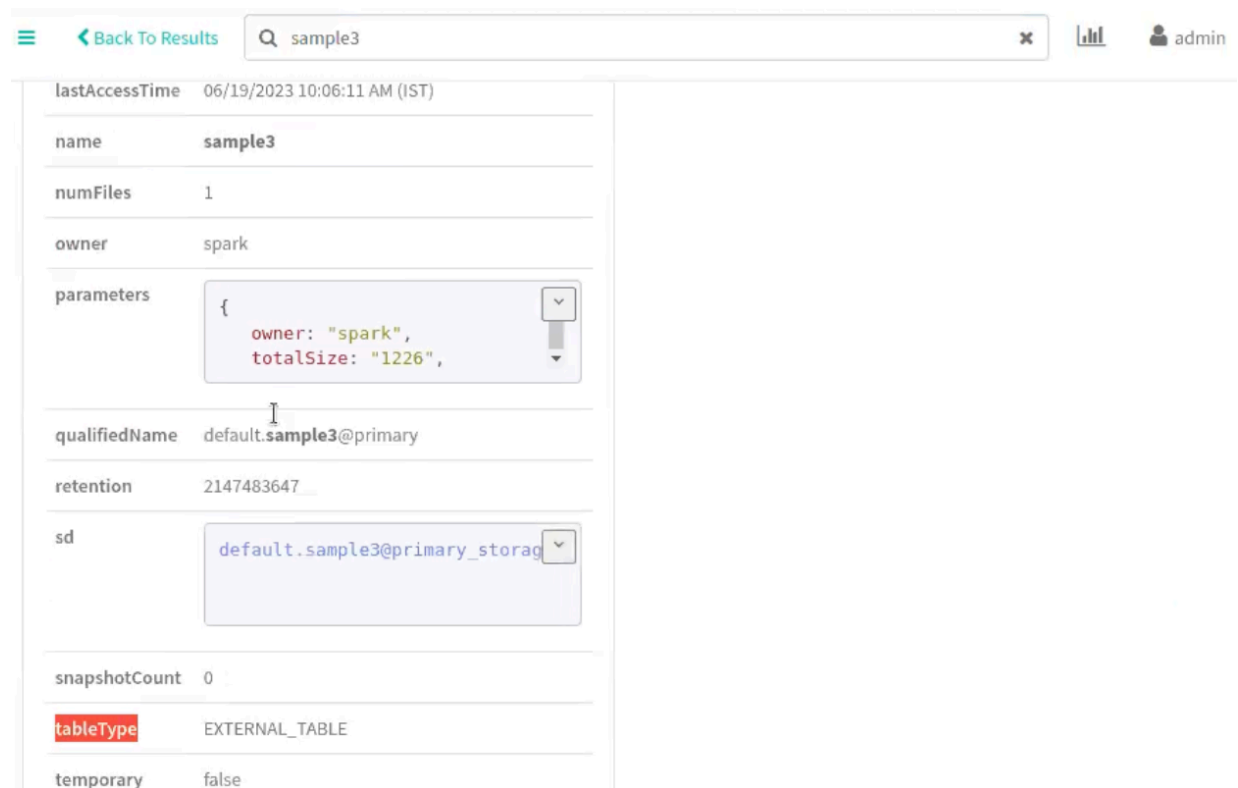
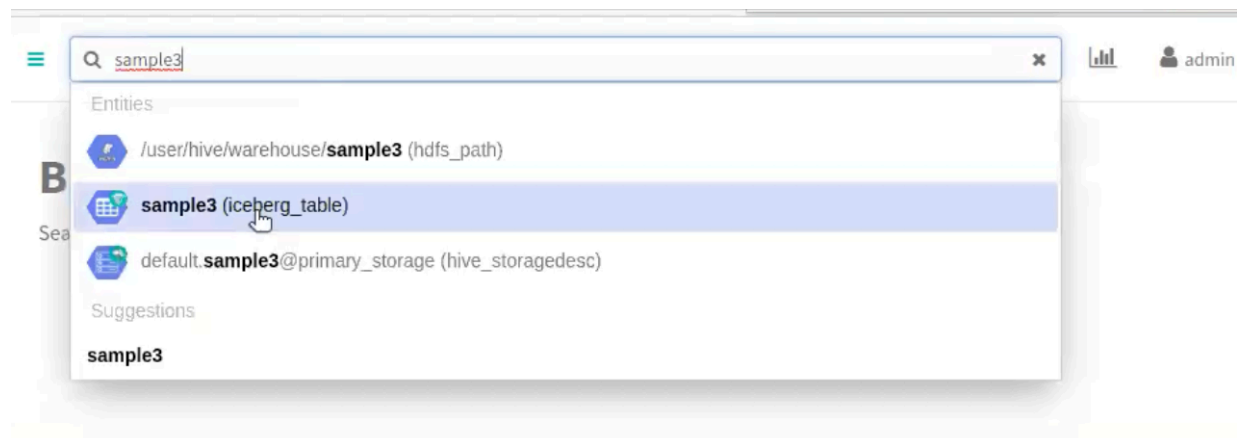
The following images provide information about Iceberg partition evolution process.

name	sample_3
owner	spark
parameters	<pre>{   owner: "spark",   previous_metadata_location: }</pre>
partitionSpec (4)	<pre>category, ts_year, id_bucket, ts_day</pre>
qualifiedName	default.sample_3@primary
retention	2147483647
sd	default.sample_3@primary_stora
tableType	EXTERNAL_TABLE
temporary	false
typeName	iceberg_table

Displaying Snapshot attributes

Run the following command to display relevant snapshot table parameters as attributes in Atlas. For example: Existing snapshot ID, current snapshot timestamp, snapshot count, number of files and related attributes.

```
spark.sql("CREATE TABLE spark_catalog.default.sample3 ( id      int, data string) USING iceberg");
spark.sql("INSERT INTO default.sample3 VALUES (1,      'TEST')");
```



Run the following command to scale up the snapshot count value.

```
spark.sql("INSERT INTO default.sample3 VALUES (1,      'TEST')");
```

The latest Snapshot ID that Iceberg points to along with the Snapshot timestamp and Snapshot count are updated respectively.

The screenshot shows the Cloudera Atlas interface for an Iceberg table. The top navigation bar includes a 'Back To Results' link, a search bar, and a user profile for 'admin'. The main content area is divided into two panels. The left panel displays the table's metadata, including columns (id, data), creation time, current snapshot ID, current snapshot timestamp, database (default), last access time, name (sample3), number of files (1), and owner (spark). The right panel shows options to add labels and business metadata. A pink highlight is visible on the right side of the interface.

This screenshot shows the same Cloudera Atlas interface, but with the 'parameters' field expanded. The parameters are displayed as a JSON object: `{ owner: "spark", previous_metadata_location: "default.sample3@primary_snapshot" }`. Other fields visible include the qualified name (default.sample3@primary), retention (2147483647), snapshot count (1), table type (EXTERNAL\_TABLE), and temporary status (false).

Click on the parameters field to display the details pertaining to the snapshot attributes.

#### Support for data compaction

Data Compaction is the process of taking several small files and rewriting them into fewer larger files to speed up queries. When performing compaction on an Iceberg table, execute the `rewriteDataFiles` procedure, optionally specifying a filter of which files to rewrite and the desired size of the resulting files.

As an example, in an Atlas instance consider that the number of files and snapshot count are 9.

Run the following command to perform data compaction

```
spark.sql("CALL spark_catalog.system.rewrite_data_files('default.sample3'),show();
```

```
+-----+-----+
|rewritten_data_files_count|added_data_files_count|
+-----+-----+
|                9|                1|
+-----+-----+
```

The count for the number of rewritten data files is compacted from a total count of 9 to 1.

<div><div></div><div><a href="#">Back To Results</a></div><div><div>Q</div>Search entities</div></div>	
currentSnapshotTsMs	1687149580886
db	<div>default<div></div></div>
lastAccessTime	06/19/2023 10:06:11 AM (IST)
name	sample3
numFiles	1
owner	spark
parameters	<div><div>{ owner: "spark", previous_metadata_loca</div><div></div></div>
qualifiedName	default.sample3@primary
retention	2147483647
sd	<div>default.sample3@primary_s<div></div> rage</div>
snapshotCount	10

## Support for metadata rewrite attributes

Iceberg uses metadata in its manifest list and manifest files speed up query planning and to prune unnecessary data files. You can rewrite manifests for a table to optimize the plan to scan the data.

Run the following command to rewrite manifests on a sample table 3.

```
spark.sql("CALL spark_catalog.system.rewrite_manifests('default.sample3').show();
```

rewritten_manifests_count	added_manifests_count
10	1

The count for table manifested data is rewritten from 10 to 1.

<a href="#">← Back To Results</a> <input type="text" value="Search entities"/>	
lastAccessTime	06/19/2023 10:06:11 AM (IST)
manifestsCreated	1
manifestsKept	0
manifestsReplaced	10
name	sample3
numFiles	1
owner	spark

The process is completed.

#### Related Information

[Using the Hive shell](#)

[Using the Impala shell](#)

## Using the Hive shell

Using Hive, you can create an Iceberg table followed by using the CTAS command to alter or copy the existing Hive table and its properties into the Iceberg table.

### Before you begin

In this case, you create an external table and alter an existing Hive table to Iceberg table using the Hive engine.

Run the following command in your Hive shell to create an Iceberg table.

### Procedure

1. create external table if not exists hive\_ice\_1 (CountryID int, CountryName string, Capital string, Population string) STORED BY ICEBERG STORED AS PARQUET;

- 2. Navigate accordingly in the Atlas UI to view the changes.  
The following images provide information about Iceberg table creation process.

hive\_ice\_1 (iceberg\_table)

Classifications:

Terms:

Properties

Lineage

Relationships

Classifications

Audits

Tasks

Users	Timestamp	Actions
hive	03/27/2023 10:44:04 AM (IST)	Entity Updated
hive	03/27/2023 10:44:03 AM (IST)	Entity Created

Showing 2 records From 1 - 25

Page Limit : 25

hive\_ice\_1 (iceberg\_table)

Classifications:

Terms:

Properties

Lineage

Relationships

Classifications

Audits

Tasks

Current Entity

In Progress

Lineage

Impact

/user/hive/wareho...

default.hive\_ice\_...

hive\_ice\_1

Run the following commands in your Hive shell to copy the contents of one table (hive\_ice\_3) to another newly created table (hive\_ice\_4).

- CountryName string, Capital string, Population st

4. create external table if not exists hive\_ice\_4 STORED BY ICEBERG STORED AS PARQUET as select \* from hive\_ice\_3;

The following images provide information about copying contents from one table to another.



Technical properties

clusterName	primary
endTime	03/27/2023 10:45:17 AM (IST)
inputs (2)	<div>hdfs://atlas-hadoop:9000/user/hive/warehouse/hive_ice_4@primary</div>
name	default.hive_ice_4@primary:1679894103000
operationType	CREATETABLE_AS_SELECT
outputs (2)	<div>default.hive_ice_4@primary hdfs://atlas-hadoop:9000/user/hive/warehouse</div>
qualifiedName	default.hive_ice_4@primary:1679894103000
queryId	
queryPlan	Not Supported
queryText	

You can alter an existing Hive table to Iceberg table.

5. create external table if not exists hive\_ice\_5 (CountryID int, CountryName string, Capital string, Population string) STORED AS PARQUET;

6. ALTER TABLE hive\_ice\_5 SET TBLPROPERTIES ('storage\_handler'='org.apache.iceberg.mr.hive.HiveIcebergStorageHandler');

The following images provide information about alter tables operations.

Q hive\_ice\_5

Entities

/user/hive/warehouse/hive\_ice\_5 (hdfs\_path)

hive\_ice\_5 (iceberg\_table)

hive\_ice\_5 (hive\_table)

default.hive\_ice\_5@primary\_storage (hive\_storagedesc)

default.hive\_ice\_5@primary:1679894181153 (hive\_table\_ddl)

Suggestions

hive\_ice\_5

Properties

Lineage

Relationships

Classifications

Audits

Tasks

Current Entity

In Progress

Lineage

Impact

hive\_table

guid5bce52d0-cc48-4d84-bbe8-54db00a22345

typeNamehive\_table

namehive\_ice\_5

qualifiedNamedefault.hive\_ice\_5@primary

ownerhive

createTime03/27/2023 10:46:10 AM (IST)

statusACTIVE

default.hive\_ice\_...

hive\_ice\_5

The top screenshot shows the 'hive\_process' entity details:

guid	c17a03db-221d-42e5-a6a2-59bc8e58832b
typeName	hive_process
name	ALERTABLE_PROPERTIES:default.hive_ice_5@primary:1679894170000->:default.hive_ice_5@primary:1679894170000
qualifiedName	ALERTABLE_PROPERTIES:default.hive_ice_5@primary:1679894170000->:default.hive_ice_5@primary:1679894170000

The bottom screenshot shows the 'iceberg\_table' entity details:

guid	16d64519-bc28-466e-beb9-b7809e4c2318
typeName	iceberg_table
name	hive_ice_5
qualifiedName	default.hive_ice_5@primary
owner	hive
createTime	1679894170000
status	ACTIVE

### Related Information

[Using the Spark shell](#)

[Using the Impala shell](#)

## Using the Impala shell

Using Impala, you can create an Iceberg table followed by Schema evolution, partition specification, partition evolution and CTAS operation.

### Before you begin

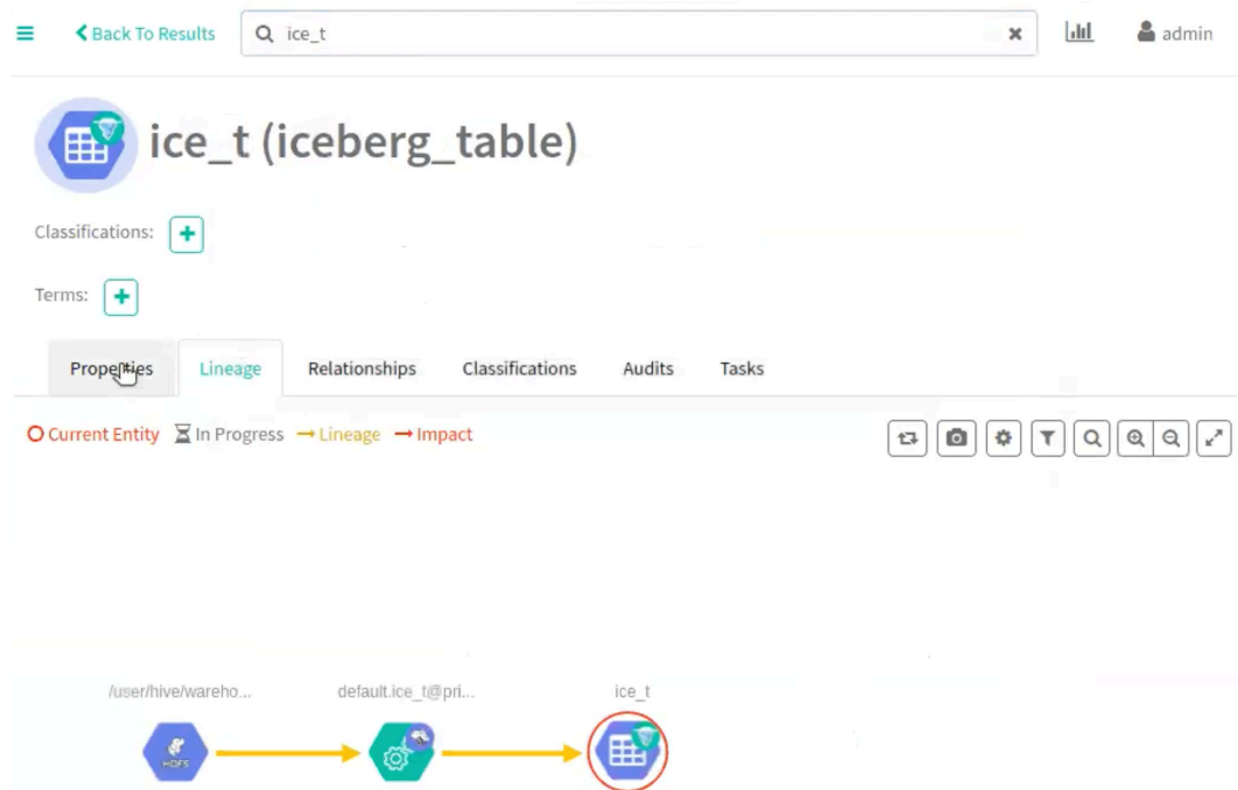
Run the following command in your Impala shell to create a new Iceberg table

### Procedure

1. `CREATE TABLE ice_t (i INT) STORED AS ICEBERG;`

2. Navigate accordingly in the Atlas UI to view the changes.

The following images provide information about Iceberg table creation process.



Run the following command in your Impala shell to create a scheme evolution:

### 3. CREATE TABLE ice\_t\_2 (i INT) STORED AS ICEBERG;

The screenshot shows the Cloudera Atlas interface for the table `ice_t_2 (iceberg_table)`. The top navigation bar includes a search bar with the text `ice_t_2` and a user profile icon labeled `admin`. Below the search bar, there are tabs for `Properties`, `Lineage`, `Relationships`, `Classifications`, `Audits`, and `Tasks`. The `Properties` tab is selected, showing a section for `Technical properties` with a toggle switch. The `Technical properties` section includes a table with the following data:

Property Name	Value
columns (1)	i
createTime	03/27/2023 10:48:21 AM (IST)
db	default@primary

To the right of the `Technical properties` section, there are three expandable sections: `User-defined properties`, `Labels`, and `Business Metadata`, each with an `Add` button.

Run the following command in your Impala shell to add a column to the existing table (`ice_t_2`):

4. `alter table ice_t_2 ADD COLUMNS (add_col_1 string );`



[Back To Results](#)



Search entities



# ice\_t\_2 (iceberg\_tab

Classifications:



Terms:



Properties

Lineage

Relationships

Classification

Technical properties

columns (2)

i

add\_col\_1

createTime

03/27/2023 10:48:21 AM (IST)

db

default@primary

Run the following command in your Impala shell to create a partition specification.

5. `CREATE TABLE ice_part_spec (s string , b string ) PARTITIONED BY SPEC (truncate(3, s)) STORED AS ICEBERG ;`

ice\_part\_spec (iceberg\_table)

Classifications: [+](#)

Terms: [+](#)

Properties Lineage Relationships Classifications **Audits** Tasks

Users	Timestamp	Actions
impala	03/27/2023 10:49:28 AM (IST)	Entity Created

Showing 1 records From 1 - 25 Page Limit: 25

lastAccessTime 01/07/1970 05:39:15 PM (IST)

name ice\_part\_spec

owner impala

parameters {  
"external.table.purge":  
"TRUE",

partitionSpec (1) s\_trunc

qualifiedName default.ice\_part\_spec@primary

retention 2147483647

sd default.ice\_part\_spec@primary\_orage

tableType EXTERNAL\_TABLE

temporary false

typeName iceberg\_table

Run the following command in your Impala shell to create a partition evolution.

6. CREATE TABLE ice\_p (i INT, d DATE, s STRING, t TIMESTAMP) PARTITIONED BY SPEC (BUCKET(5, i), MONTH(d), TRUNCATE(3, s), HOUR(t))STORED AS ICEBERG;

The screenshot shows the Cloudera Atlas interface for a table named 'ice\_p'. The interface includes a search bar at the top with the text 'ice\_p' and a 'Back To Results' link. The table details are displayed in a list format:

- lastAccessTime**: 01/07/1970 05:40:00 PM (IST)
- name**: ice\_p
- owner**: impala
- parameters**: { "external.table.purge": "TRUE", }
- partitionSpec (4)**: s\_trunc, t\_hour, i\_bucket, d\_month
- qualifiedName**: default.ice\_p@primary
- retention**: 2147483647
- sd**: default.ice\_p@primary\_storage
- tableType**: EXTERNAL\_TABLE

Run the following command in your Impala shell to modify the partition specification

7. ALTER TABLE ice\_p SET PARTITION SPEC (VOID(i), VOID(d), TRUNCATE(3, s), HOUR(t), i);



[Back To Results](#)



Search entities

lastAccessTime 01/07/1970 05:40:00 PM (IST)

name ice\_p

owner impala

parameters

```
{
  previous_metadata_location:
  "hdfs://atlas-
```

partitionSpec  
(5)

```
d_null, s_trunc, t_hour, i_nul
i
```

qualifiedName default.ice\_p@primary

retention 2147483647

sd

```
default.ice_p@primary_storage
```

Run the following commands in your Impala shell to create the contents of one table (ice\_t\_3) to another table (ice\_t\_4).

**8. CREATE TABLE ice\_t\_3 (i INT) STORED AS ICEBERG;**

**9.** CREATE TABLE ice\_t\_4 STORED AS ICEBERG as select \* from ice\_t\_3;

[Back To Results](#)

partitionSpec (5)



impala

Name: ice\_p

### Technical properties

comment

N/

createTime

03/27/2023 10:50:13 AM (IS

lastAccessTime

01/07/1970 05:40:00 PM (IS

name

ice\_

Q ice\_t\_4

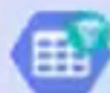
#### Entities



/user/hive/warehouse/ice\_t\_4



default.ice\_t\_4@primary:-100



ice\_t\_4 (iceberg\_table)



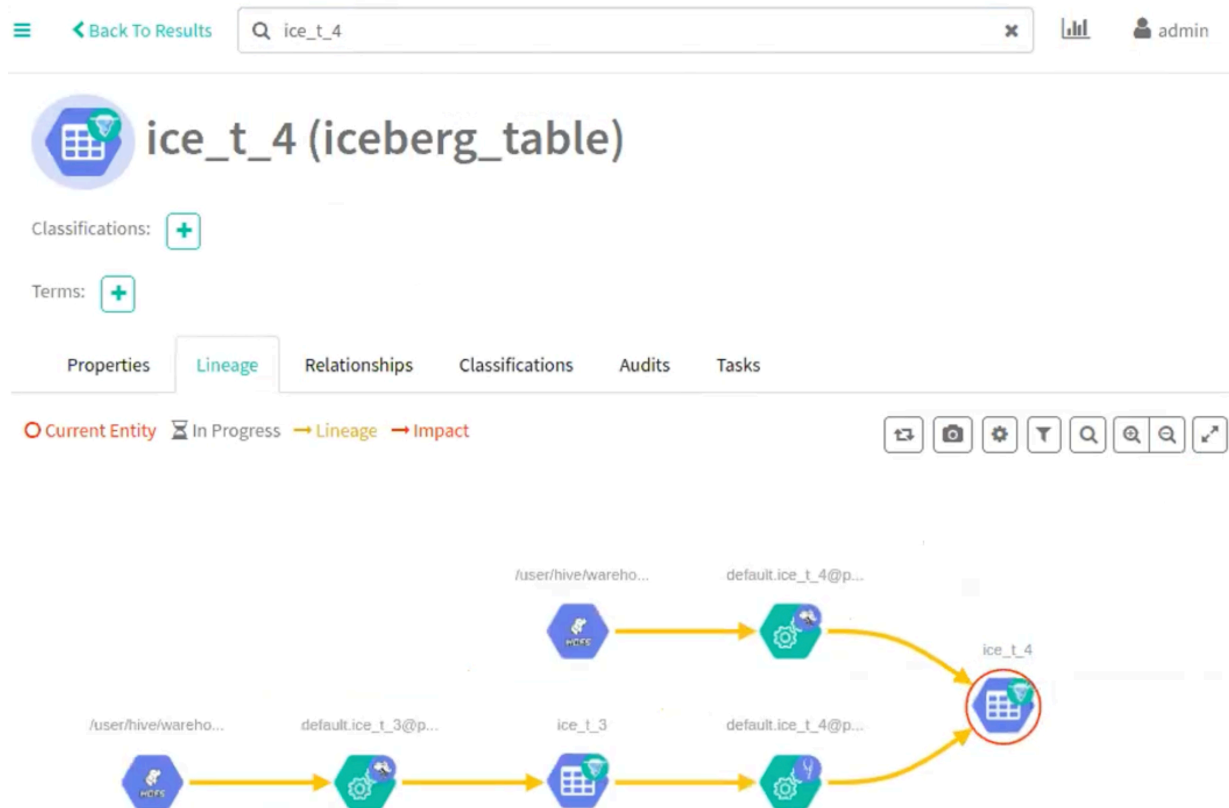
default.ice\_t\_4@primary\_stor



default.ice\_t\_4@primary:1679

#### Suggestions

ice\_t\_4



The process is completed.

#### Related Information

[Using the Spark shell](#)

[Using the Hive shell](#)