

Cloudera Runtime 7.1.0

Apache Atlas Reference

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CLOUDERA

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Apache Atlas Advanced Search language reference

Atlas lets you search for metadata using a domain-specific language with a SQL-like format.

If you find that the Basic Search or Free-text Search doesn't allow you to search as precisely as you would like, you can create a query in the Advanced Search interface to return exactly the results you are looking for. Advanced Search queries use a domain-specific language that is intentionally SQL-like.

Each Advanced Search query is in the form of three clauses:

```
FROM WHERE SELECT
```

Additional keywords such as GROUPBY, ORDERBY, and LIMIT can be used to affect the output.

FROM clause

The value specified in the FROM clause acts as the scope of the query. You can specify any entity type in the FROM clause. The possible entity types are the same list as in the Type search; the names are case-sensitive.

The FROM clause is required and also assumed: the first item included in the query (if not literally the word "from") is assumed to be the object of the FROM clause.

Examples

With or without FROM: To retrieve all entities of type "hive_db" use one of the following queries:

```
hive_db  
from hive_db
```

If you only specify a FROM clause, Atlas returns all entities of that type.



Note: To avoid unintentional load on the server because of an overly broad search, Atlas returns a maximum of 100 results when no limit is set.

Where Clause

The WHERE clause allows for filtering over the result set identified in the FROM clause by specifying a condition of the form:

```
identifier operator 'literal'
```

The identifier is the name of a property of the entity type specified in the FROM clause. The properties for a given entity type are those shown in the Properties tab of an entity detail page. The names are case-sensitive.

Operators vary by the data type of the literal and include the following:

String: = LIKE

Numeric, Date: = <>

Boolean: =

The LIKE operator allows you to use wildcards in the literal. Asterisk (*) replaces zero to multiple values; question mark (?) replaces a single value.

The literal must be enclosed in single or double quotes. Matches are case-sensitive. Literals can be lists of values. If you specify comma-separated values in square brackets, they act as an OR operation.

Dates used in literals need to be specified using the ISO 8601 format and in single or double quotes.

Boolean values used in literals are lower case "true" and "false" without quotation marks.

You can specify multiple conditions using AND or OR operators. Note that making a list of values is more efficient than using the same identifier in multiple conditions.

Examples:

Exact string: To retrieve all entities of type `hive_table` with a specific name "time_dim", use:

```
from hive_table where name = 'time_dim'
```

Multiple conditions: To retrieve entity of type `hive_table` with name that can be either "time_dim" or "customer_dim":

```
from hive_table where name = 'time_dim' or name = 'customer_dim'
```

List of values: The query in the example above can be written using a value array:

```
from hive_table where name = ["customer_dim", "time_dim"]
```

Wildcard filtering: To retrieve entity of type `hive_table` whose name ends with '_dim':

```
from hive_table where name LIKE '*_dim'
```

To retrieve a `hive_db` whose name starts with R followed by any 3 characters, followed by rt followed by at least 1 character, followed by none or any number of characters:

```
DB where name like "R???rt?*"
```

Date Literal: To retrieve entity of type `hive_table` created within 2019 and 2020, use the date portion of the time value and specify a range using two phrases connected by AND:

```
from hive_table where createTime > '2019-01-01' and
  createTime < '2019-01-03'
```

Boolean Literal: To retrieve entity of type `hdfs_path` whose attribute `isFile` is set to true and whose name is Invoice:

```
from hdfs_path where isFile = true and name = "Invoice"
```

Select Clause

The select clause allows you to specify the properties you want returned in the search results. Properties with simple values can be returned; properties that contain other entities are not available. The property names are case sensitive.

To display column headers that are more meaningful than the system property names, you can use aliases using 'as.'

Examples

Select clause only: To retrieve entities of type "hive_table" with some of its properties:

```
from hive_table select owner, name, qualifiedName
```

WHERE and SELECT clauses: To retrieve entity of type `hive_table` for a specific table with some properties:

```
from hive_table where name = 'customer_dim' select owner, name, qualifiedName
```

Change output names using AS: To display column headers as 'Owner', 'Name' and 'FullName'.

```
from hive_table select owner as Owner, name as Name, qualifiedName as FullName
```

Advanced Searches using Classifications

You can search for entities that are tagged with a specific classification using "is" or "isa" keywords in either the From or Where clauses. Is and Isa are interchangeable.

Examples

FROM or WHERE clause: To retrieve all entities of type "hive_table" that are tagged with the "Dimension" classification, you could use any of the following queries:

```
hive_table is Dimension
from hive_table where hive_table isa Dimension
```

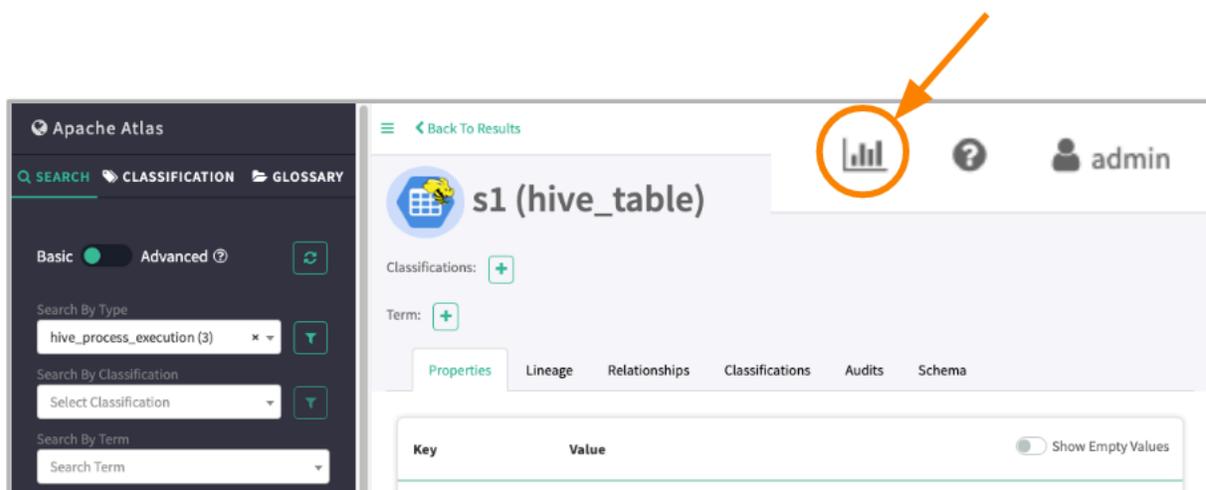
Related Information

[Apache Atlas Advanced Search](#)

Apache Atlas Statistics reference

Atlas collects statistics on the metadata it processes. Use this information to help troubleshoot problems and to gauge performance.

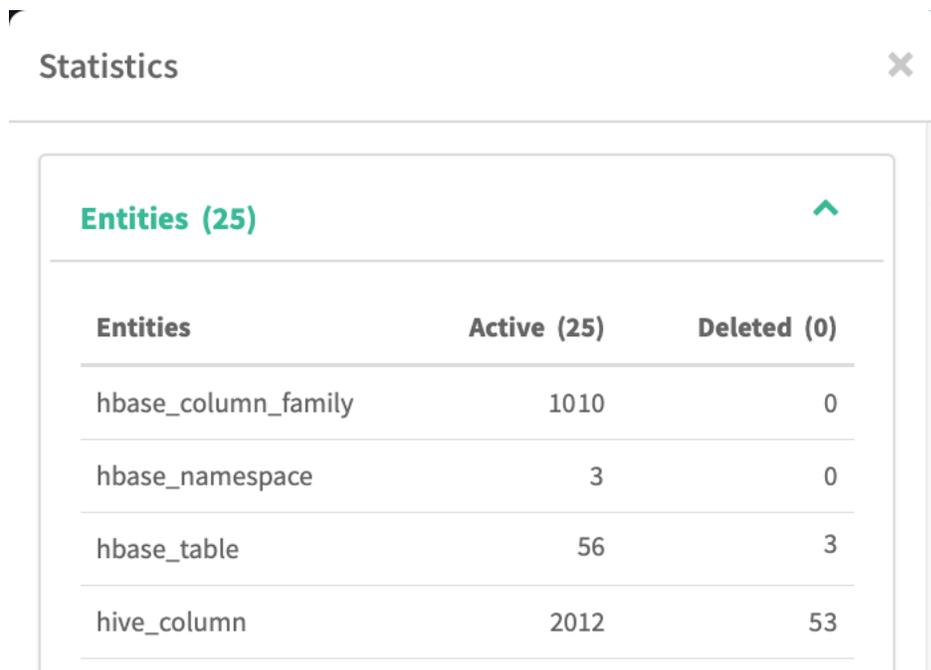
To view statistics, click the graph button in the top right corner:



The statistics available are categorized into Entity Statistics and Server Statistics:

Entity Statistics

The distribution of entity across their types. A second column gives the number of these entities that have been marked as deleted.



Statistics [Close]

Entities (25) [Up Arrow]

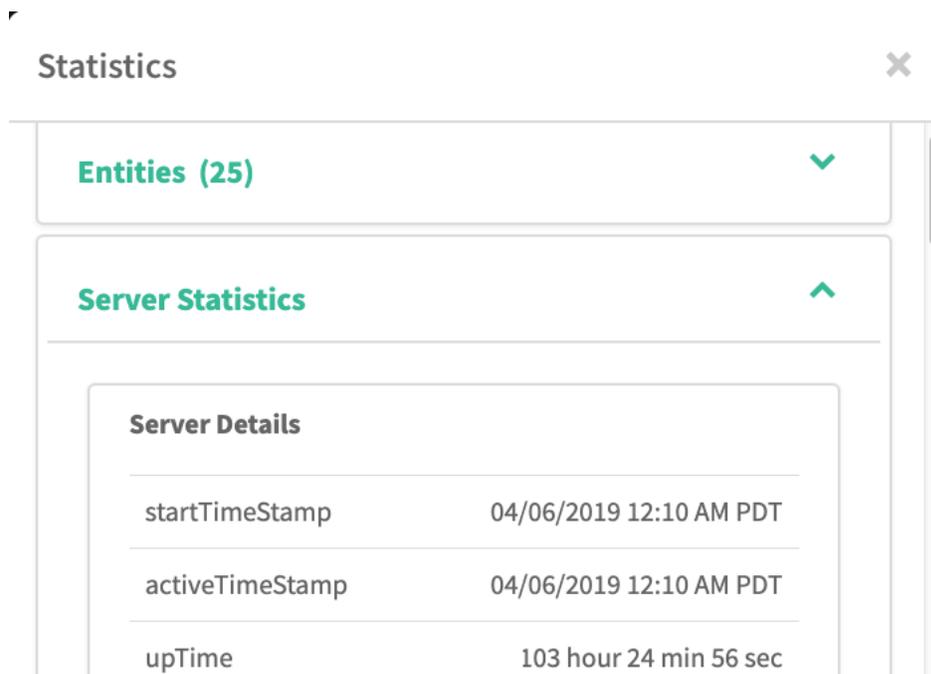
Entities	Active (25)	Deleted (0)
hbase_column_family	1010	0
hbase_namespace	3	0
hbase_table	56	3
hive_column	2012	53

Classification Statistics

A list of classifications assigned to entities and the count of entities marked with that classification. The count for each classification is a hyperlink that runs a search for entities marked with the classification.

Server Statistics

Server statistics reflect the current server session and the metadata collection messages that Atlas reads from a dedicated Kafka topic.



Statistics [Close]

Entities (25) [Down Arrow]

Server Statistics [Up Arrow]

Server Details

startTimeStamp	04/06/2019 12:10 AM PDT
activeTimeStamp	04/06/2019 12:10 AM PDT
upTime	103 hour 24 min 56 sec

Server Details
startTimeStampThe

The timestamp of the most recent start of the Atlas server.

activeTimeStamp

Same as the startTimeStamp unless Atlas was disabled.

upTime

The amount of time between startTimeStamp and the current time when the server was running.

statusBackendStore

The status of the Atlas server connection to the HBase namespace where entity metadata is stored.

statusIndexStore

The status of the Atlas server connection to the Solr collection where entity metadata is indexed.

collectionTime

The last time metrics were calculated.

lastMessageProcessedTime

The timestamp of the last message Atlas recorded from the Kafka topic where services publish metadata.

offsetCurrent

The index in the Kafka partition that was most recently read.

offsetStart

The index in the Kafka partition that was first read.

Notification Details: Kafka Topic-Partition**Atlas Hook**

The primary topic through which services send metadata to Atlas and Atlas sends metadata to Ranger.

Spark-Atlas Hook Topic

A supplementary topic provided for Spark communication to Atlas.

Notification Details: Message Statistics**Period**

The interval that the statistic applies to, including the total lifetime of Atlas. Each period indicated includes a timestamp for when the period started.

Count

The number of messages processed by Atlas during the period.

Avg Time (ms)

The average duration between the time that a hook published a message to the Kafka topic to the time entities were successfully created or updated.

Creates

The number of entities produced from the messages processed during the period.

Updates

The number of entities updated based on the messages processed during the period.

Deletes

The number of entities updated based on the messages processed during the period.

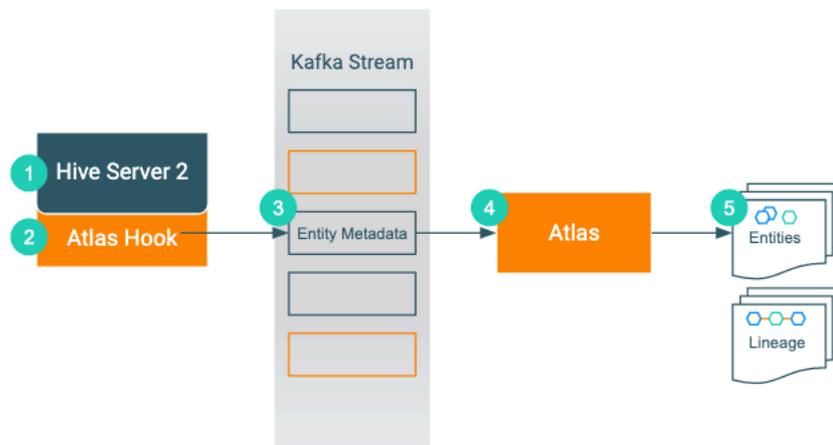
Failed

The number of messages that were received but not processed. For more information on what might have prevented these messages from being processed.

HiveServer metadata collection

Atlas can collect metadata from HiveServer, including queries and the data assets the queries affect.

An Atlas hook runs in each HiveServer instance. This hook sends metadata to Atlas for both Hive operations and Hive data assets. Operations are represented by process and process execution entities in Atlas. Hive databases, tables, views, and columns are represented by entities in Atlas. When a Hive operation involves files, the metadata for the file system and files are represented in Atlas as file system paths.



1. When an action occurs in the HiveServer instance...
2. The corresponding Atlas hook collects information for the action into metadata entities.
3. The hook publishes the metadata on a Kafka topic.
4. Atlas reads the message from the topic and determines what information will create new entities and what information updates existing entities.
5. Atlas creates and updates the appropriate entities and determines lineage from existing entities to the new entities.

The Atlas bridge for HBase pulls the same metadata as the hook, but instead of sending the metadata through Kafka, it passes message in bulk in an API call. The bridge creates entities in Atlas for all of the existing HBase namespaces, tables, columns, and column families.

HiveServer actions that produce Atlas entities

Operations that create, update, or delete Hive metadata will affect Atlas entities; operations that only affect data do not show up in Atlas.

The following table lists the HiveServer actions that produce or update metadata in Atlas.

This Action in HiveServer...	...Produces metadata for these Atlas entities
ALTER DATABASE, CREATE DATABASE, DROP DATABASE	hive_db, hive_db_ddl
ALTER TABLE, CREATE TABLE, CREATE TABLE AS SELECT, DROP TABLE	hive_process, hive_process_execution, hive_table, hive_table_ddl, hive_column, hive_column_lineage, hive_storagedesc, hdfs_path

This Action in HiveServer...	...Produces metadata for these Atlas entities
ALTER VIEW, ALTERVIEW_AS_SELECT, CREATE VIEW, CREATE VIEW AS SELECT, DROP VIEW	hive_process, hive_process_execution, hive_table, hive_column, hive_column_lineage, hive_table_ddl
INSERT INTO (SELECT), INSERT OVERWRITE	hive_process, hive_process_execution

Notable actions in HiveServer that do NOT produce process or process execution entities in Atlas, meaning that no lineage is produced for these operations:

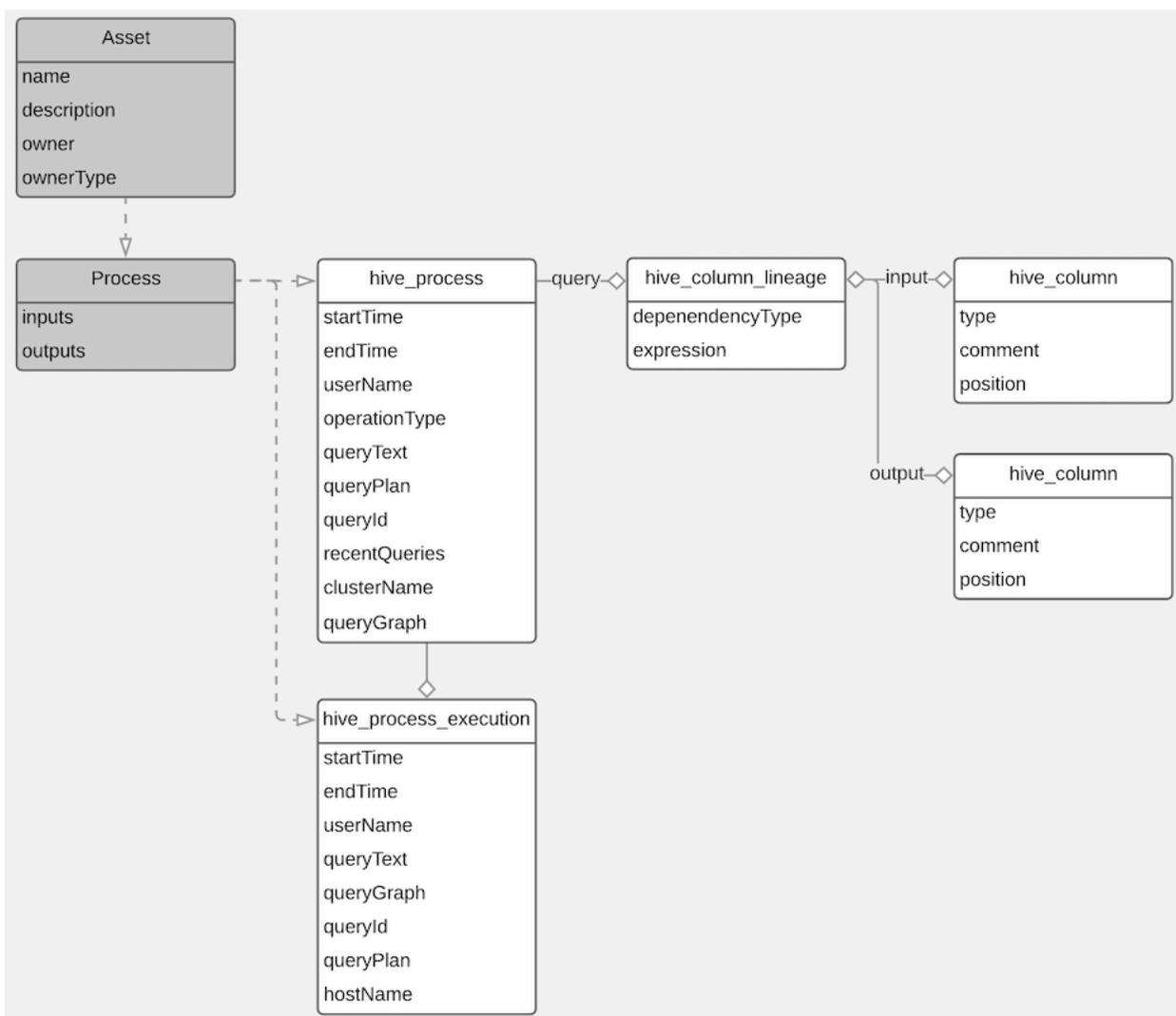
- SELECT

HiveServer entities created in Atlas

Each HiveServer entity in Atlas includes detailed metadata collected from Hive.

The following diagrams show a summary of the entities created in Atlas for Hive operations and assets. The supertypes that contribute attributes to the entity types are shaded.

Figure 1: Atlas Entity Types for HiveServer Data Sets



The metadata collected for each entity type is as follows:

Hive Process

Identifier	Example content
typeName	hive_process
guid	System generated ID. This value is used to identify the entity in the Atlas Dashboard URL.
qualifiedName	<database>.<target table>@<clustername>:<generated ID> The generated ID is distinct from the GUID.
name	Text of the query.
inputs	List of the input tables or views, including each entity's type name and the qualified name.
outputs	List of the output objects, including each entity's type name and the qualified name.
recentQueries	Last query executed (duplicated in process_execution).
operationType	One of the operations that triggers metadata collection.
queryPlan	Reserved for future use.

Hive Process Execution

Identifier	Example Content
typeName	hive_process_execution
guid	System generated ID. This value is used to identify the entity in the Atlas Dashboard URL.
qualifiedName	<database>.<target table>@<clustername>:<ID from process qualified name>:<ID from the process execution name>:<generated ID for this process execution>
name	Text of the query with a system-generated ID added to the end.
queryText	Text of the query.
queryPlan	Reserved for future use.
queryId	impala_<date as yyyyymmddhhmmss>_<generated id>
startTime	Query start time.
endTime	Query end time.
userName	The user who ran the query.
Relationship: Process	One process to one or more process executions. hive_process_process_execution

Hive Database

Identifier	Example Content
typeName	hive_db
guid	System generated ID. This value is used to identify the entity in the Atlas Dashboard URL.
qualifiedName	<database>@<clustername>
name	Database name as reported from Hive.
clusterName	Cluster name.
location	The file system path where the backing files for the database are stored. This could be an HDFS path, an AWS S3 object, or an Azure data storage location.
owner	The user who initially created the database.
ownerType	The principal type of the database owner. Could be USER, ROLE, or GROUP.
parameters	Additional key-value pair metadata that comes from Hive such as table size, number of rows, and number of storage files.
Relationship: Table	One database to many tables. hive_table_db
Relationship: Database DDL	One database to many database DDL entities. hive_db_ddl_queries

Hive Table

Identifier	Example Content
typeName	hive_table
guid	System generated ID. This value is used to identify the entity in the Atlas Dashboard URL.
qualifiedName	<database>.<tablename>@<clustername>
name	Table name.
columns	List of the columns defined in the table. The Atlas Dashboard shows these as links to the column entity details.
owner	The user who created the table.

Identifier	Example Content
parameters	Table details from HiveServer such as: <ul style="list-style-type: none"> totalSize External numFiles transient_lastDdlTime bucketing_version
retention	Provided by HS2. Integer value
sd	The location of the table data, the storage description. <database>.<table>@<clustername>_storage
tableType	How the table was created: one of EXTERNAL_TABLE, VIRTUAL_VIEW, or MANAGED_TABLE.
Relationship: Database	One database to many tables. hive_table_db
Relationship: Columns	One table to one or more columns. hive_table_columns
Relationship: Partition Key Column	One table to one or more columns that are partition keys. hive_table_partitionkeys
Relationship: Storage Description	One table to one storage description. hive_table_storagedesc
Relationship: DDL	One table to many DDL entities. hive_table_ddl_queries

Hive Column

Identifier	Example Content
typeName	hive_column
comment	Metadata from Hive from the column description.
name	Column name as reported by HMS.
owner	Table owner name as reported by HMS.
position	This column's position in the list of columns in a zero-based index.
qualifiedName	<database>.<table>.<column>@<clustername>
table	Table name. Also modeled as relationship.
type	Column data type as reported by HMS.
Relationship: table	One table to one or more columns. hive_table_columns
Relationship: inputToProcesses	The hive_column_lineage entities that include this column in the input to a transformation. The relationship type is dataset_process_inputs.
Relationship: outputFromProcesses	The hive_column_lineage entities that include this column in the output to a transformation. The relationship type is process_dataset_outputs.
Relationship: Table	One table to one or more columns. hive_table_columns
Relationship: Partition Key Column	One table to one or more columns that are partition keys. hive_table_partitionkeys

Hive Column Lineage

Identifier	Example Content
typeName	hive_column_lineage
dependencyType	The type of relationship between the input and output columns; one of SIMPLE, EXPRESSION, or SCRIPT.
name	<database>.<table>@<clustername>:<generated ID>:<output_column>

Identifier	Example Content
inputs	List of 0 or more hive_column entities that contributed to the output columns. This is a legacy model component: the more current model uses a relationship attribute.
outputs	This is a legacy model component: the more current model uses a relationship attribute.
qualifiedName	Same as name.
query	Name of the hive_process entity that produced this lineage. This is a legacy model component: the more current model uses a relationship attribute.
Relationship: Process	Name of the hive_process entity that produced this lineage. hive_process_column_lineage
Relationship: inputToProcesses	List of 0 or more hive_column entities that contributed to the output columns.
Relationship: outputFromProcesses	List of 0 or more hive_column entities that were produced in the process.

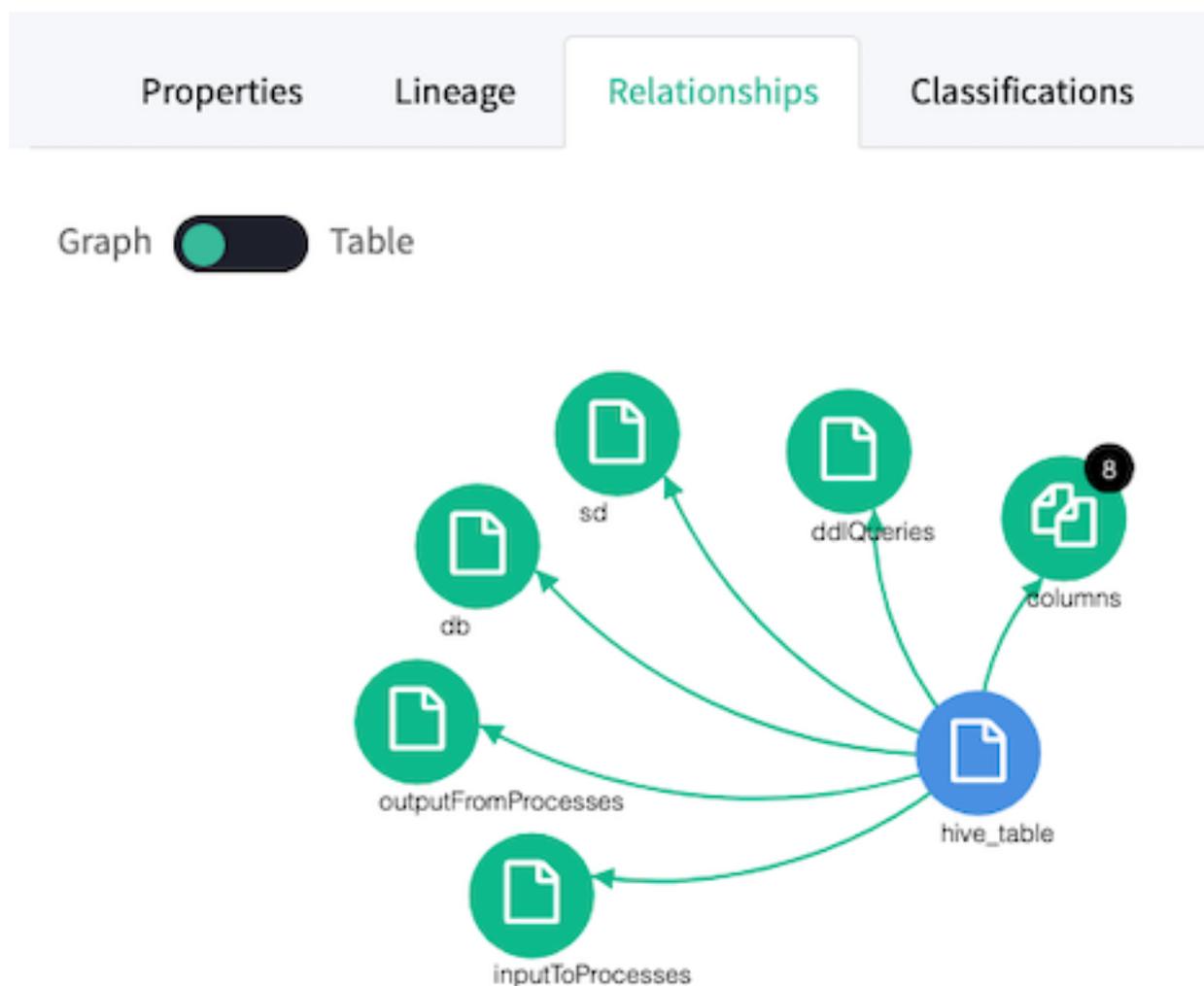
Hive Storage Description

Identifier	Example Content
typeName	hive_storagedesc
compressed	Metadata from Hive indicating whether the table is stored compressed.
inputFormat	Metadata from Hive indicating the storage input format.
outputFormat	Metadata from Hive indicating the storage output format.
parameters	Additional metadata from Hive in the form of key-value pairs.
qualifiedName	<database>.<table>@<clustername>_storage
serdeInfo	Metadata from Hive indicating the serialization/deserialization implementation used to write/read table data.
sortCols	Metadata from Hive listing the column or columns used to sort the table data.
storedAsSubDirectories	Metadata from Hive indicating whether a skewed table uses the list bucketing feature, which creates subdirectories for skewed values.
numBuckets	Metadata from Hive indicating the number of buckets for bucketed tables. Non-bucketed tables are indicated by -1.
table	The table that this storage description holds data for. Also represented as a relationship.
Relationship: table	The table that this storage description holds data for.

HiveServer relationships

Atlas shows the entities related to this entity in the Relationships tab in the Dashboard.

The Relationship tab shows the relationships that exist for an entity. Use this view to navigate among related entities.



HiveServer lineage

Atlas collects metadata from HiveServer to represent the lineage among data assets.

The Atlas lineage graph shows the input and output processes that the current entity participated in, specifically those relationships modeled as “inputToProcesses” and “outputFromProcesses.” Entities are included if they were inputs to processes that lead to the current entity or they are output from processes for which the current entity was an input. HiveServer processes follow this pattern.

claim_savings (hive_table)

Classifications: DATA_QUALITY +

Term: +

Properties Lineage Relationships Classifications Audits Schema

○ Current Entity → → Lineage → → Impact

create external t... claim_savings create view if no... claims_view

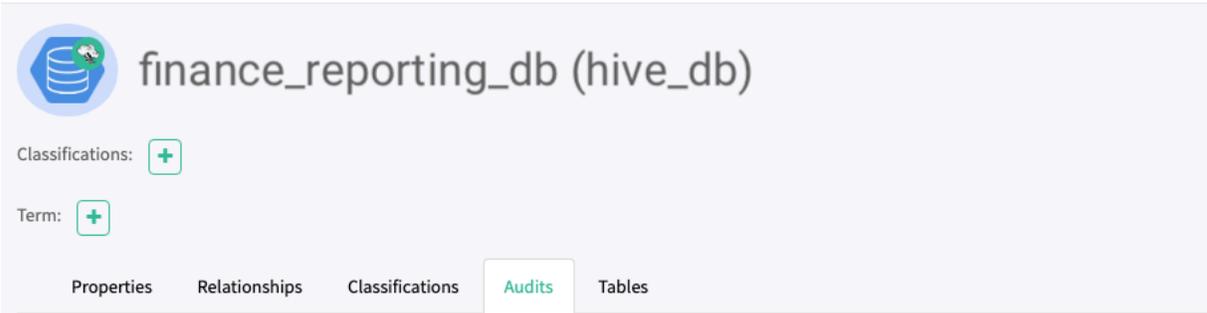


Related Information
[Viewing lineage](#)

HiveServer audit entries

Atlas lists changes to metadata entities in the Audit tab in the Dashboard.

Atlas tracks the lifecycle of each Hive entity, including its creation, update, and deletion. User access and actions that affect the data content of the source asset are not included in the audit.



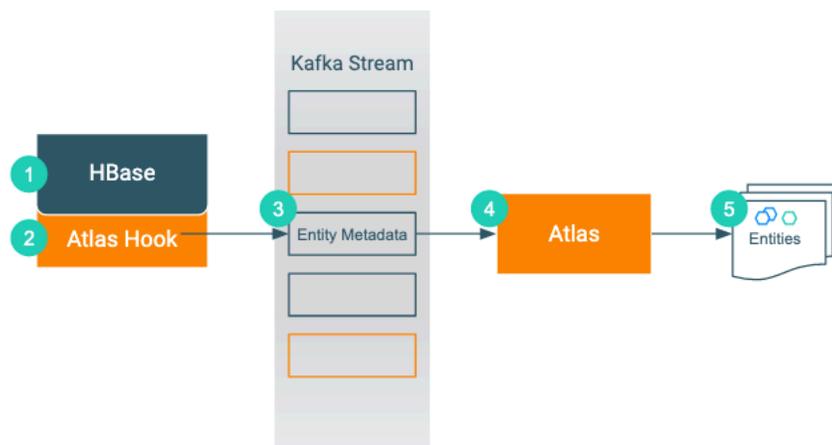
Showing 8 records From 1 - 25

Users ↕	Timestamp ↕	Actions ↕	Tools
hive	Fri Jul 12 2019 19:48:58 GMT-0700 (Pacific Daylight Time)	Entity Updated	Detail
hive	Fri Jul 12 2019 18:36:51 GMT-0700 (Pacific Daylight Time)	Entity Updated	Detail
hive	Fri Jul 12 2019 18:36:50 GMT-0700 (Pacific Daylight Time)	Entity Updated	Detail
hive	Fri Jul 12 2019 18:36:49 GMT-0700 (Pacific Daylight Time)	Entity Updated	Detail
hive	Fri Jul 12 2019 18:36:47 GMT-0700 (Pacific Daylight Time)	Entity Updated	Detail
hive	Fri Jul 12 2019 18:36:46 GMT-0700 (Pacific Daylight Time)	Entity Updated	Detail
hive	Fri Jul 12 2019 18:36:45 GMT-0700 (Pacific Daylight Time)	Entity Updated	Detail
hive	Fri Jul 12 2019 18:36:44 GMT-0700 (Pacific Daylight Time)	Entity Created	Detail

HBase metadata collection

Atlas can collect metadata from HBase that describes the data assets HBase manages.

An Atlas hook runs in each HBase instance. This hook sends metadata to Atlas for HBase data assets. HBase namespaces, tables, columns, and column families are represented by entities in Atlas.



1. When an action occurs in the HBase instance...
2. The corresponding Atlas hook collects information for the action into metadata entities.
3. The hook publishes the metadata on a Kafka topic.
4. Atlas reads the message from the topic and determines what information will create new entities and what information updates existing entities.
5. Atlas creates and updates the appropriate entities.

The Atlas bridge for HBase pulls the same metadata as the hook, but instead of sending the metadata through Kafka, it passes message in bulk in an API call. The bridge creates entities in Atlas for all of the existing HBase namespaces, tables, columns, and column families.

HBase actions that produce Atlas entities

As data assets are created in HBase, Atlas generates entities to represent those assets. Atlas does not create processes to represent HBase operations.

The following table lists the HBase actions that produce or update metadata in Atlas.

This Action in HBase...	...Produces metadata for these Atlas entities
alter_async	hbase_namespace, hbase_table, hbase_column_family
create_namespace, alter_namespace, drop_namespace	hbase_namespace
create table, alter table, drop table, drop_all tables	alter table (create column family), alter table (alter column family), alter table (delete column family)
alter table (create column family), alter table (alter column family), alter table (delete column family)	hive_process, hive_process_execution

Notable actions in HBase that do NOT produce metadata entities include any actions that affect only data and not metadata. In addition, Atlas does not collect metadata for HBase columns. Actions that do not create Atlas entities include:

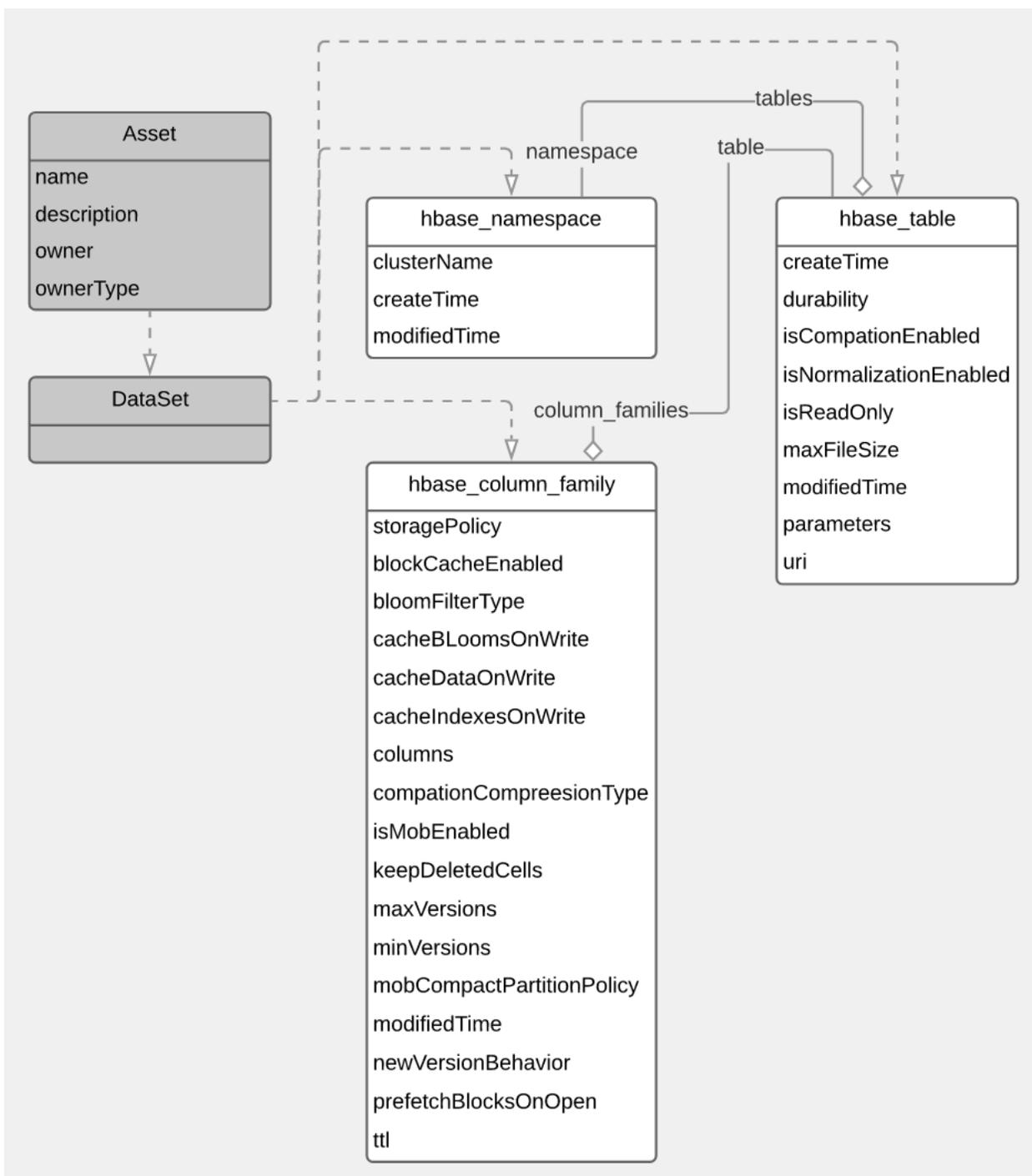
- Truncate table
- Put (cell value]
- Disable/enable table

HBase entities created in Atlas

Each HBase data set entity in Atlas includes detailed metadata collected from HBase.

The following diagrams show a summary of the entities created in Atlas for Hive operations and assets. The supertypes that contribute attributes to the entity types are shaded.

Figure 3: Atlas Entity Types for HBase Data Sets



The metadata collected for each entity type is as follows:

HBase Namespace

Identifier	Example content
typeName	hbase_namespace
guid	System generated ID. This value is used to identify the entity in the Atlas Dashboard URL.
qualifiedName	<name>@<clustername>
name	Namespace name as reported from HBase.

Identifier	Example content
description	String description metadata from HBase.
modifiedTime	Time from HBase indicating a change to the namespace. Formatted as in this example: "Wed Apr 17 2019 18:32:14 GMT-0700 (Pacific Daylight Time)"
owner	Owner as reported from HBase.
parameters	Reserved for future use.
replicatedFrom	Reserved for future use.
replicatedTo	Reserved for future use.
Relationship: tables	One namespace to many tables. hbase_table_namespace

HBase Table

Identifier	Example content
typeName	hbase_table
guid	System generated ID. This value is used to identify the entity in the Atlas Dashboard URL.
qualifiedName	<namespace>:<tablename>@<clustername>
name	Table name as reported from HBase.
description	String description metadata from HBase.
modifiedTime	Time from HBase indicating a change to the table. Formatted as in this example: "Wed Apr 17 2019 18:32:14 GMT-0700 (Pacific Daylight Time)"
owner	Owner as reported from HBase.
parameters	Reserved for future use.
replicatedFrom	Reserved for future use.
replicatedTo	Reserved for future use.
durability	Storage property as reported from HBase. Values include true or false.
isCompactionEnabled	Storage property as reported from HBase. Values include true or false.
isNormalizationEnabled	Storage property as reported from HBase. Values include true or false.
isReadOnly	
maxFileSize	Storage property as reported from HBase. -1 indicates that no maximum was set.
uri	Table name.
Relationship: namespace	One namespace to many tables. hbase_table_namespace
Relationship: column families	Column families associated with this table. hbase_table_column_families

HBase Column Family

Identifier	Example content
typeName	hbase_column_family
guid	System generated ID. This value is used to identify the entity in the Atlas Dashboard URL.
qualifiedName	<namespace>:<tablename>.<columnfamily>@<clustername>
name	Column family name as reported from HBase.
description	String description metadata from HBase.
modifiedTime	Time from HBase indicating a change to the column family. Formatted as in this example: "Wed Apr 17 2019 18:32:14 GMT-0700 (Pacific Daylight Time)"

Identifier	Example content
owner	Owner as reported from HBase.
StoragePolicy	Value for the storagePolicy property for the column family. Values include N/A, ALL_SSD, ONE_SSD, HOT, WARM, COLD.
blockCacheEnabled	Storage property as reported from HBase. Values include true or false.
bloomFilterType	Value for the BLOOM_FILTER_TYPE property for the column family. Values include NONE, ROW, or ROWCOL.
cacheBloomsOnWrite	Boolean value for the CACHE_BLOOMS_ON_WRITE property for the column family.
cacheDataOnWrite	Boolean value for the CACHE_DATA_ON_WRITE property for the column family.
cacheIndexesOnWrite	Boolean value for the CACHE_INDEX_ON_WRITE property for the column family.
columns	List of columns included in the column family.
compactionCompressionType	Storage property as reported from HBase.
compressionType	Value for the COMPRESSION property for the column family. Values include NONE, SNAPPY, LZ0, LZ4, GZ.
createTime	Time from HBase indicating when the column family was created. Formatted as in this example: "Wed Apr 17 2019 18:32:14 GMT-0700 (Pacific Daylight Time)"
dataBlockEncoding	The DATA_BLOCK_ENCODING property for the column family. Values include NONE, PREFIX, DIFF, FAST_DIFF, ROW_INDEX_V1.
encryptionType	Column family encryption property. Values include "N/A", and AES.
evictBlocksOnClose	Boolean value for the EVICT_BLOCKS_ON_CLOSE property for the column family.
inMemoryCompactionPolicy	In memory compaction behavior (IN_MEMORY_COMPACTION) set for the column family. Values include NONE, BASIC, EAGER, ADAPTIVE, or "N/A".
isMobEnabled	Boolean value for Medium Object (MOB) properties for the column family (IS_MOB).
keepDeletedCells	Boolean value for the KEEP_DELETED_CELLS property of the column family.
maxVersions	The maximum number of row versions this column family is configured to store.
minVersions	The minimum number of row versions this column family is configured to store.
mobCompactPartitionPolicy	The MOB_COMPACT_PARTITION_POLICY for this column family. Values include DAILY, WEEKLY, MONTHLY.
modifiedTime	Time from HBase indicating a change to the column family. Formatted as in this example: "Wed Apr 17 2019 18:32:14 GMT-0700 (Pacific Daylight Time)"
newVersionBehavior	Boolean value for the NEW_VERSION_BEHAVIOR property for this column family.
prefetchBlocksOnOpen	Boolean value for PREFETCH_BLOCKS_ON_OPEN property of the column family.
replicatedFrom	Not used.
replicatedTo	Not used.
table	The table that the column family corresponds to. Also modeled as a relationship.
ttl	Time to live (TTL) length in seconds. The TTL time encoded in the HBase for the row is specified in UTC.
Relationship: columns	Not used.
Relationship: table	One table to many column families. hbase_table_column_families

Hbase lineage

Atlas collects lineage information for HBase data assets when HBase tables are referenced in HiveServer or Impala operations.

The Atlas lineage graph shows the input and output processes that the current entity participated in, specifically those relationships modeled as "inputToProcesses" and "outputFromProcesses." Entities are included if they were inputs to processes that lead to the current entity or they are output from processes for which the current entity was an input.

No lineage metadata is collected directly from HBase.

Related Information

[Viewing lineage](#)

HBase audit entries

Atlas lists changes to metadata entities in the Audit tab in the Dashboard.

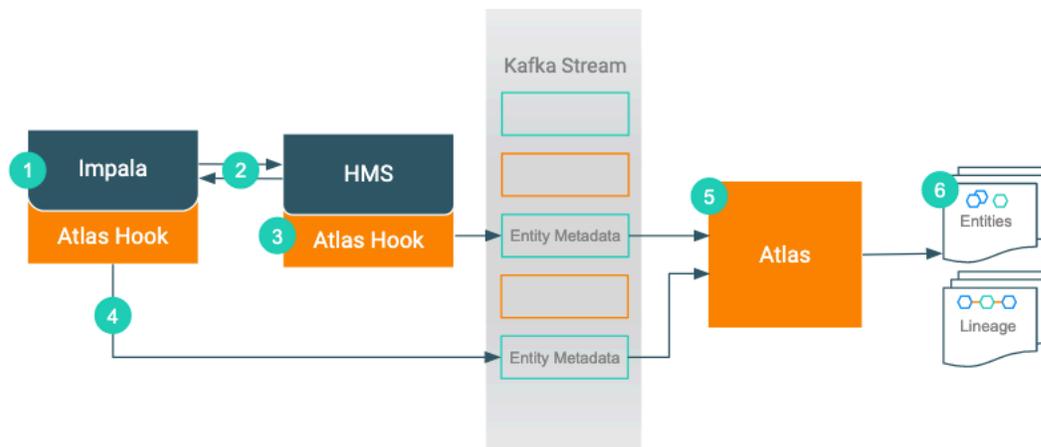
Atlas tracks the lifecycle of each HBase entity, including its creation, update, and deletion. User access and actions that affect the data content of the source asset are not included in the audit.

Impala metadata collection

Atlas can collect metadata for queries from Impala. It collects metadata for affected data assets from Hive Metastore (HMS).

An Atlas hook runs in each Impalad instance. This hook sends metadata to Atlas for Impala operations, which are represented by process and process execution entities in Atlas.

In addition, an Atlas hook runs in Hive Metastore (HMS). Before sending metadata to Atlas, Impala synchronizes its metadata with HMS. This synchronization makes sure that Impala uses the same names and IDs as HMS.



1. When an action occurs in the Impala instance...
2. Impala updates HMS with information about the assets affected by the action.
3. The Atlas hook for HMS collects information for the changed and new assets and forms it into metadata entities. It publishes the metadata to a Kafka topic.
4. The Atlas hook for the Impala instance collects information for the action and forms it into metadata entities. It publishes the metadata to a Kafka topic.
5. Atlas reads the messages from the topic and determines what information will create new entities and what information updates existing entities. Atlas is able to determine the correct entities regardless of the order in which Atlas receives messages from the Kafka topic.
6. Atlas creates the appropriate entities and determines lineage from existing entities to the new entities.

Impala actions that produce Atlas entities

Impala operations that create, update, or delete Hive metadata will affect Atlas entities; operations that only affect data do not show up in Atlas.

The following table lists the Impala actions that produce or update metadata in Atlas.

This Action in Impala...	...Produces metadata for these Atlas entities	...Triggers HMS to produce metadata for these Atlas entities	...Produces metadata for these Atlas relationships
CREATETABLE_AS_SELECT	impala_process, impala_process_execution, impala_column_lineage, hive_db hive_table_ddl	hive_table, hive_column(s), hive_storedesc, hive_db hive_table_ddl	hive_table_db, hive_table_columns, hive_table_partitionkeys, hive_table_storedesc, hive_process_process_execution, hive_process_columnlineage, hive_table_ddl_queries, hive_db_ddl_queries
CREATEVIEW	impala_process, impala_process_execution, impala_column_lineage, hive_table_ddl	hive_table, hive_column(s), hive_db	hive_table_db, hive_table_columns, hive_table_partitionkeys, hive_process_process_execution, hive_process_columnlineage, hive_table_ddl_queries
ALTERVIEW_AS_SELECT	impala_process, impala_process_execution, impala_column_lineage, hive_table_ddl	Updates to: hive_table, hive_column(s)	hive_process_process_execution, hive_process_columnlineage, hive_table_ddl_queries
INSERT INTO, INSERT, OVERWRITE	impala_process, impala_process_execution	If not already in Atlas, HMS sends metadata for data assets indicated in the query: hive_table, hive_column(s), hive_storedesc, hive_db	hive_process_process_execution

Notable actions in Impala that do NOT produce process or process execution entities in Atlas, meaning that no lineage is produced for these operations:

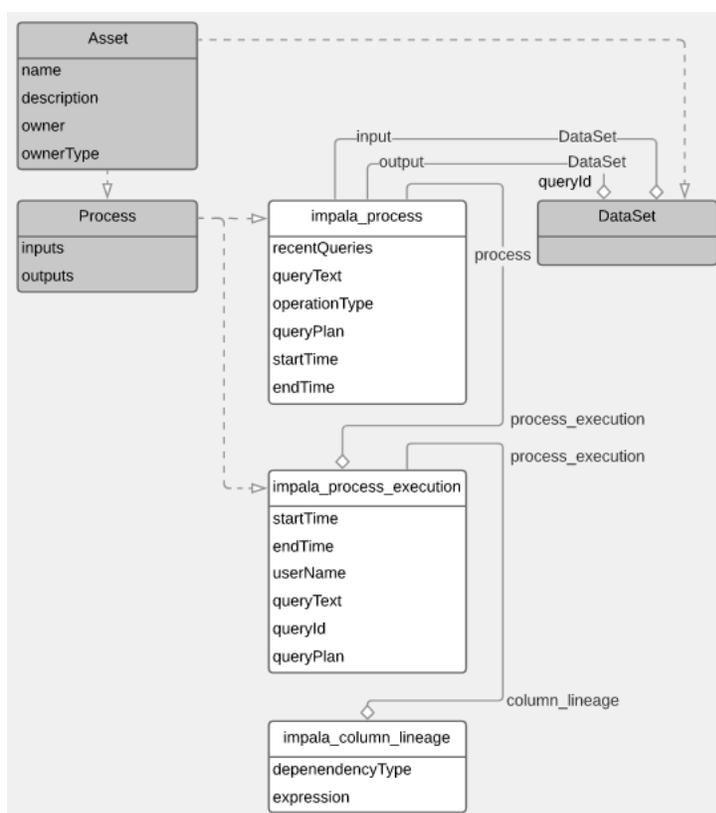
- LOAD DATA INPATH
- CREATE TABLE (table metadata produced by HMS)
- ALTER VIEW (table metadata produced by HMS)
- SELECT or other queries that don't produce output

Impala entities created in Atlas

Each Impala entity in Atlas includes detailed metadata for Impala queries.

The following diagrams show a summary of the entities created in Atlas for Impala operations. The supertypes that contribute attributes to the entity types are shaded.

Figure 4: Atlas Entity Types for Impala Operations



The metadata collected for each entity type is as follows:

Impala Process

Identifier	Example content
typeName	impala_process
guid	System generated ID. This value is used to identify the entity in the Atlas Dashboard URL.
qualifiedName	<database>.<target table>@<clustername>:<generated ID> The generated ID is distinct from the GUID.
name	Text of the query.
inputs	List of the input tables or views, including each entity's type name and the qualified name.
outputs	List of the output objects, including each entity's type name and the qualified name.
recentQueries	Last query executed (duplicated in process_execution).
operationType	One of the operations that triggers metadata collection.
queryPlan	Reserved for future use.
startTime	Most recent query start time.
endTime	Most recent query end time.
Relationship: Process Execution	One process to one or more process executions. impala_process_process_execution
Relationship: Column Lineage	One process to one or more column lineages. impala_process_column_lineage

Impala Process Execution

Identifier	Example Content
typeName	impala_process_execution
guid	System generated ID. This value is used to identify the entity in the Atlas Dashboard URL.
qualifiedName	<database>.<target table>@<clustername>:<ID from process qualified name>:<ID from the process execution name>:<generated ID for this process execution>
name	Text of the query with a system-generated ID added to the end.
queryText	Text of the query.
queryPlan	Reserved for future use.
queryId	impala_<date as yyyyymmddhhmmss>_<generated id>
startTime	Query start time.
endTime	Query end time.
userName	The user who ran the query.
Relationship: Process	One process to one or more process executions. impala_process_process_execution

Impala Column Lineage

Identifier	Example Content
typeName	impala_column_lineage
dependencyType	The type of relationship between the input and output columns; one of SIMPLE, EXPRESSION, or SCRIPT.
name	<database>.<table>@<clustername>:<generated ID>:<output_column>
inputs	List of 0 or more hive_column entities that contributed to the output columns. This is a legacy model component: the more current model uses a relationship attribute.
outputs	This is a legacy model component: the more current model uses a relationship attribute.
qualifiedName	Same as name.
query	Name of the impala_process entity that produced this lineage. This is a legacy model component: the more current model uses a relationship attribute.
Relationship: Process	Name of the impala_process entity that produced this lineage. impala_process_column_lineage
Relationship: inputToProcesses	List of 0 or more hive_column entities that contributed to the output columns.
Relationship: outputFromProcesses	List of 0 or more hive_column entities that were produced in the process.

Impala lineage

Atlas collects metadata from Impala to represent the lineage among data assets.

The Atlas lineage graph shows the input and output processes that the current entity participated in. Entities are included if they were inputs to processes that lead to the current entity or they are output from processes for which the current entity was an input. Impala processes follow this pattern.

Note that lineage is not updated between a table and views that the table is a part of when an Impala ALTER TABLE operation runs on the table.

Related Information

[Viewing lineage](#)

Impala audit entries

Atlas lists changes to metadata entities in the Audit tab in the Dashboard.

Atlas tracks the lifecycle of each Impala entity, including its creation, update, and deletion.

ML metadata collection

Atlas can collect metadata for machine learning projects, model builds, and model deployments and the operations that create these assets.

An Atlas hook runs in an MLX instance. This hook sends metadata to Atlas for MLX operations, which are represented by data sets and process entities in Atlas.

ML operations entities created in Atlas

Each ML operations entity in Atlas includes detailed metadata collected from MLX.

The following diagrams show a summary of the entities created in Atlas for ML operations and assets. The supertypes that contribute attributes to the entity types are shaded.

Figure 5: Atlas Entity Types for ML Assets

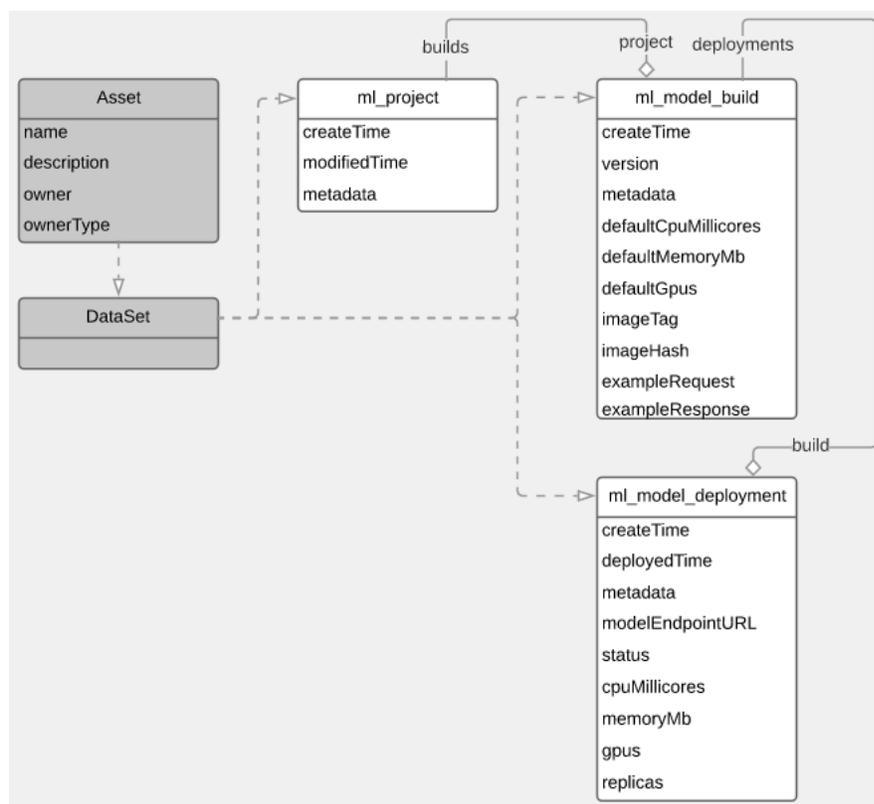
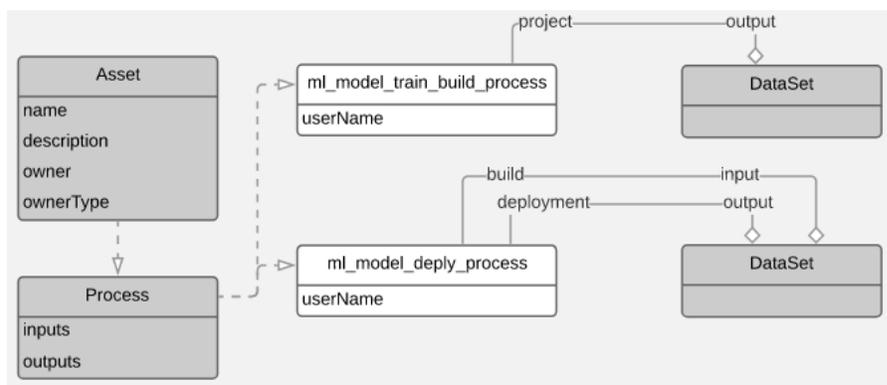


Figure 6: Atlas Entity Types for ML Processes



The metadata collected for each entity type is as follows:

ML Project

Identifier	Description and example content
typeName	ml_project
guid	System generated ID. This value is used to identify the entity in the Atlas Dashboard URL.
qualifiedName	???
name	Project name as reported from MLX.
description	String description metadata from MLX.
owner	Owner as reported from MLX.
createTime	Project creation time as reported by MLX.
modifiedTime	Time from MLX indicating a change to the project. Formatted as in this example: "Wed Apr 17 2019 18:32:14 GMT-0700 (Pacific Daylight Time)"
ownerType	Reserved for future use.
replicatedFrom	Reserved for future use.
replicatedTo	Reserved for future use.
Relationship: builds	One project to many ml_model_build entities. ml_project_model_build

ML Model Build

Identifier	Description and example content
typeName	ml_model_build
guid	System generated ID. This value is used to identify the entity in the Atlas Dashboard URL.
qualifiedName	???
name	Model build name as reported by MLX.
description	String description metadata from MLX.
createTime	Time from MLX indicating the creation time of the model build. Formatted as in this example: "Wed Apr 17 2019 18:32:14 GMT-0700 (Pacific Daylight Time)"
owner	Owner as reported from MLX.
version	Integer value as reported from MLX.
metadata	Key-value pairs reported from MLX.
defaultCpuMillicores	???
defaultMemoryMb	???

Identifier	Description and example content
defaultGpus	???
imageTag	URL to the container image for the model build.
imageHash	Image signature. Combined with imageTag to uniquely identify a model build
exampleRequest	JSON string describing an example request to the model.
exampleResponse	JSON string describing an example response to the model.
ownerType	Reserved for future use.
replicatedFrom	Reserved for future use.
replicatedTo	Reserved for future use.
Relationship: project	One project to many ml_model_build entities. ml_project_model_build
Relationship: deployments	One build to many deployments. ml_build_deployment

ML Model Deployment

Identifier	Description and example content
typeName	ml_model_deployment
guid	System generated ID. This value is used to identify the entity in the Atlas Dashboard URL.
qualifiedName	???
name	Model deployment name as reported by MLX.
description	String description metadata from MLX.
createTime	Time from MLX indicating the creation time of the model deployment. Formatted as in this example: "Wed Apr 17 2019 18:32:14 GMT-0700 (Pacific Daylight Time)"
owner	Owner as reported from MLX.
deployedTime	Time from MLX indicating the deployment time of the model deployment. Formatted as in this example: "Wed Apr 17 2019 18:32:14 GMT-0700 (Pacific Daylight Time)"
metadata	Key-value pairs reported from MLX.
modelEndpointURL	The URL to receive a request and send back the response (prediction).
ml_model_deployment_status	Enumeration indicating where the deployment is in its lifecycle.
cpuMillicores	???
memoryMb	???
gpus	???
replicas	???
ownerType	Reserved for future use.
replicatedFrom	Reserved for future use.
replicatedTo	Reserved for future use.
Relationship: builds	One build to many deployments. ml_build_deployment

ML Project Create Process

Identifier	Description and example content
typeName	ml_project_create_process
guid	System generated ID. This value is used to identify the entity in the Atlas Dashboard URL.
qualifiedName	???

Identifier	Description and example content
name	???
description	String description metadata from MLX.
userName	User who created the project as reported from MLX.
owner	Reserved for future use.
ownerType	Reserved for future use.
replicatedFrom	Reserved for future use.
replicatedTo	Reserved for future use.
Relationship: input	???
Relationship: output	One process to one project. output

ML Model Train Build Process

Identifier	Description and example content
typeName	ml_model_train_build_process
guid	System generated ID. This value is used to identify the entity in the Atlas Dashboard URL.
qualifiedName	???
name	???
description	String description metadata from MLX.
userName	User who triggered the operation to train a model and create a model build.
owner	Reserved for future use.
ownerType	Reserved for future use.
replicatedFrom	Reserved for future use.
replicatedTo	Reserved for future use.
Relationship: input	One process to one project. input
Relationship: output	One process to one model build. output

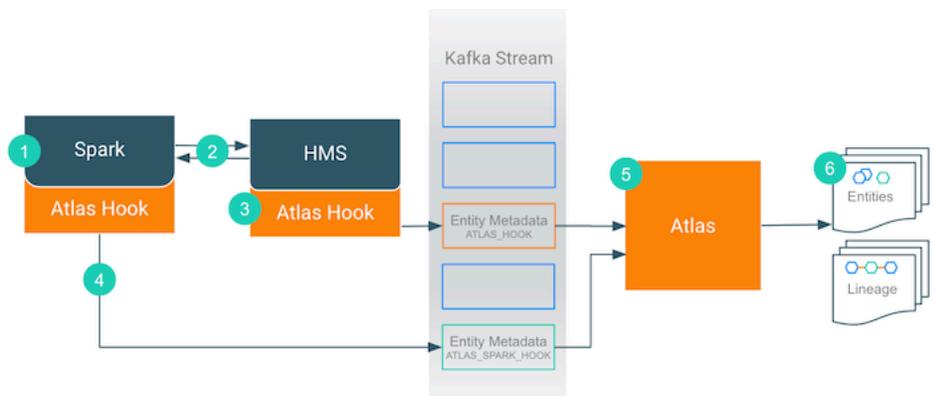
ML Model Deploy Process

Identifier	Description and example content
typeName	ml_model_deploy_process
guid	System generated ID. This value is used to identify the entity in the Atlas Dashboard URL.
qualifiedName	???
name	???
description	String description metadata from MLX.
userName	User who triggered the operation to deploy a model build.
owner	Reserved for future use.
ownerType	Reserved for future use.
replicatedFrom	Reserved for future use.
replicatedTo	Reserved for future use.
Relationship: input	One process to one model build. input
Relationship: output	One process to one model deployment. output

Spark metadata collection

Atlas can collect metadata from Spark, including queries on Hive tables. The Spark Atlas Connector (SAC) is available as of Spark 2.4 and Atlas 2.1.

An Atlas hook runs in each Spark instance. This hook sends metadata to Atlas for Spark operations. Operations are represented by process entities in Atlas. Hive databases, tables, views, and columns that are referenced in the Spark operations are also represented in Atlas, but the metadata for these entities is collected from HMS. When a Spark operation involves files, the metadata for the file system and files are represented in Atlas as file system paths.



1. When an action occurs in the Spark instance...
2. It updates HMS with information about the assets affected by the action.
3. The Atlas hook corresponding to HMS collects information for the changed and new assets and forms it into metadata entities. It publishes the metadata to the Kafka topic named ATLAS_HOOK.
4. The Atlas hook corresponding to the Spark instance collects information for the action and forms it into metadata entities. It publishes the metadata to a different Kafka topic named ATLAS_SPARK_HOOK.
5. Atlas reads the messages from the topics and determines what information will create new entities and what information updates existing entities. Atlas is able to determine the correct entities regardless of the order in which Atlas receives messages from the Kafka topics.
6. Atlas creates the appropriate entities and the relationships among them and determines lineage from existing entities to the new entities.

Spark actions that produce Atlas entities

Operations that create Spark process entities and create, update, or delete the data assets affected by those operations will affect Atlas entities; operations that only affect data do not show up in Atlas.

The following table lists the Spark actions that produce or update metadata in Atlas.

This Action in Spark...	...Produces metadata for these Atlas entities
CREATE TABLE USING CREATE TABLE AS SELECT, CREATE TABLE USING ... AS SELECT	spark_process, hive_table, hive_column, hive_storagedesc
CREATE VIEW AS SELECT,	spark_process, hive_table, hive_column, hive_storagedesc
INSERT INTO (SELECT), LOAD DATA [LOCAL] INPATH	spark_process

Notable actions in Spark that do NOT produce process entities in Atlas, meaning that no lineage is produced for these operations:

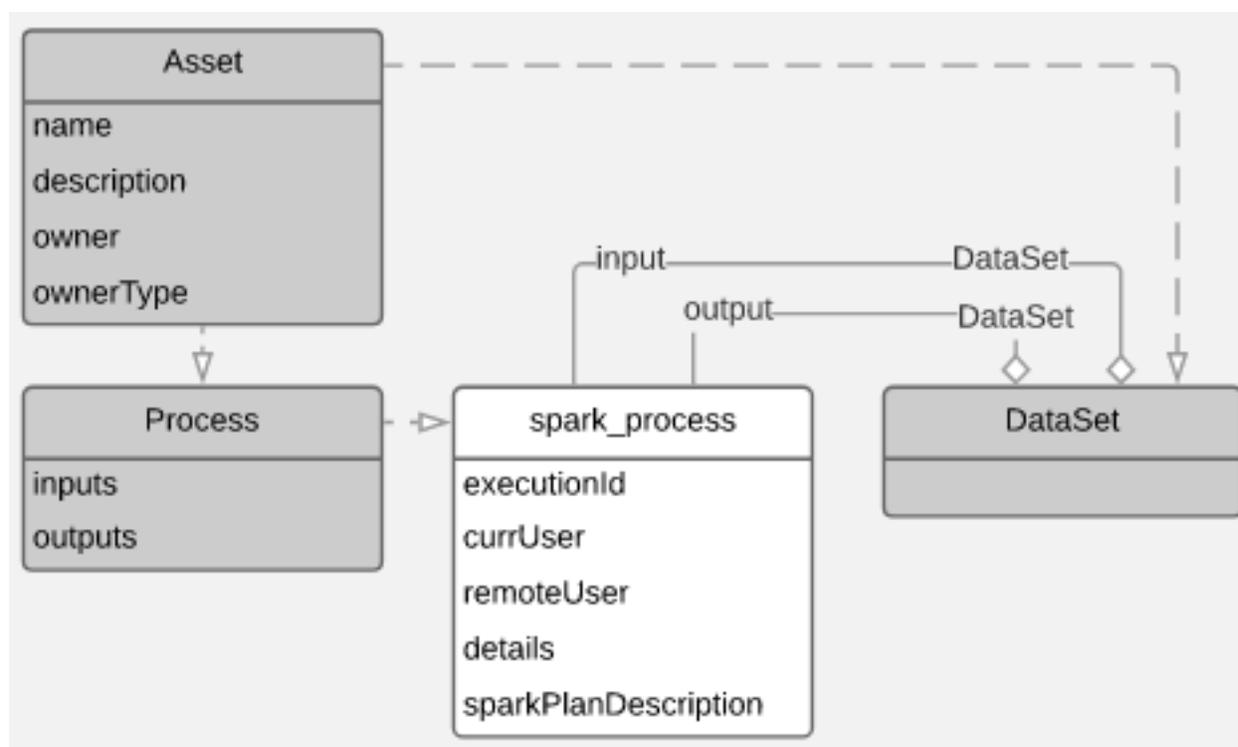
- LOAD DATA INPATH (when not coming from a local file source)
- CREATE TABLE (hive_table metadata produced by HMS)
- ALTER VIEW (hive_table metadata produced by HMS)
- SELECT or other queries that don't change table metadata

Spark entities created in Apache Atlas

Each Spark entity in Atlas includes detailed metadata collected from Spark.

The following diagrams show a summary of the entities created in Atlas for Spark operations. The data assets that Spark operations act upon are collected through HMS. The supertypes that contribute attributes to the entity types are shaded.

Figure 7: Atlas Entity Types for Spark Data Sets



The metadata collected for each entity type is as follows:

Spark Process

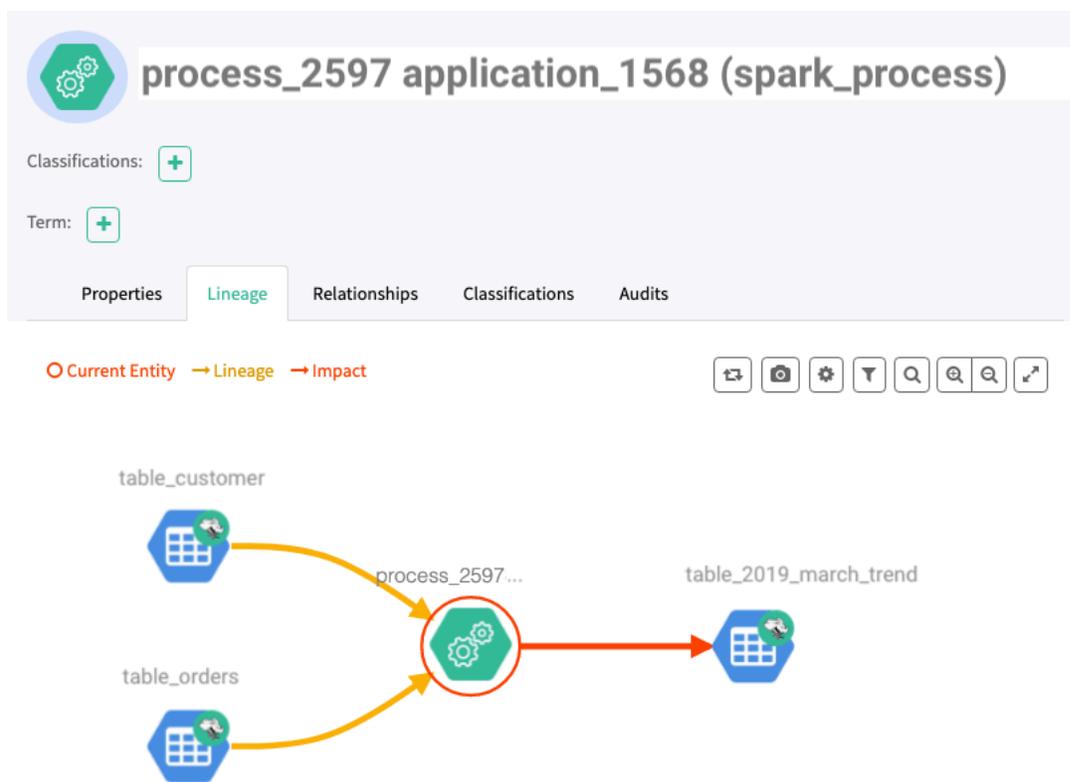
Identifier	Example content
typeName	spark_process
guid	System generated ID. This value is used to identify the entity in the Atlas Dashboard URL.
qualifiedName	<generated ID> The generated ID is distinct from the GUID.
name	process_<generated ID>
description	Metadata from Spark.

Identifier	Example content
owner	Metadata from Spark.
ownerType	Metadata from Spark.
inputs	List of the input tables or views, including each entity's type name and the qualified name.
outputs	List of the output objects, including each entity's type name and the qualified name.
executionId	Metadata from Spark.
currUser	Metadata from Spark. In a Kerberized environment, this value contains the principal name.
remoteUser	Metadata from Spark. In a Kerberized environment, this value contains the principal name.
executionTime	Metadata from Spark.
details	Query plan text, including parsed logical plan, analyzed logical plan, optimized logical plan, and physical plan.
sparkPlanDescription	Physical plan text.

Spark lineage

Atlas collects metadata from Spark to represent the lineage among data assets.

The Atlas lineage graph shows the input and output processes that the current entity participated in, specifically those relationships modeled as “inputToProcesses” and “outputFromProcesses.” Entities are included if they were inputs to processes that lead to the current entity or they are output from processes for which the current entity was an input. Spark processes follow this pattern.



Related Information

[Viewing lineage](#)

Spark relationships

Atlas shows the entities related to this entity in the Relationships tab in the Dashboard.

The Relationship tab shows the relationships that exist for an entity. Use this view to navigate among related entities.

process_2597 application_1568

Classifications: [+](#)

Term: [+](#)

Properties Lineage **Relationships** Classifications Audits

Graph Table

Key	Value	<input type="checkbox"/> Show Empty Values
inputs (2)	table_customers table_orders	
outputs (1)	table_2019_march_trends	

Spark audit entries

Atlas lists changes to metadata entities in the Audit tab in the Dashboard.

Atlas tracks the lifecycle of each Spark entity, including its creation, update, and deletion. User access and actions that affect the data content of the source asset are not included in the audit.

Spark troubleshooting

What do you do if you don't see Atlas metadata from Spark?

Spark runs an Atlas "hook" or plugin on every host where it runs. To troubleshoot problems, consider the following methods for narrowing down where the problem is:

- Are you missing all metadata?

Make sure that all the services supporting Atlas are configured and running. For CDP, the configuration is done for you; look in Cloudera Manager to see that Kafka, Solr, and Atlas services are running in the Data Lake.

- Are you missing all Spark process metadata?

By default, Spark operations are configured to send metadata to Atlas. To check that these settings have not been rolled back, look at the Spark configuration page in Cloudera Manager to ensure that Spark is configured to send metadata to Atlas. Assuming this configuration is enabled, you can next check the Kafka topic queue to make sure that metadata messages are being produced in Spark and making it to the Kafka topic.

- Missing only some Spark metadata?

Because each instance of Spark collects metadata independently of other instances, it is possible that one instance failed to send metadata to Atlas. To determine if this is the problem, check the Kafka topic queue to see if one of the Spark hosts is not sending metadata.