Hortonworks Data Platform

Data Governance

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Hortonworks Data Platform: Data Governance

The Hortonworks Data Platform, powered by Apache Hadoop, is a massively scalable and 100% open source platform for storing, processing and analyzing large volumes of data. It is designed to deal with data from many sources and formats in a very quick, easy and cost-effective manner. The Hortonworks Data Platform consists of the essential set of Apache Hadoop projects including MapReduce, Hadoop Distributed File System (HDFS), HCatalog, Pig, Hive, HBase, ZooKeeper and Ambari. Hortonworks is the major contributor of code and patches to many of these projects. These projects have been integrated and tested as part of the Hortonworks Data Platform release process and installation and configuration tools have also been included.

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Table of Contents

List of Figures

List of Tables

1. HDP Data Governance

Apache Atlas provides governance capabilities for Hadoop that use both prescriptive and forensic models enriched by business taxonomical metadata. Atlas is designed to exchange metadata with other tools and processes within and outside of the Hadoop stack, thereby enabling platform-agnostic governance controls that effectively address compliance requirements.

Apache Atlas enables enterprises to effectively and efficiently address their compliance requirements through a scalable set of core governance services. These services include:

- Search and Proscriptive Lineage – facilitates pre-defined and *ad hoc* exploration of data and metadata, while maintaining a history of data sources and how specific data was generated.
- Metadata-driven data access control.
- Flexible modeling of both business and operational data.
- Data Classification – helps you to understand the nature of the data within Hadoop and classify it based on external and internal sources.
- Metadata interchange with other metadata tools.

1.1. Apache Atlas Features

Apache Atlas is a low-level service in the Hadoop stack that provides core metadata services. Atlas currently provides metadata services for the following components:

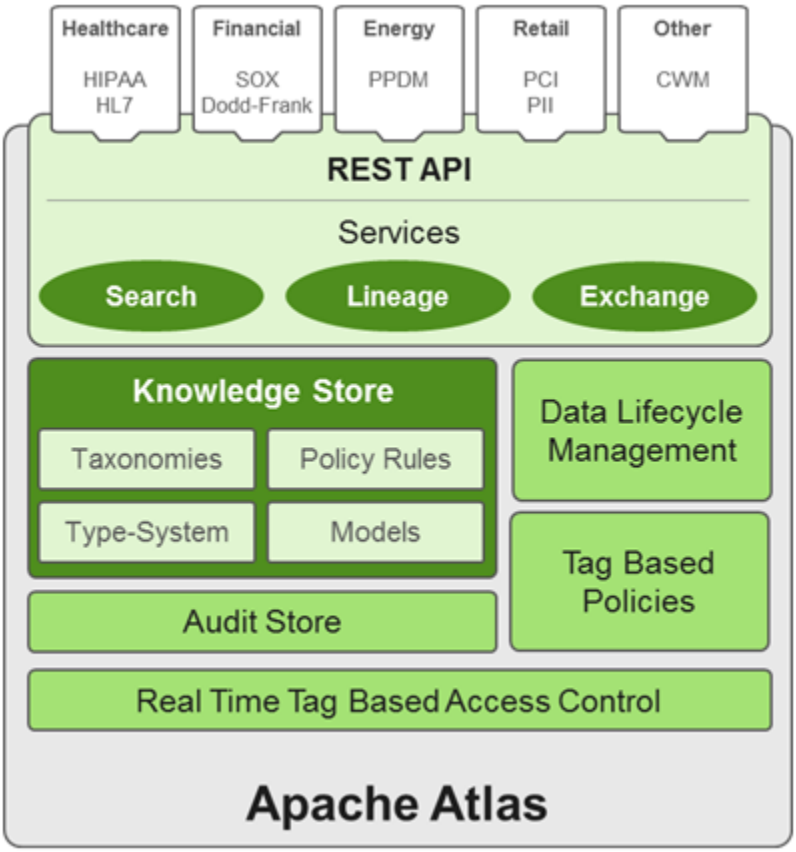
- Hive
- Ranger
- Sqoop
- Storm/Kafka (limited support)
- Falcon (limited support)

Apache Atlas provides the following features:

- **Knowledge store that leverages existing Hadoop metastores:** Categorized into a business-oriented taxonomy of data sets, objects, tables, and columns. Supports the exchange of metadata between HDP foundation components and third-party applications or governance tools.
- **Data lifecycle management:** Leverages existing investment in Apache Falcon with a focus on provenance, multi-cluster replication, data set retention and eviction, late data handling, and automation.
- **Audit store:** Historical repository for all governance events, including security events (access, grant, deny), operational events related to data provenance and metrics. The Atlas audit store is indexed and searchable for access to governance events.

- **Security:** Integration with HDP security that enables you to establish global security policies based on data classifications and that leverages Apache Ranger plug-in architecture for security policy enforcement.
- **Policy engine:** Fully extensible policy engine that supports metadata-based, geo-based, and time-based rules that rationalize at runtime.
- **RESTful interface:** Supports extensibility by way of REST APIs to third-party applications so you can use your existing tools to view and manipulate metadata in the HDP foundation components.

Figure 1.1. Atlas Overview



1.2. Atlas-Ranger Integration

Atlas provides data governance capabilities and serves as a common metadata store that is designed to exchange metadata both within and outside of the Hadoop stack. Ranger provides a centralized user interface that can be used to define, administer and manage security policies consistently across all the components of the Hadoop stack. The Atlas-Ranger unites the data classification and metadata store capabilities of Atlas with security enforcement in Ranger.

You can use Atlas and Ranger to implement dynamic classification-based security policies, in addition to role-based security policies. Ranger's centralized platform empowers data

administrators to define security policy based on Atlas metadata tags or attributes and apply this policy in real-time to the entire hierarchy of entities including databases, tables, and columns, thereby preventing security violations.

Ranger-Atlas Access Policies

- **Classification-based access controls:** A data entity such as a table or column can be marked with the metadata tag related to compliance or business taxonomy (such as "PCI"). This tag is then used to assign permissions to a user or group. This represents an evolution from role-based entitlements, which require discrete and static one-to-one mapping between user/group and resources such as tables or files. As an example, a data steward can create a classification tag "PII" (Personally Identifiable Information) and assign certain Hive table or columns to the tag "PII". By doing this, the data steward is denoting that any data stored in the column or the table has to be treated as "PII". The data steward now has the ability to build a security policy in Ranger for this classification and allow certain groups or users to access the data associated with this classification, while denying access to other groups or users. Users accessing any data classified as "PII" by Atlas would be automatically enforced by the Ranger policy already defined.

- **Data Expiry-based access policy:** For certain business use cases, data can be toxic and have an expiration date for business usage. This use case can be achieved with Atlas and Ranger. Apache Atlas can assign expiration dates to a data tag. Ranger inherits the expiration date and automatically denies access to the tagged data after the expiration date.

- **Location-specific access policies:** Similar to time-based access policies, administrators can now customize entitlements based on geography. For example, a US-based user might be granted access to data while she is in a domestic office, but not while she is in Europe. Although the same user may be trying to access the same data, the different geographical context would apply, triggering a different set of privacy rules to be evaluated.

- **Prohibition against dataset combinations:** With Atlas-Ranger integration, it is now possible to define a security policy that restricts combining two data sets. For example, consider a scenario in which one column consists of customer account numbers, and another column contains customer names. These columns may be in compliance individually, but pose a violation if combined as part of a query. Administrators can now apply a metadata tag to both data sets to prevent them from being combined.

Cross Component Lineage

Apache Atlas now provides the ability to visualize cross-component lineage, delivering a complete view of data movement across a number of analytic engines such as Apache Storm, Kafka, Falcon, and Hive.

This functionality offers important benefits to data stewards and auditors. For example, data that starts as event data through a Kafka bolt or Storm Topology is also analyzed as an aggregated dataset through Hive, and then combined with reference data from a RDBMS via Sqoop, can be governed by Atlas at every stage of its lifecycle. Data stewards, Operations, and Compliance now have the ability to visualize a data set's lineage, and then drill down into operational, security, and provenance-related details. As this tracking is done at the platform level, any application that uses these engines will be natively tracked. This allows for extended visibility beyond a single application view.

2. Installing and Configuring Apache Atlas Using Ambari

2.1. Apache Atlas Prerequisites

Apache Atlas requires the following components:

- Ambari Infra (which includes an internal HDP Solr Cloud instance) or an externally managed Solr Cloud instance.
- HBase (used as the Atlas Metastore).
- Kafka (provides a durable messaging bus).

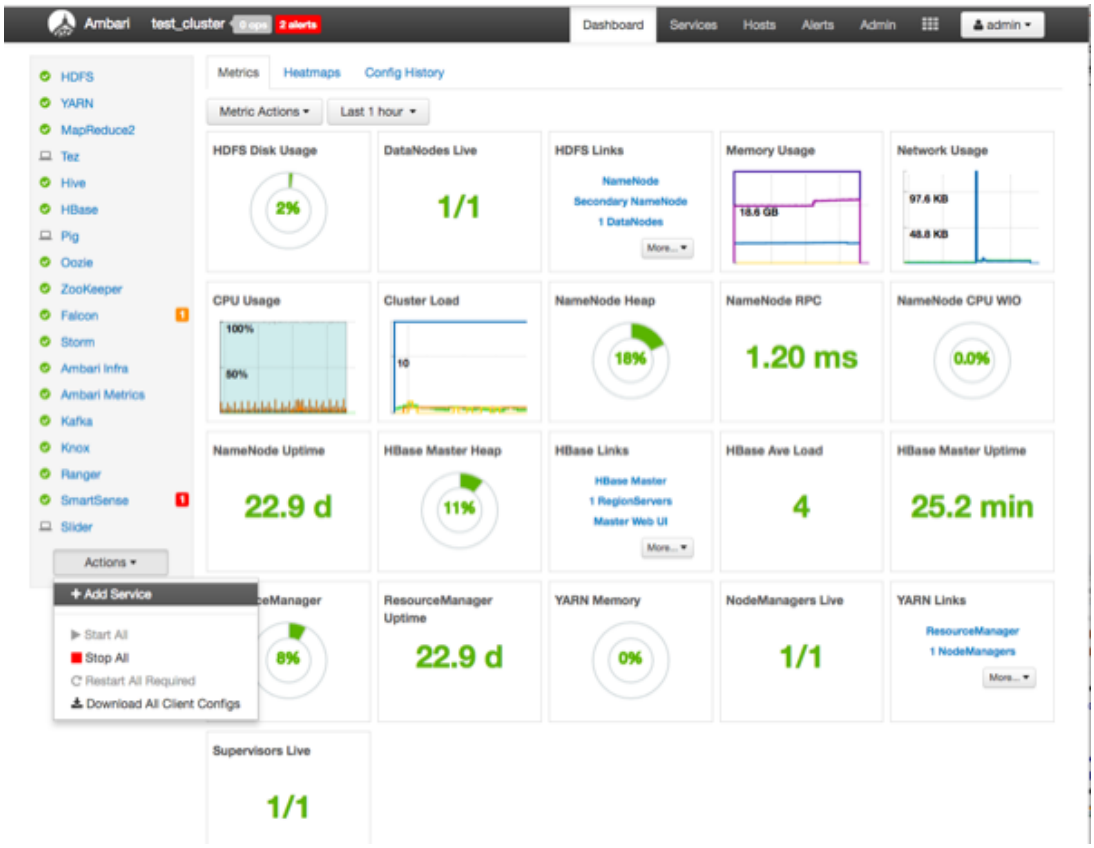
2.2. Install Atlas

To install Atlas using Ambari:

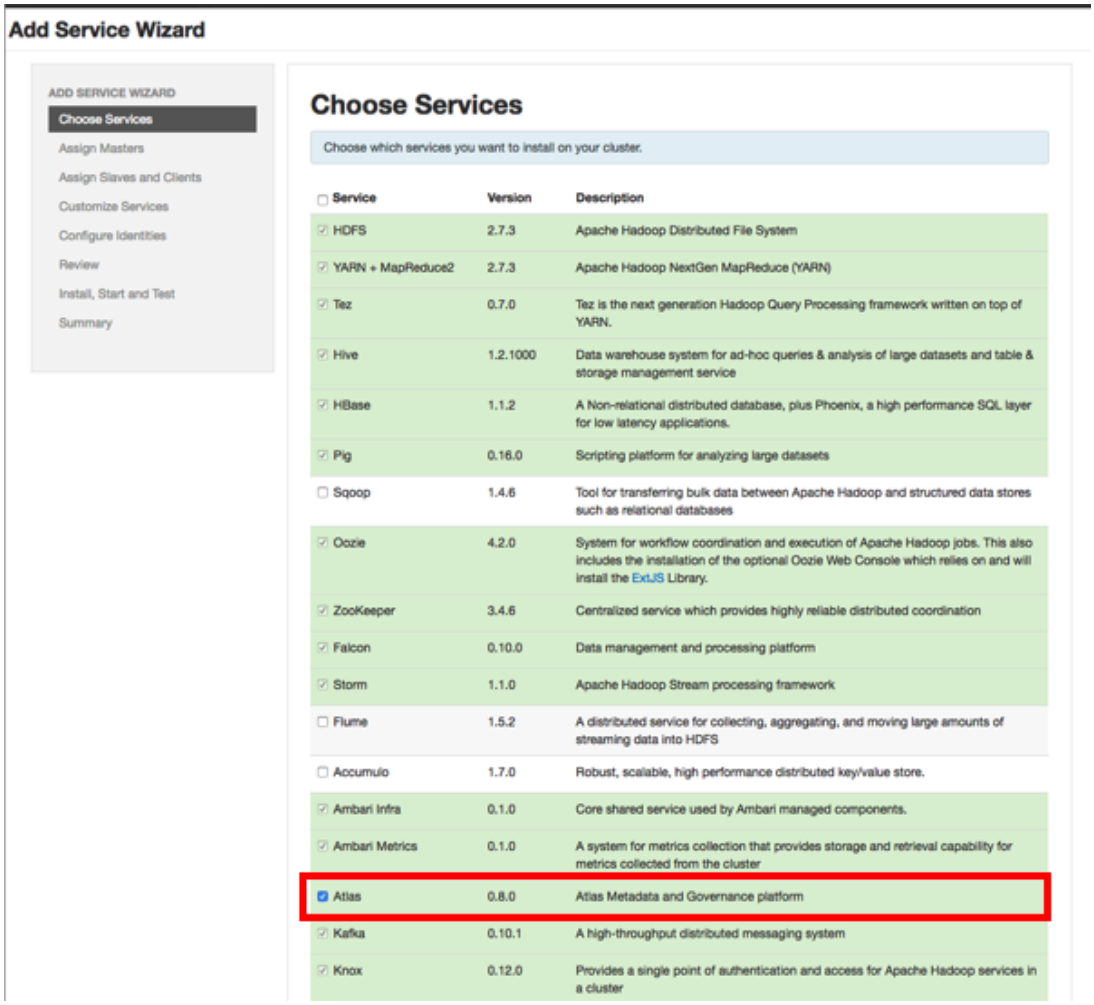
1. Start the Installation [4]
2. Customize Services [8]
3. Complete the Atlas Installation [15]

2.2.1. Start the Installation

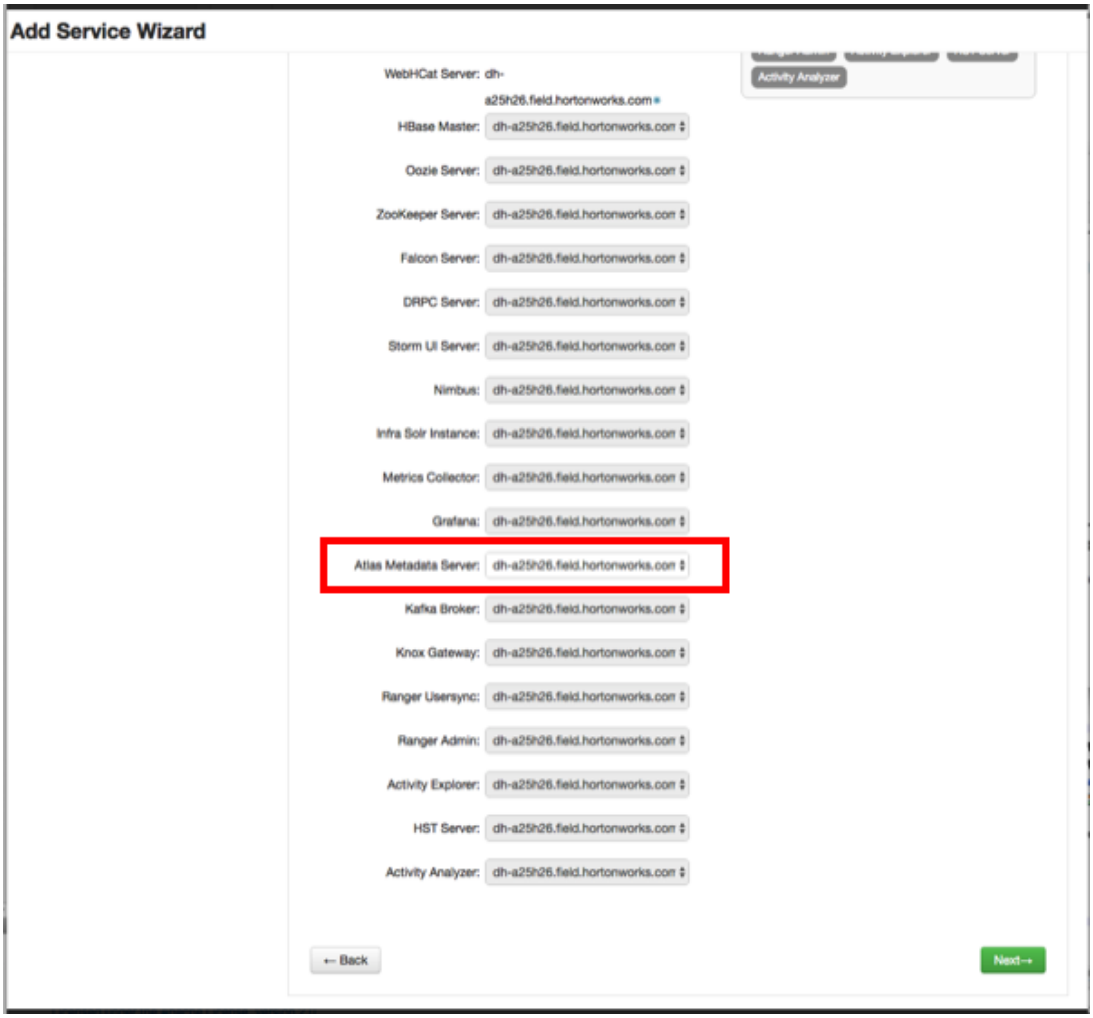
1. On the Ambari Dashboard, click **Actions**, then select **Add Service**.



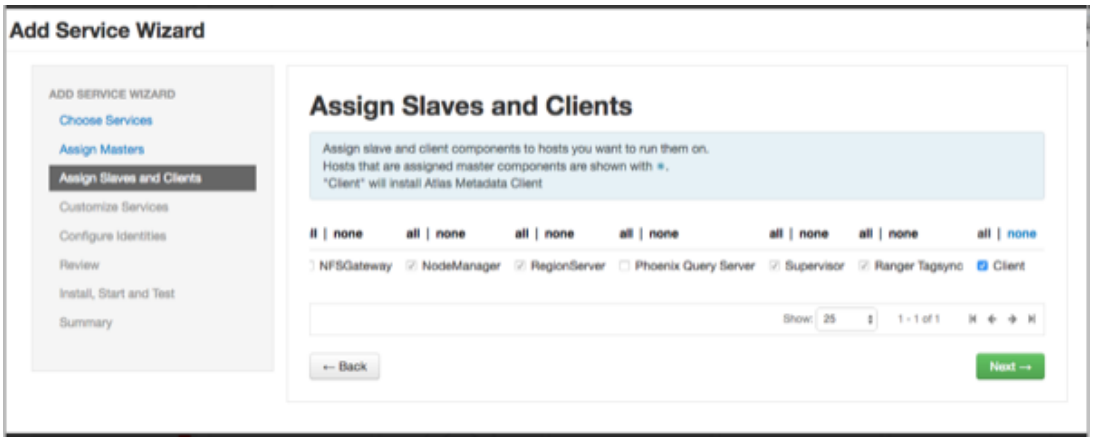
2. On the Choose Services page, select **Atlas**, then click **Next**.



3. The Assign Master page appears. Specify a host for the Atlas Metadata Server, then click **Next**.



4. The Assign Slaves and Clients page appears with Client (the Atlas Metadata Client) selected. Click **Next** to continue.



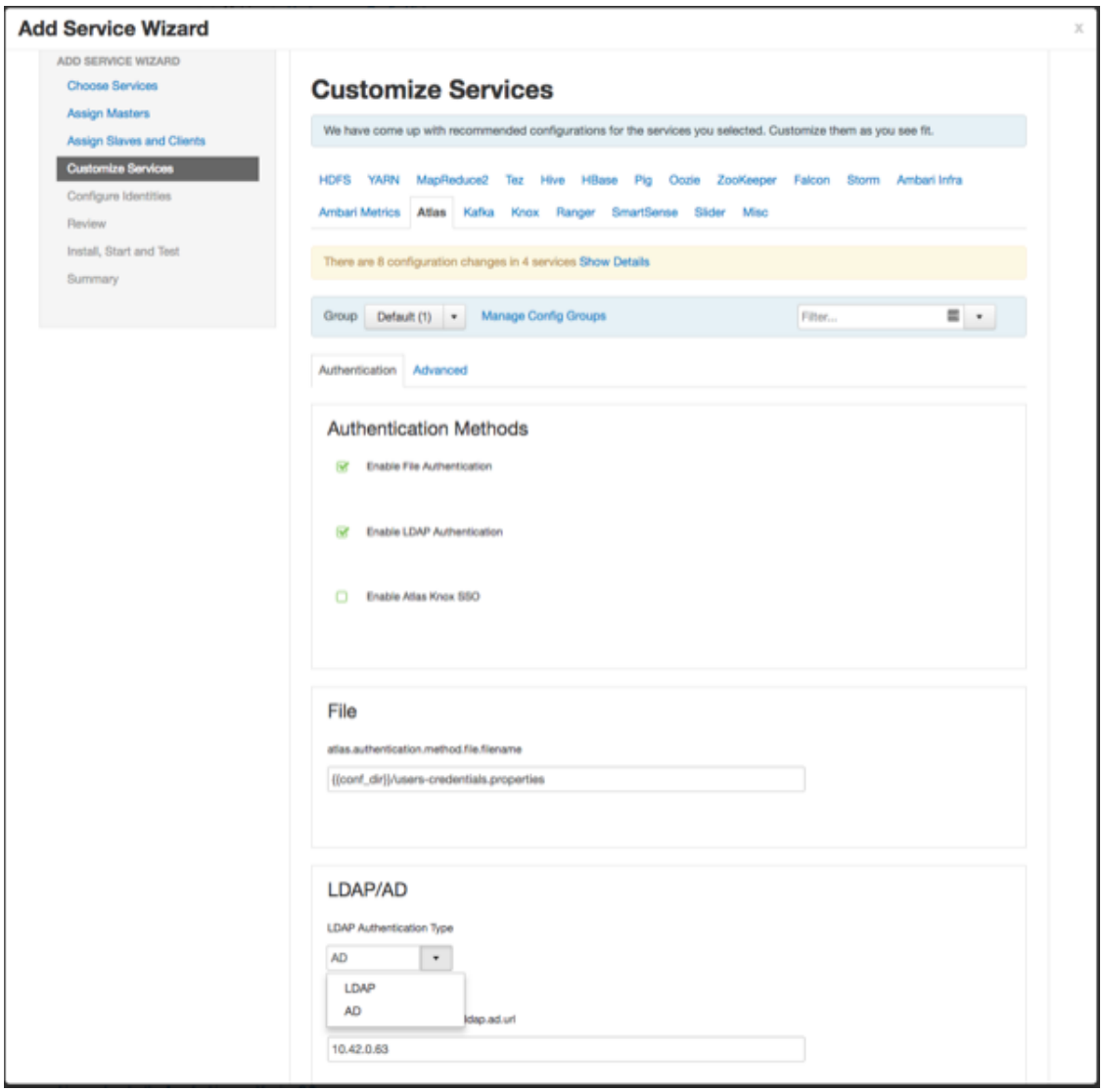
5. The Customize Services page appears. These settings are described in the next section.

2.2.2. Customize Services

The next step in the installation process is to specify Atlas settings on the Customize Services page.

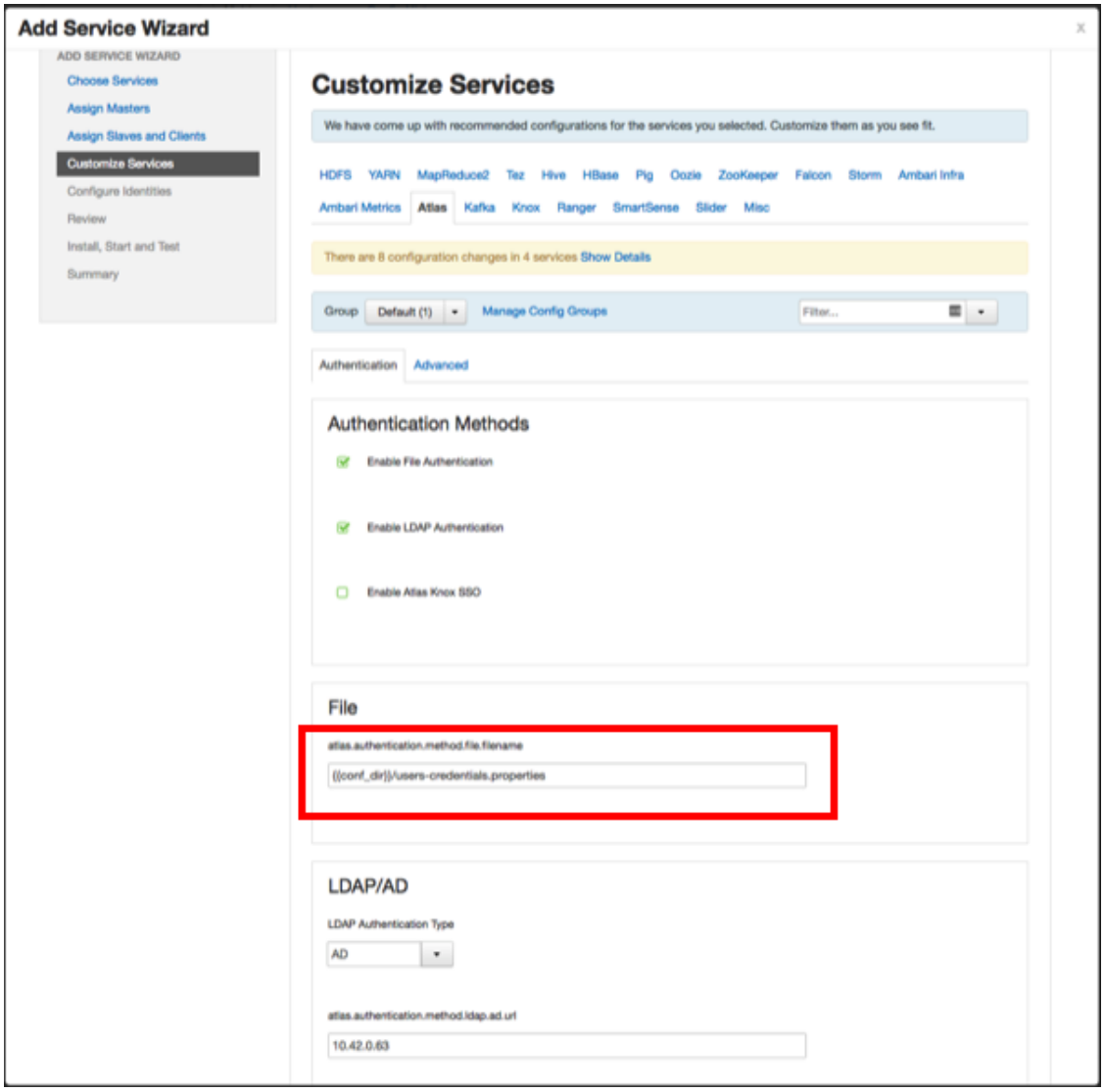
2.2.2.1. Authentication Settings

You can set the Authentication Type to File, LDAP, or AD.



2.2.2.1.1. File-based Authentication

When file-based authentication is selected, the `atlas.authentication.method.file.filename` property is automtically set to `{{conf_dir}}/users-credentials.properties`.



The `users-credentials.properties` file should have the following format:

```
username=group::sha256password
admin=ADMIN::e7cf3ef4f17c3999a94f2c6f612e8a888e5b1026878e4e19398b23bd38ec221a
```

The user group can be `ADMIN`, `DATA_STEWARD`, or `DATA_SCIENTIST`.

The password is encoded with the `sha256` encoding method and can be generated using the UNIX tool:

```
echo -n "Password" | sha256sum
e7cf3ef4f17c3999a94f2c6f612e8a888e5b1026878e4e19398b23bd38ec221a -
```

Note

You can also set the Admin password using the Ambari UI:

Select **Advanced > Advanced atlas-env**, then use the **Admin password** and **Admin username** boxes to set the Admin user name and password.

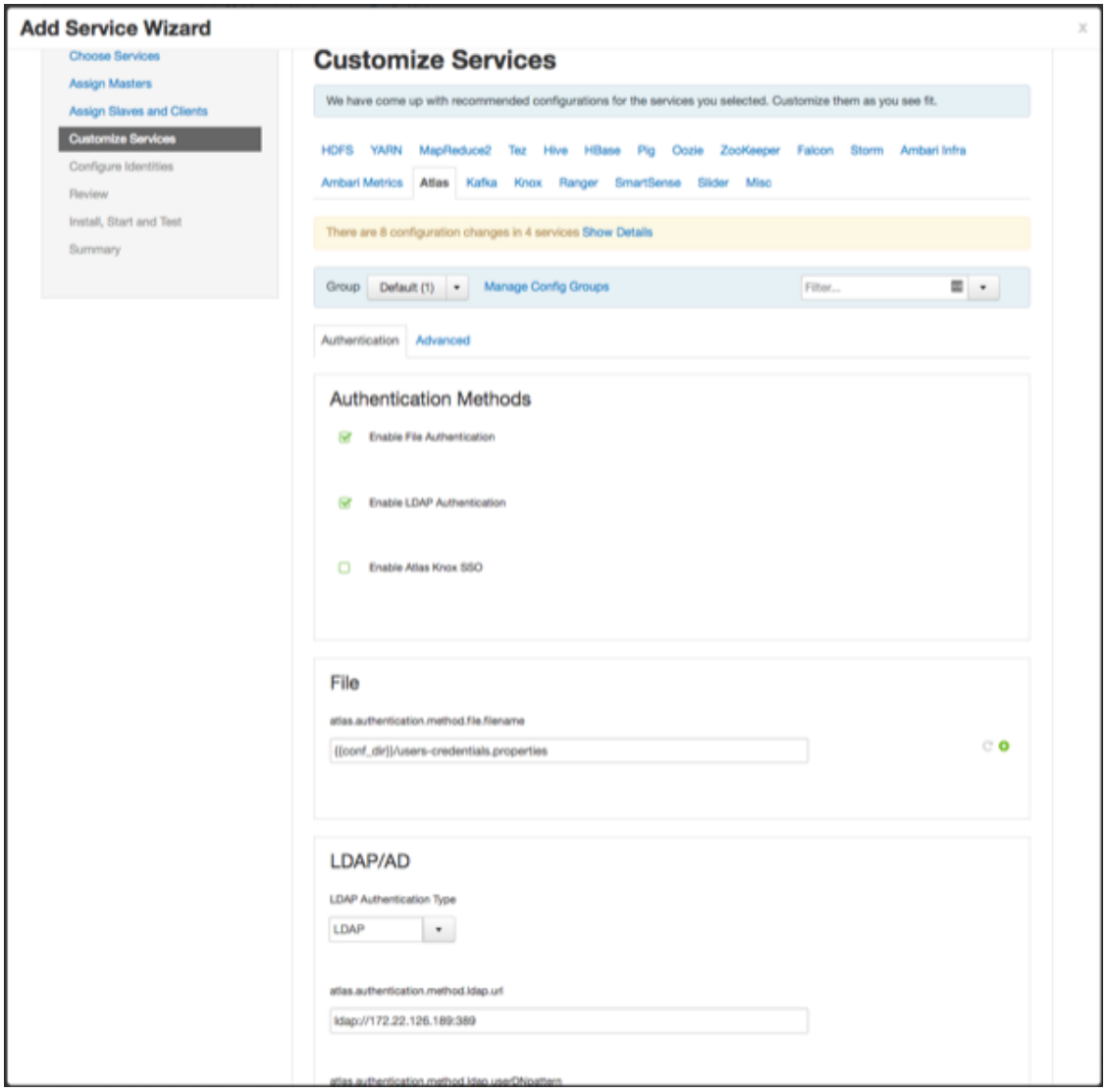
When updating these settings post-installation, click **Save**, then restart Atlas and all other components that require a restart.

2.2.2.1.2. LDAP Authentication

To enable LDAP authentication, select **LDAP**, then set the following configuration properties.

Table 2.1. Apache Atlas LDAP Configuration Settings

Property	Sample Values
atlas.authentication.method.ldap.url	ldap://127.0.0.1:389
atlas.authentication.method.ldap.userDNpattern	uid={0],ou=users,dc=example,dc=com
atlas.authentication.method.ldap.groupSearchBase	dc=example,dc=com
atlas.authentication.method.ldap.groupSearchFilter	(member=cn={0},ou=users,dc=example,dc=com
atlas.authentication.method.ldap.groupRoleAttribute	cn
atlas.authentication.method.ldap.base.dn	dc=example,dc=com
atlas.authentication.method.ldap.bind.dn	cn=Manager,dc=example,dc=com
atlas.authentication.method.ldap.bind.password	PassW0rd
atlas.authentication.method.ldap.referral	ignore
atlas.authentication.method.ldap.user.searchfilter	(uid={0})
atlas.authentication.method.ldap.default.role	ROLE_USER

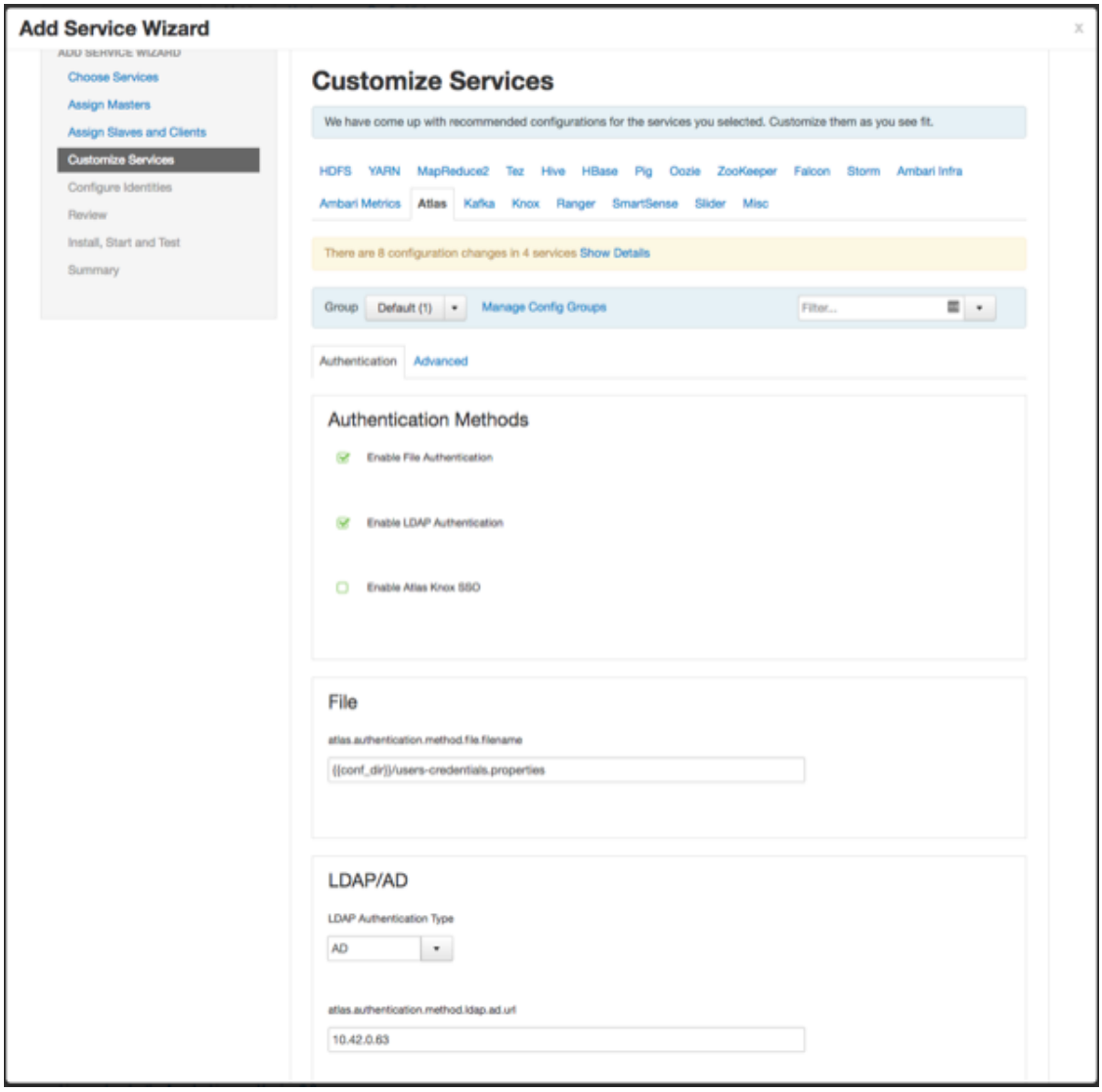


2.2.2.1.3. AD Authentication

To enable AD authentication, select **AD**, then set the following configuration properties.

Table 2.2. Apache Atlas AD Configuration Settings

Property	Sample Values
atlas.authentication.method.ldap.ad.url	ldap://127.0.0.1:389
Domain Name (Only for AD)	example.com
atlas.authentication.method.ldap.ad.base.dn	DC=example,DC=com
atlas.authentication.method.ldap.ad.bind.dn	CN=Administrator,CN=Users,DC=example,DC=com
atlas.authentication.method.ldap.ad.bind.password	PassW0rd
atlas.authentication.method.ldap.ad.referral	ignore
atlas.authentication.method.ldap.ad.user.searchfilter	(sAMAccountName={0})
atlas.authentication.method.ldap.ad.default.role	ROLE_USER



2.2.2.2. Authorization Settings

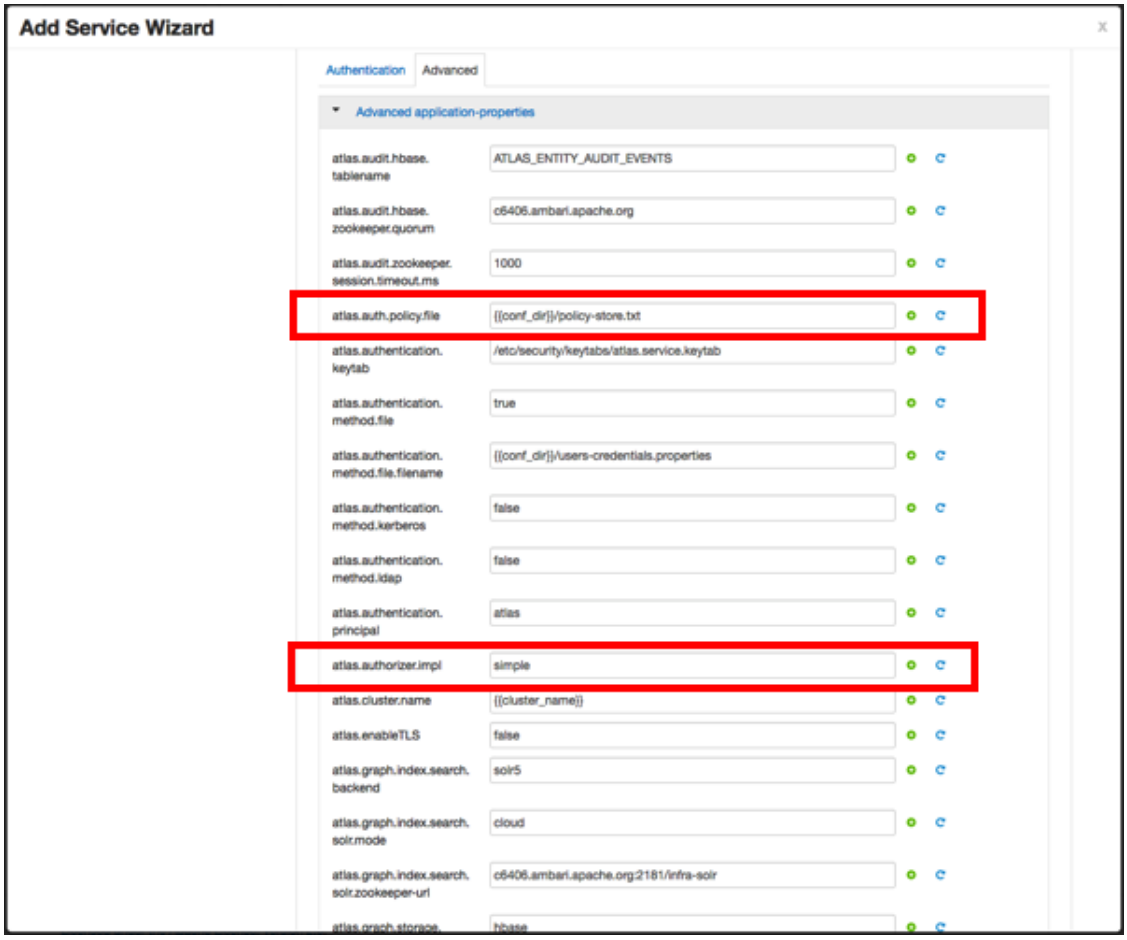
Two authorization methods are available for Atlas: Simple and Ranger.

2.2.2.2.1. Simple Authorization

The default setting is Simple, and the following properties are automatically set under **Advanced application-properties** on the Advanced tab.

Table 2.3. Apache Atlas Simple Authorization

Property	Value
atlas.authorizer.impl	simple
atlas.auth.policy.file	{{conf_dir}}/policy-store.txt



The `policy-store.txt` file has the following format:

```
Policy_Name;;User_Name:Operations_Allowed;;Group_Name:Operations_Allowed;;Resource_Type:Reso
```

For example:

```
adminPolicy;;admin:rwud;;ROLE_ADMIN:rwud;;type:*,entity:*,operation:*,
taxonomy:*,term:*
userReadPolicy;;readUser1:r,readUser2:r;;DATA_SCIENTIST:r;;type:*,entity:*,
operation:*,taxonomy:*,term:*
userWritePolicy;;writeUser1:rwu,writeUser2:rwu;;BUSINESS_GROUP:rwu,
DATA_STEWARD:rwud;;type:*,entity:*,operation:*,taxonomy:*,term:*
```

In this example `readUser1`, `readUser2`, `writeUser1` and `writeUser2` are the user IDs, each with its corresponding access rights. The `User_Name`, `Group_Name` and `Operations_Allowed` are comma-separated lists.

Authorizer Resource Types:

- Operation
- Type
- Entity
- Taxonomy

- Term
- Unknown

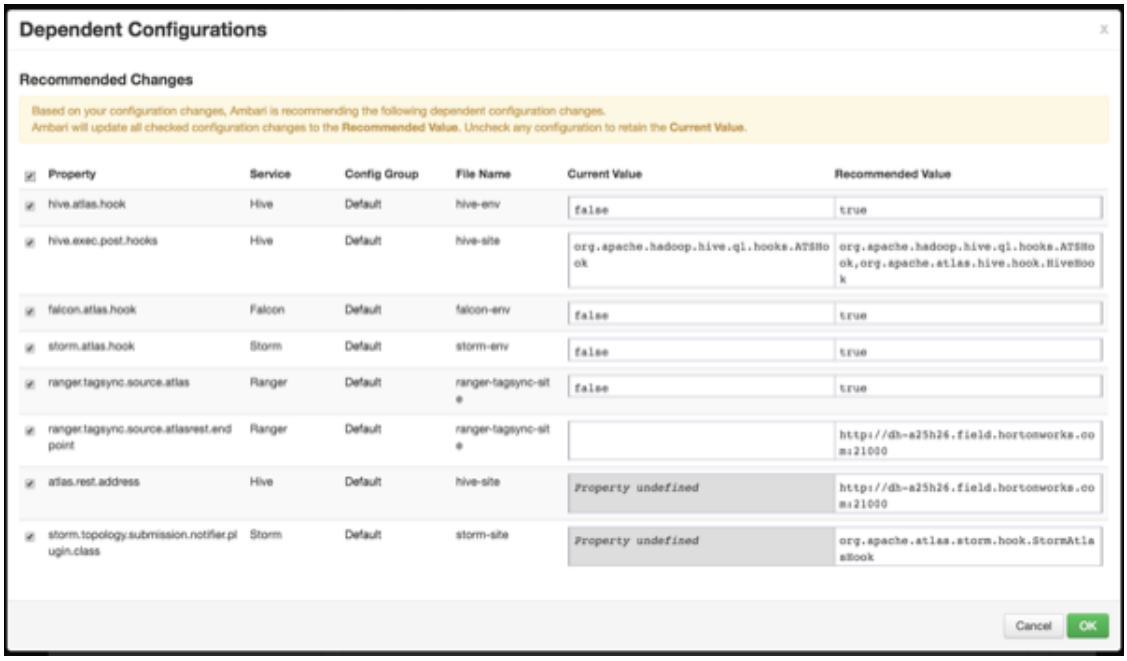
`Operations_Allowed` are `r` = read, `w` = write, `u` = update, `d` = delete

2.2.2.2.2. Ranger Authorization

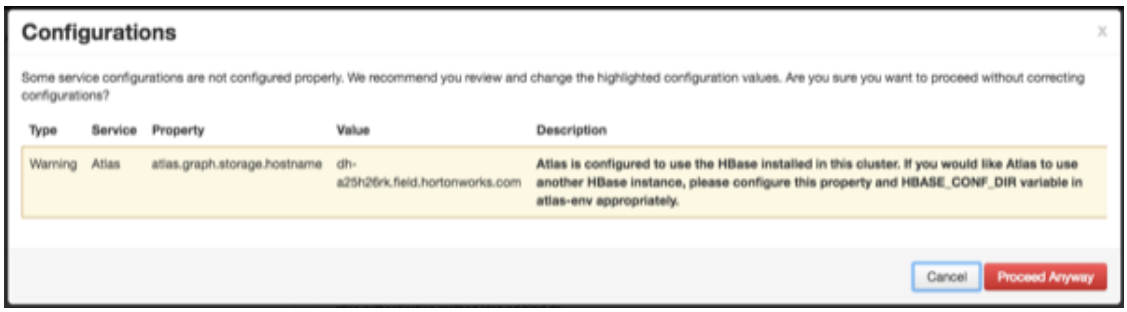
Ranger Authorization is activated by enabling the Ranger Atlas plug-in in Ambari.

2.2.3. Dependent Configurations

After you customize Atlas services and click **Next**, the Dependent Configurations page displayes recommended settings for dependent configurations. Clear the checkbox next to a property to retain the current value. Click **OK** to set the selected recommended property values.

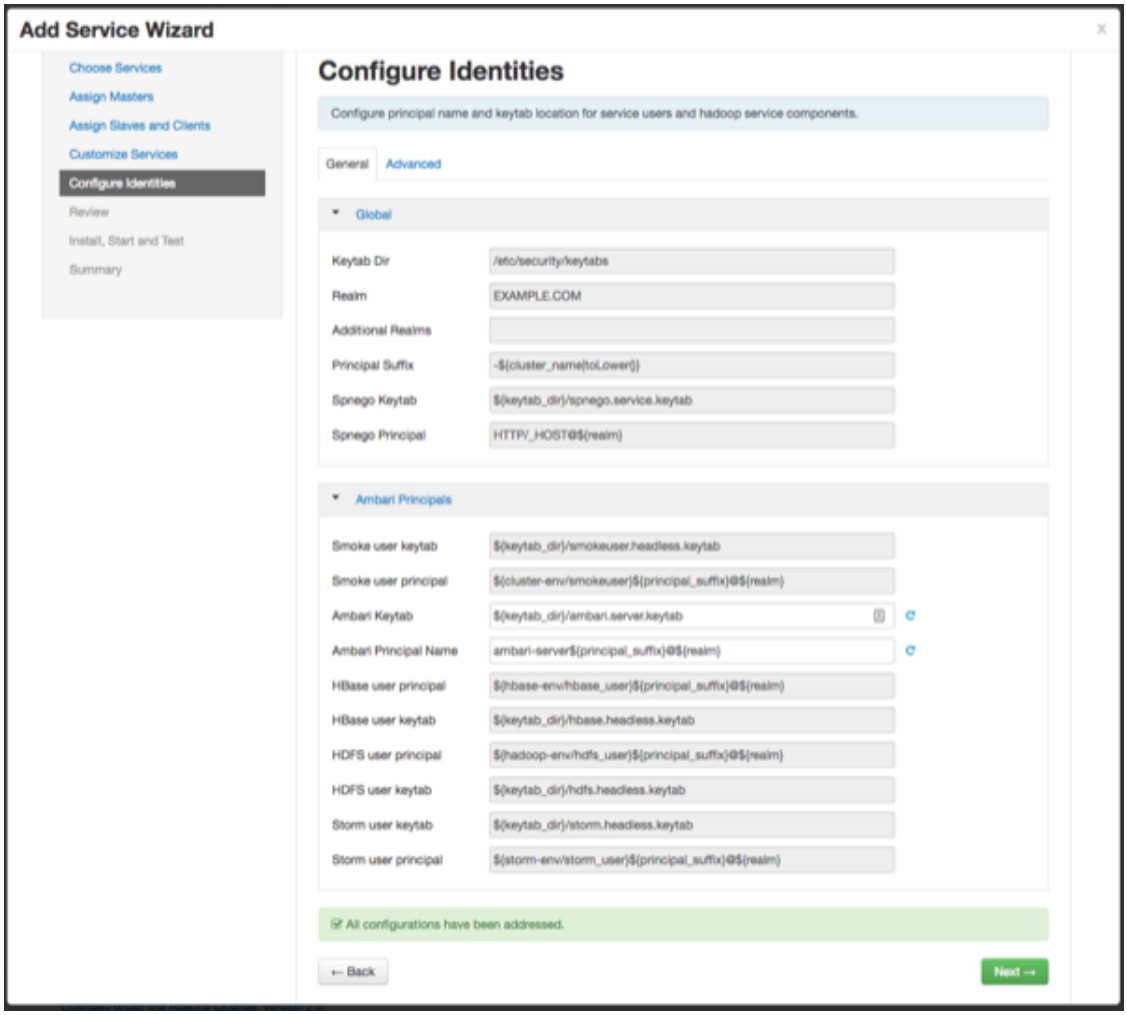


If Ambari detects other configuration issues, they will be displayed on a Configurations pop-up. Click **Cancel** to go back and change these settings, or click **Proceed Anyway** to continue the installation without changing the configurations.



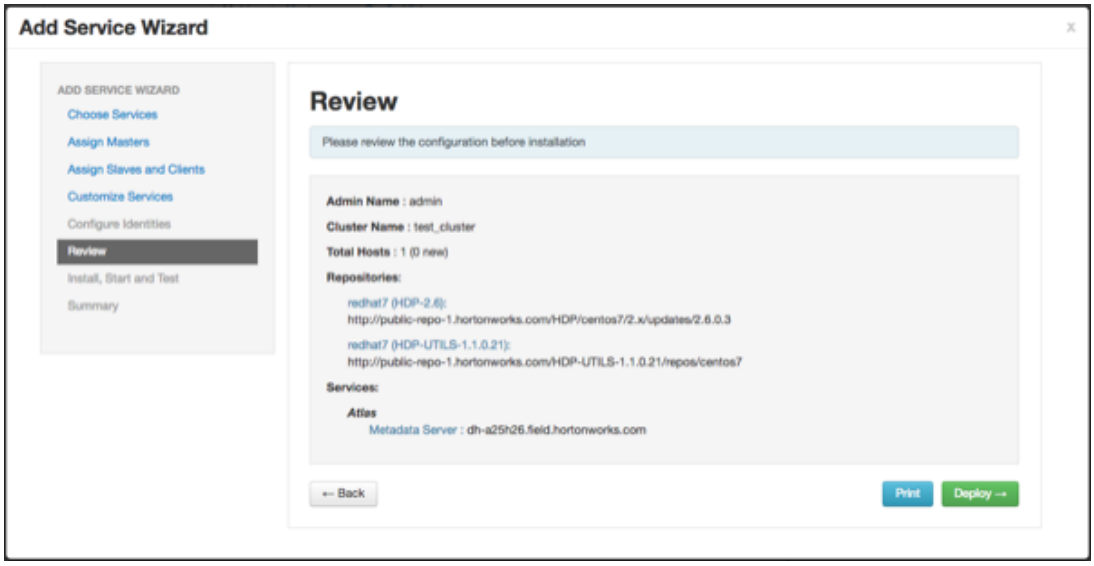
2.2.4. Configure Identities

If Kerberos is enabled, the Configure Identities page appears. Click **Next** to continue with the installation.

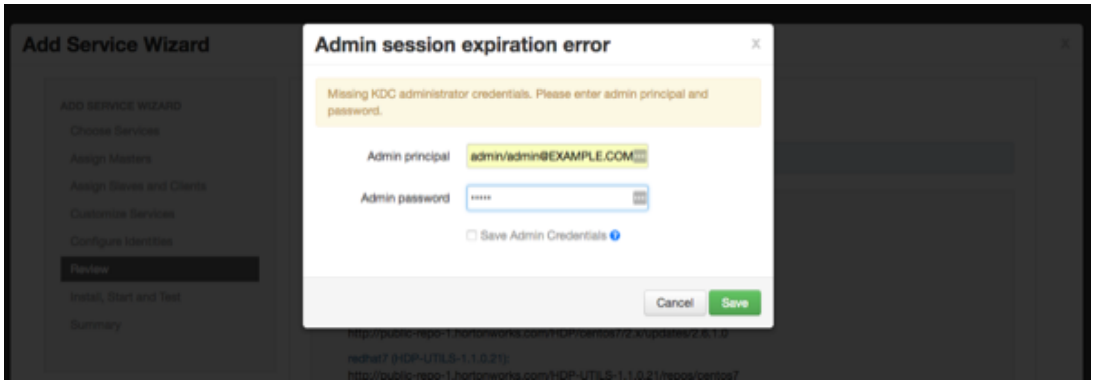


2.2.5. Complete the Atlas Installation

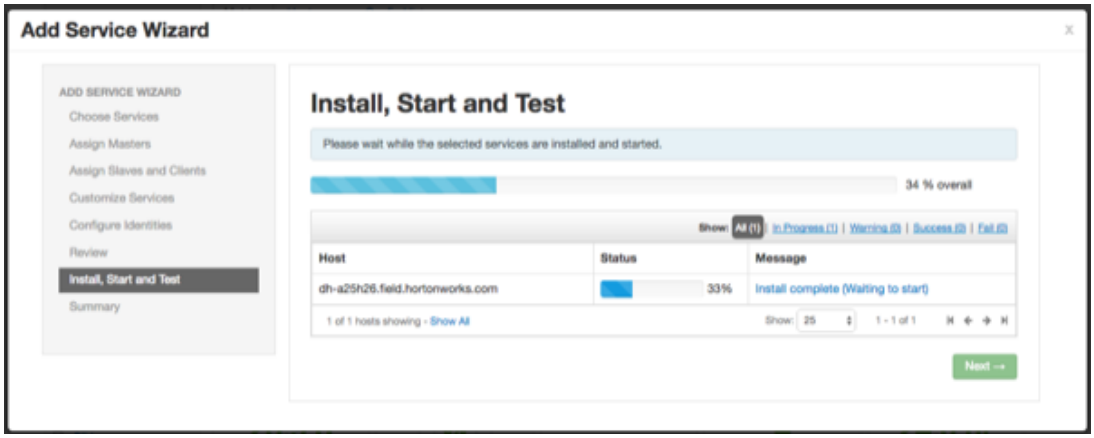
1. On the Review page, carefully review all of your settings and configurations. If everything looks good, click **Deploy** to install Atlas on the Ambari server.



If Kerberos is enabled, you are prompted to enter your KDC administrator credentials. Type in your KDC Admin principal and password, then click **Save**.



2. When you click **Deploy**, Atlas is installed on the specified host on your Ambari server. A progress bar displays the installation progress.

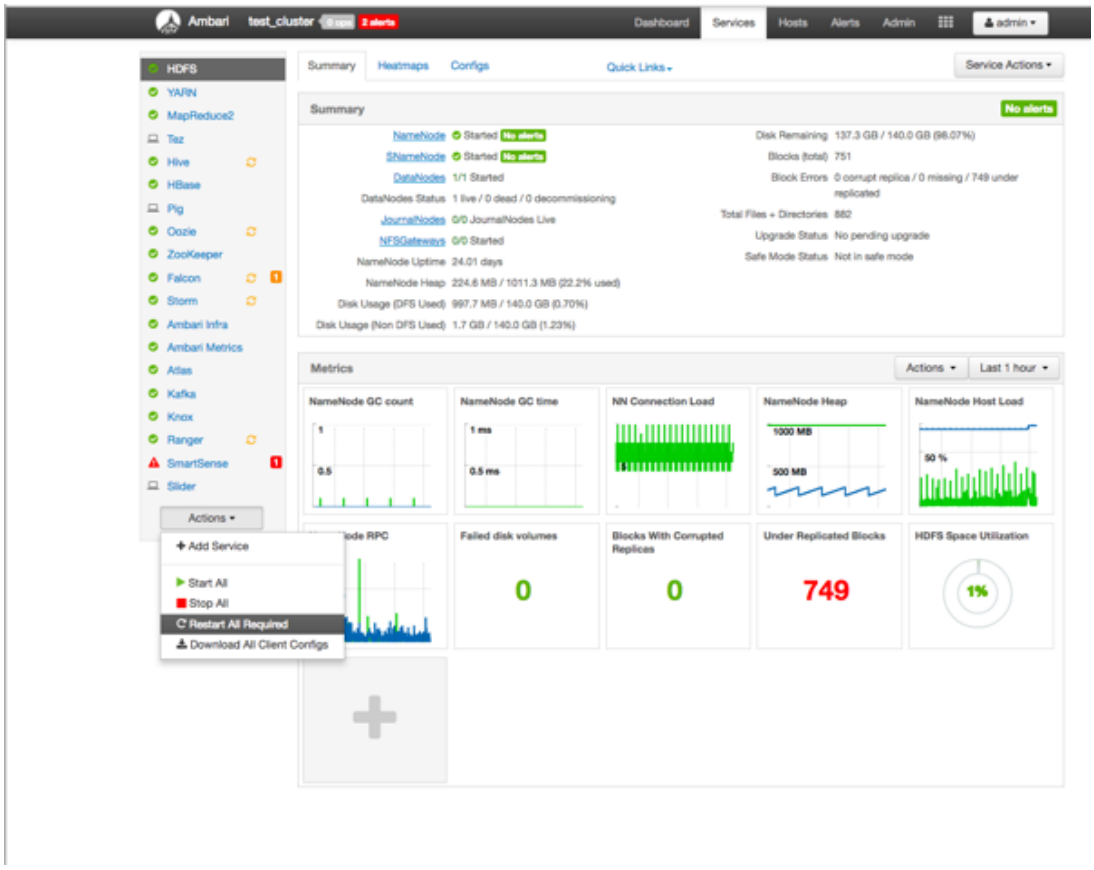


3. When the installation is complete, a Summary page displays the installation details. Click **Complete** to finish the installation.

Note

The Atlas user name and password are set to `admin`/`admin` by default.

4. Select **Actions > Restart All Required** to restart all cluster components that require a restart.



2.3. Enable the Ranger Plugin

The Ranger Atlas plugin enables you to establish and enforce global security policies based on data classifications. For more information, see enabling the Ranger Atlas plugin in Ambari.

2.4. Configure Atlas Tagsync in Ranger

Note

Before configuring Atlas Tagsync in Ranger, you must enable Ranger Authorization in Atlas by enabling the Ranger Atlas plug-in in Ambari.

For information about configuring Atlas Tagsync in Ranger, see Configure Ranger Tagsync.

2.5. Configure Atlas High Availability

For information about configuring High Availability (HA) for Apache Atlas, see Apache Atlas High Availability.

2.6. Configure Atlas Security

2.6.1. Additional Requirements for Atlas with Ranger and Kerberos

Currently additional configuration steps are required for Atlas with Ranger and in Kerberized environments.

2.6.1.1. Additional Requirements for Atlas with Ranger

When Atlas is used with Ranger, perform the following additional configuration steps:

Important

These steps are not required for Ambari-2.4.x and higher versions. For Ambari-2.4.x and higher, these steps will be performed automatically when Atlas is restarted.

- Create the following HBase policy:
  - table: atlas_titan, ATLAS_ENTITY_AUDIT_EVENTS

    user: atlas

    permission: Read, Write, Create, Admin
- Create following Kafka policies:

- topic=ATLAS_HOOK

  permission=publish, create; group=public

  permission=consume, create; user=atlas (for non-kerberized environments, set group=public)

- topic=ATLAS_ENTITIES

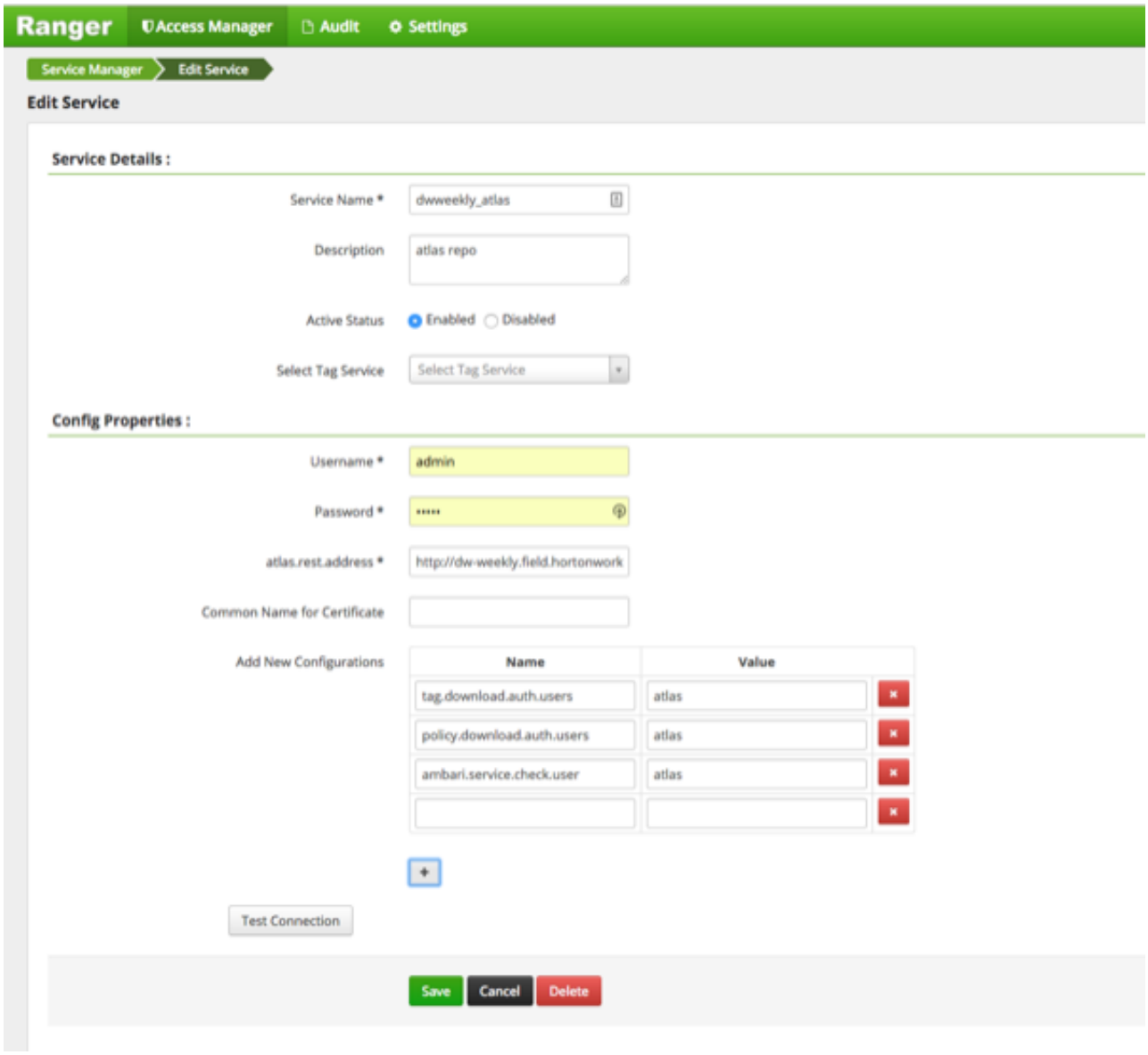
  permission=publish, create; user=atlas (for non-kerberized environments, set group=public)

  permission=consume, create; group=public

You should also ensure that an Atlas service is created in Ranger, and that the Atlas service includes the following configuration properties:

Table 2.4. Ranger Atlas Service Kerberos Properties

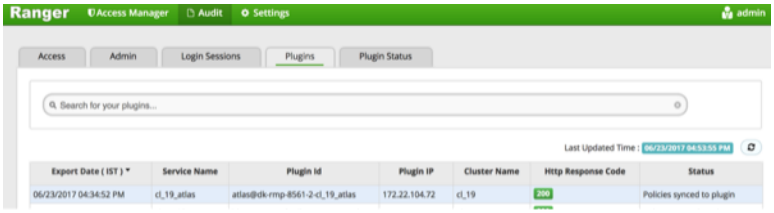
Property	Value
tag.download.auth.users	atlas
policy.download.auth.users	atlas
ambari.service.check.user	atlas



Note

If the Ranger Atlas service is not created after enabling the plugin and restarting Atlas, that indicates that either there is already a policy JSON on the Atlas host (in the `/etc/ranger/<service_name>/policycache/` directory), or Ambari was unable to connect to Ranger Admin during the Atlas restart. The solution for the first issue is to delete or move the `policycache` file, then restart Atlas.

- You can click the **Test Connection** button on the Ranger Atlas Service Details page to verify the configuration settings.
- You can also select **Audit > Plugins** in the Ranger Admin UI to check for the latest Atlas service entry.



2.6.1.2. Additional Requirements for Atlas with Kerberos without Ranger

When Atlas is used in a Kerberized environment without Ranger, perform the following additional configuration steps:

- Start the HBase shell with the user identity of the HBase admin user ('hbase')
- Execute the following command in HBase shell, to enable Atlas to create necessary HBase tables:
  - grant 'atlas', 'RWXCA'
- Start (or restart) Atlas, so that Atlas would create above HBase tables
- Execute the following commands in HBase shell, to enable Atlas to access necessary HBase tables:
  - grant 'atlas', 'RWXCA', 'atlas_titan'
  - grant 'atlas', 'RWXCA', 'ATLAS_ENTITY_AUDIT_EVENTS'
- Kafka – To grant permissions to a Kafka topic, run the following commands as the Kafka user:

```
/usr/hdp/current/kafka-broker/bin/kafka-acls.sh --topic ATLAS_HOOK --allow-
principals * --operations All --authorizer-properties "zookeeper.connect=
hostname:2181"
/usr/hdp/current/kafka-broker/bin/kafka-acls.sh --topic ATLAS_ENTITIES --
allow-principals * --operations All --authorizer-properties "zookeeper.
connect=hostname:2181"
```

2.6.2. Enable Atlas HTTPS

For information about enabling HTTPS for Apache Atlas, see Enable SSL for Apache Atlas.

2.6.3. Hive CLI Security

If you have Oozie, Storm, or Sqoop Atlas hooks enabled, the Hive CLI can be used with these components. You should be aware that the Hive CLI may not be secure without taking additional measures.

2.6.4. Configure the Knox Proxy for Atlas

You can avoid exposing Atlas hosts and ports by using Apache Knox as a proxy. Use the following steps to configure the Knox proxy for Atlas.

1. On the Ambari Dashboard, select **Knox > Configs > Advanced Topology**, then add the following services:

```
<service>
  <role>ATLAS-API</role>
  <url><atlas-server-host>:21000</url>
</service>

<service>
  <role>ATLAS</role>
  <url><atlas-server-host>:21000</url>
</service>
```

2. Click **Save** to save the new configuration, then click **Restart > Restart All Affected** to restart Knox.

3. With the Knox proxy enabled, use the following URL format to access the Atlas Dashboard:

```
https://<knox-gateway-host>:<knox-gateway-port>/<gateway-path>/<topology>/
atlas/index.html
```

For example:

```
https://<knox-gateway-host>:8443/gateway/ui/atlas/index.html
```

Use the following format to access the Atlas REST API:

```
https://<knox-gateway-host>:<knox-gateway-port>/<gateway-path>/<topology>/
atlas/
```

For example:

```
curl -i -k -L -u admin:admin -X GET \
'https://<knox-gateway-host>:8443/gateway/{topology}/atlas/api/atlas/v2/
types/typedefs?type=classification&_=1495442879421'
```

Note

- Apache Atlas HA (High Availability) is not supported with the Atlas Knox proxy.
- Knox SSO is supported with the Atlas Knox proxy, but is not required.

2.7. Install Sample Atlas Metadata

You can use the `quick_start.py` Python script to install sample metadata to view in the Atlas web UI. Use the following steps to install the sample metadata:

1. Log in to the Atlas host server using a command prompt.

2. Run the following command as the Atlas user:

```
su atlas -c '/usr/hdp/current/atlas-server/bin/quick_start.py'
```

Note

In an SSL-enabled environment, run this command as:

```
su atlas -c '/usr/hdp/current/atlas-server/bin/quick_start.py
 https://<fqdn_atlas_host>:21443'
```

When prompted, type in the Atlas user name and password. When the script finishes running, the following confirmation message appears:

```
Example data added to Apache Atlas Server!!!
```

If Kerberos is enabled, `kinit` is required to execute the `quick_start.py` script.

After you have installed the sample metadata, you can explore the Atlas web UI.

Note

If you are using the HDP Sandbox, you do not need to run the Python script to populate Atlas with sample metadata.

2.8. Update the Atlas Ambari Configuration

When you update the Atlas configuration settings in Ambari, Ambari marks the services that require restart, and you can select **Actions > Restart All Required** to restart all services that require a restart.

Important

Apache Oozie requires a restart after an Atlas configuration update, but may not be included in the services marked as requiring restart in Ambari. Select **Oozie > Service Actions > Restart All** to restart Oozie along with the other services.

3. Searching and Viewing Entities

3.1. Using Basic and Advanced Search

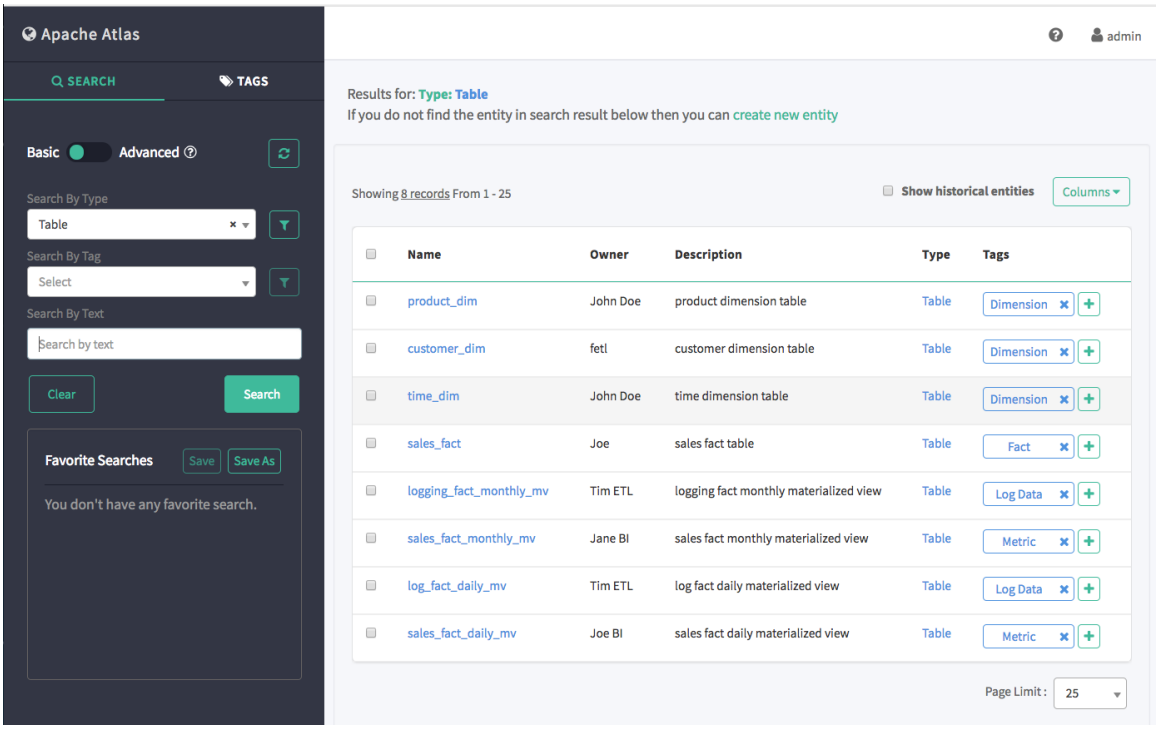
3.1.1. Using Basic Search

You can search for entities using three basic search modes:

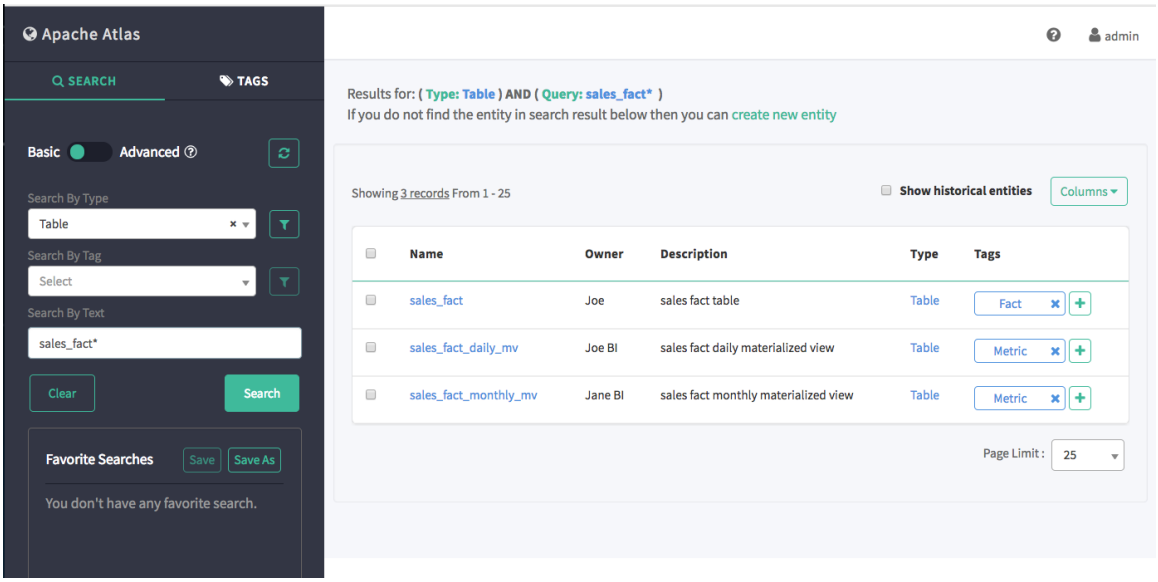
- Search by Type – search based on a selected Entity type.
- Search by Tag – search based on a selected Atlas tag.
- Search by Query – full-text search.

1. To search for entities, click **SEARCH** on the Atlas web UI. Select an entity type, an Atlas tag, or enter a text string, then click **Search** to display a list of the entities associated with the specified search criteria.

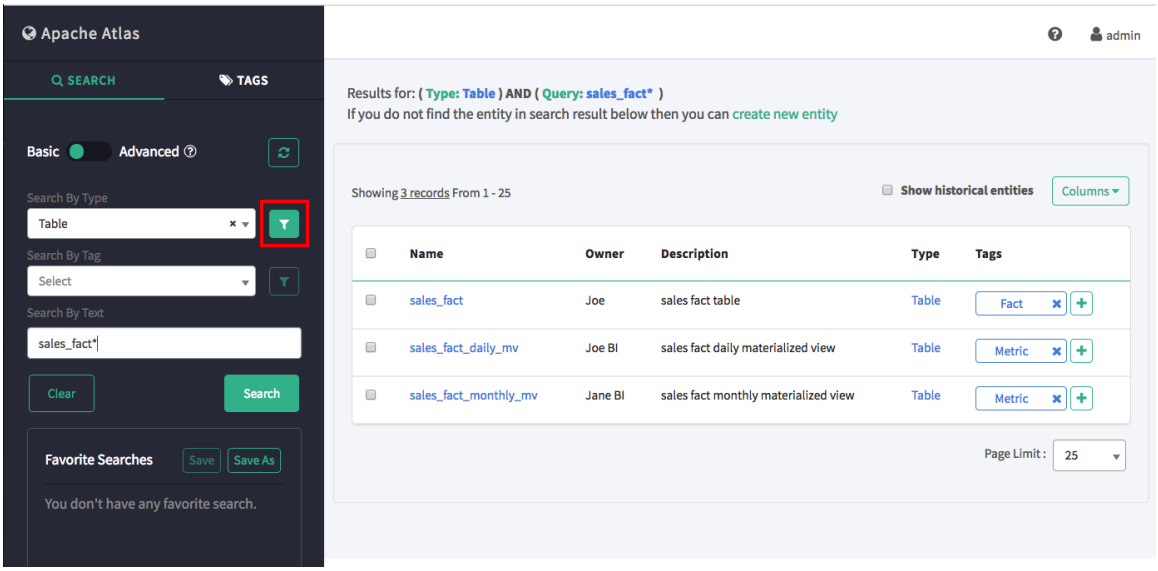
   - In the example below, we searched for the Table entity type.



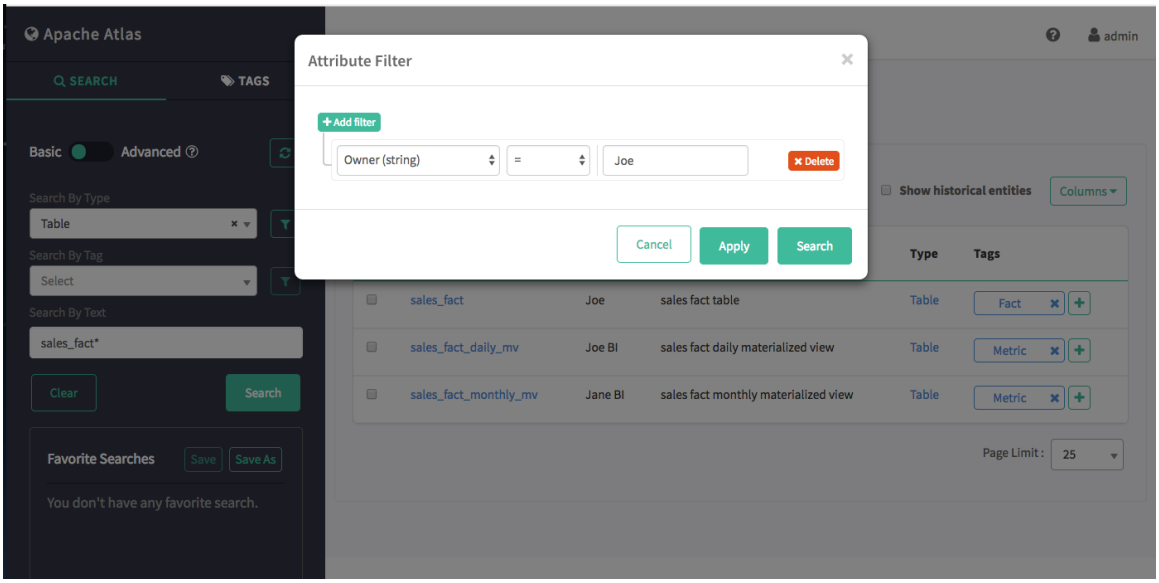
   - You can also combine search criteria. In the example below, we combined Type and full-text search to find Table entities whose name contains the text string "sales_fact".



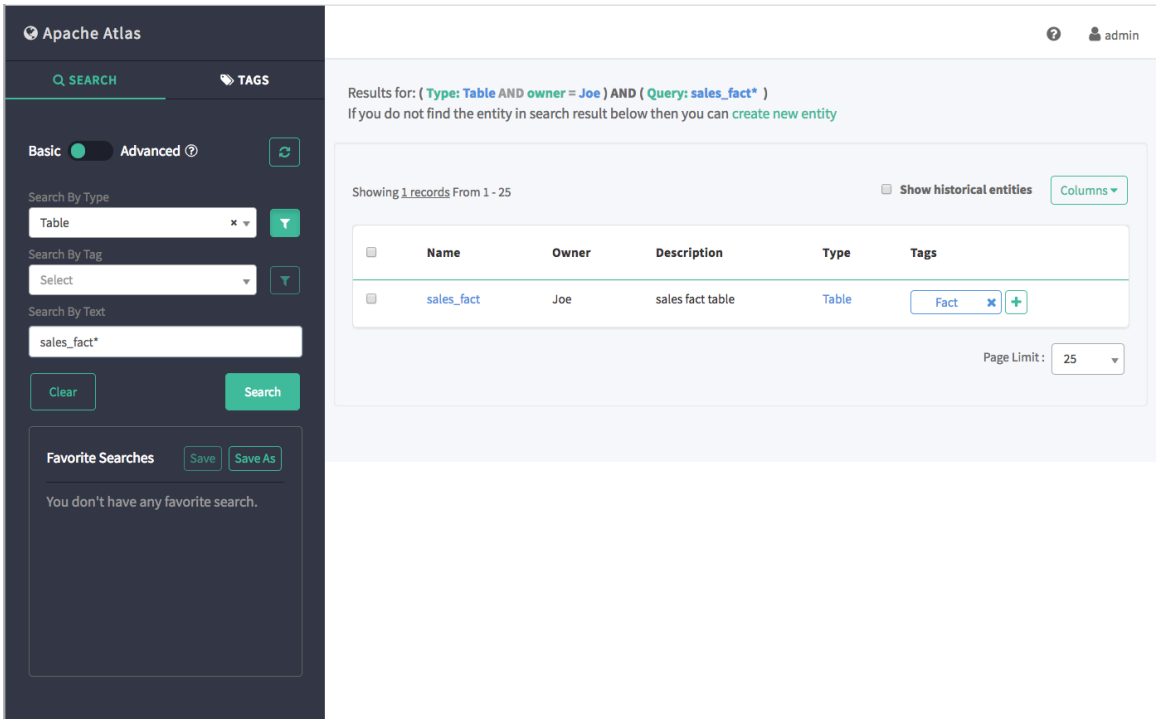
- You can use the attribute filters to further refine search criteria. Click an Attribute Filter symbol to display the Attribute Filter pop-up.



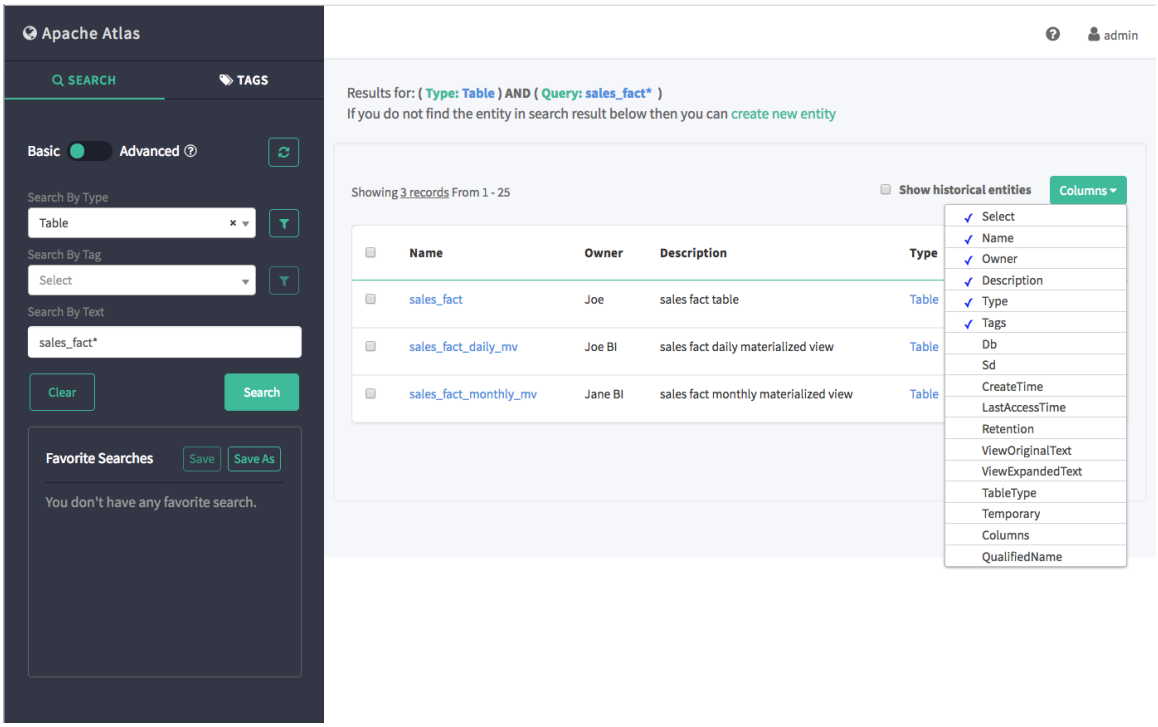
Use the selection boxes on the Attribute Filter pop-up to specify an attribute filter. The attributes listed reflect the entity type. In the following example, we set an attribute filter to return entities with an Owner attribute of "Joe".



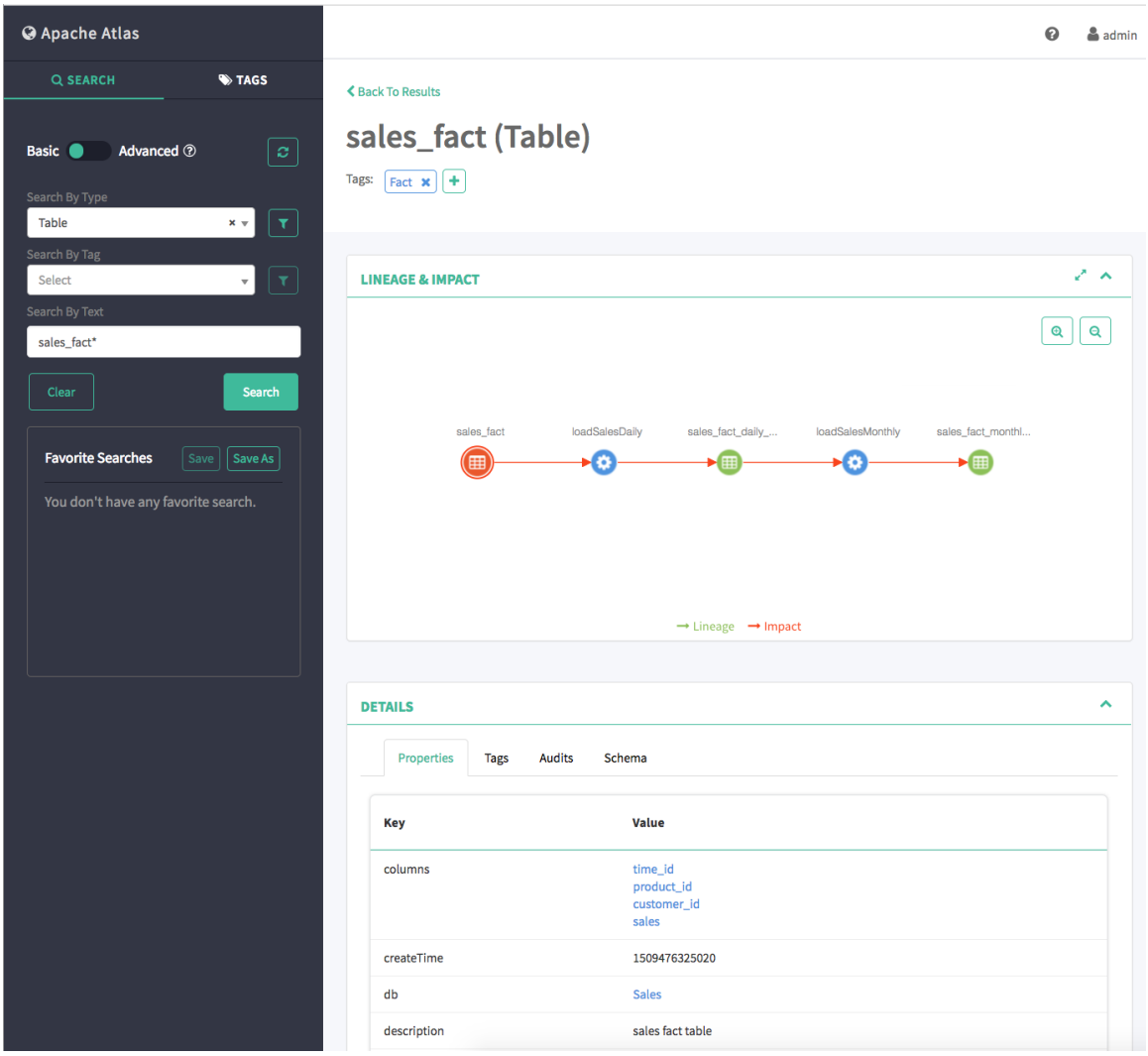
- Click **Add filter** to add more attribute filters.
- Click **Delete** to remove an attribute filter.
- Click **Apply** to temporarily save the attribute filter to the current search without applying it to the search results. Click **Search** to apply the attribute filter to the search results.



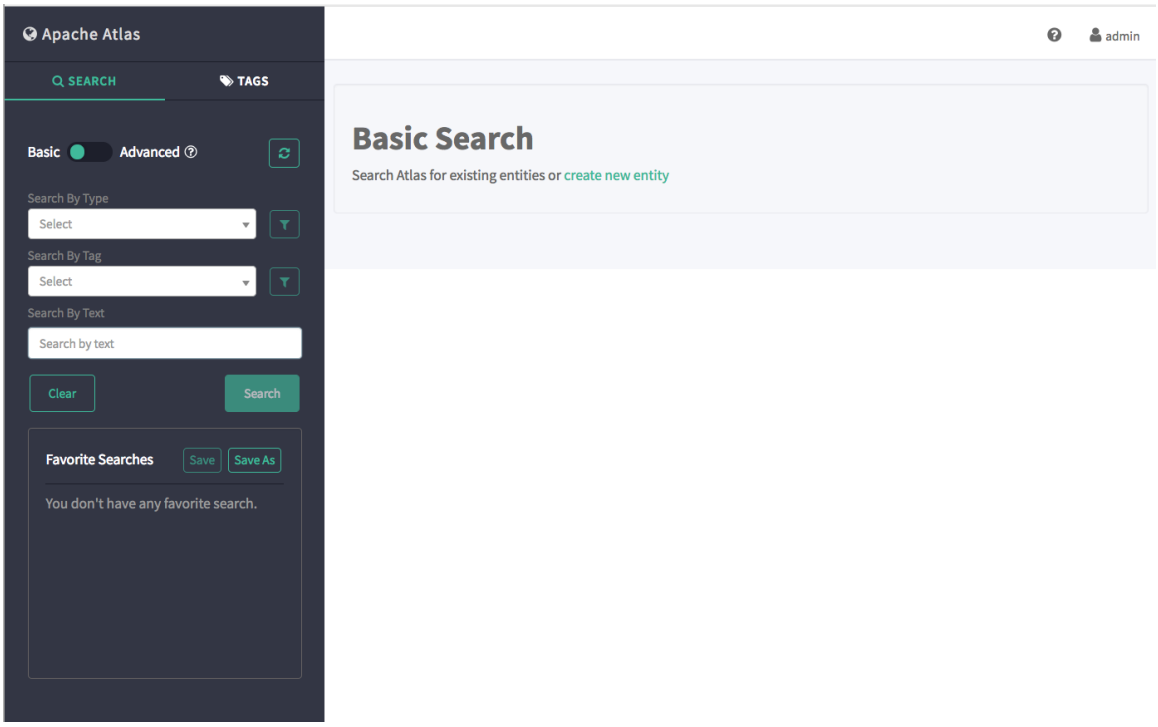
2. Click **Columns** to control which columns are displayed in the list of search results.



3. To view detailed information about an entity, click the entity in the search results list. In the example below, we selected the "sales_fact" table from the list of search results.



4. Click **Clear** to clear the search settings.



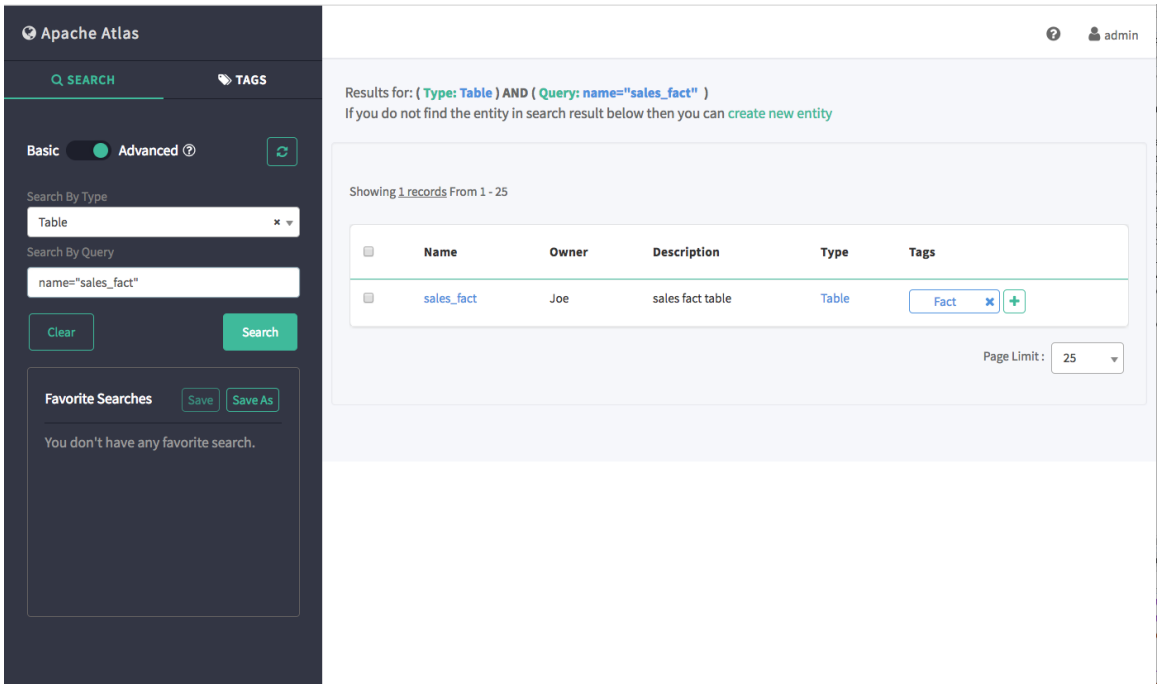
3.1.2. Using Advanced Search

To switch to Advanced search mode, slide the green toggle button from **Basic** to **Advanced**. You can search for entities using two advanced search modes:

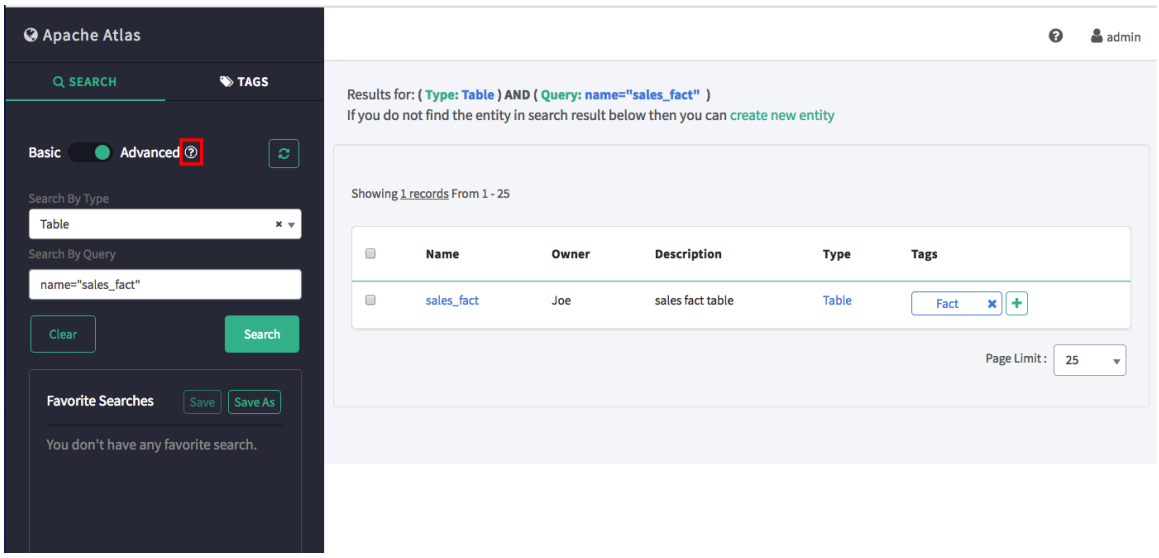
- Search by Type – search based on a selected Entity type.
- Search by Query – search using an Apache Atlas DSL query. Atlas DSL (Domain-Specific Language) is a SQL-like query language that enables you to search metadata using complex queries.

1. To search for entities, select an entity type or enter an Atlas DSL search query, then click **Search** to display a list of the entities associated with the specified search criteria.

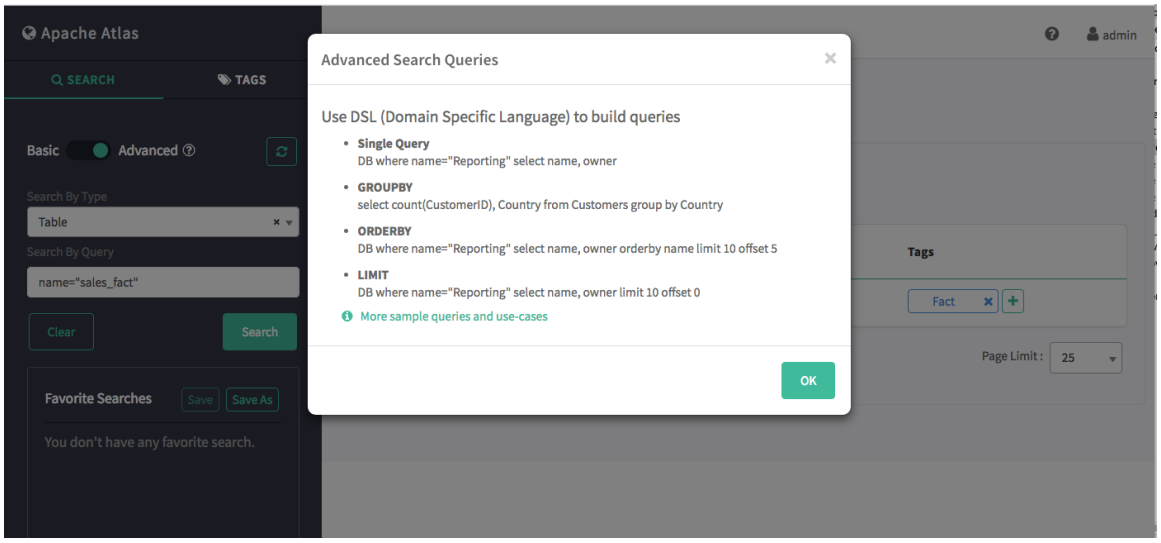
   You can also combine search criteria. In the example below, we searched for Table entity types named "sales_fact".



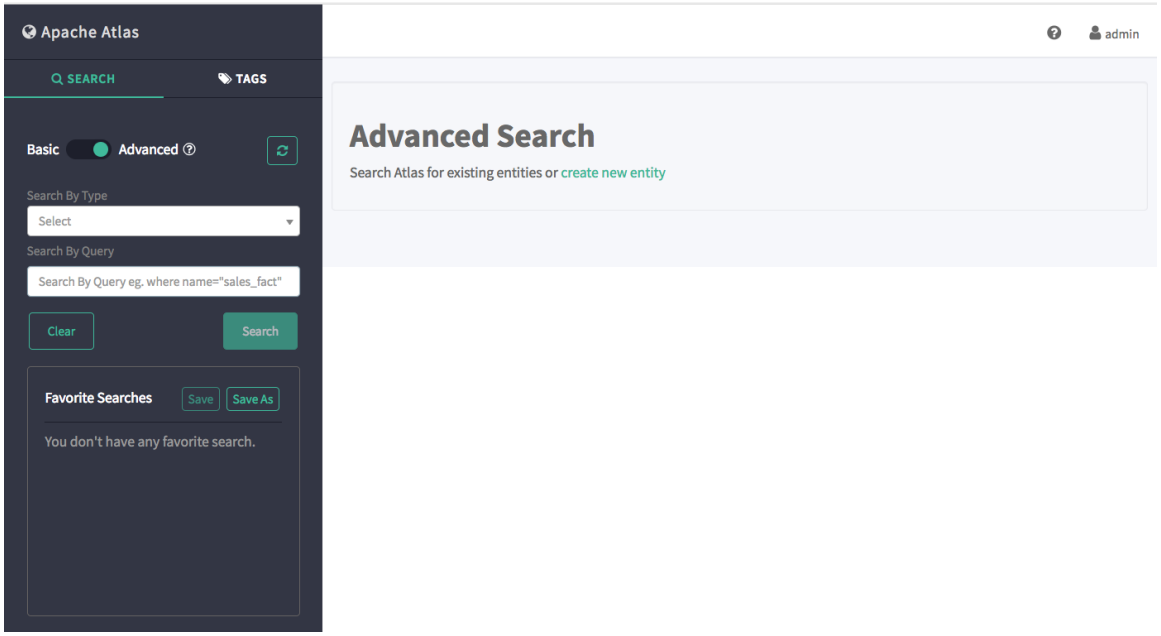
To display more information about Atlas DSL queries, click the question mark symbol next to the **Advanced** label above the search boxes.



The Advanced Search Queries lists example queries, along with a link to the Apache Atlas DSL query documentation:



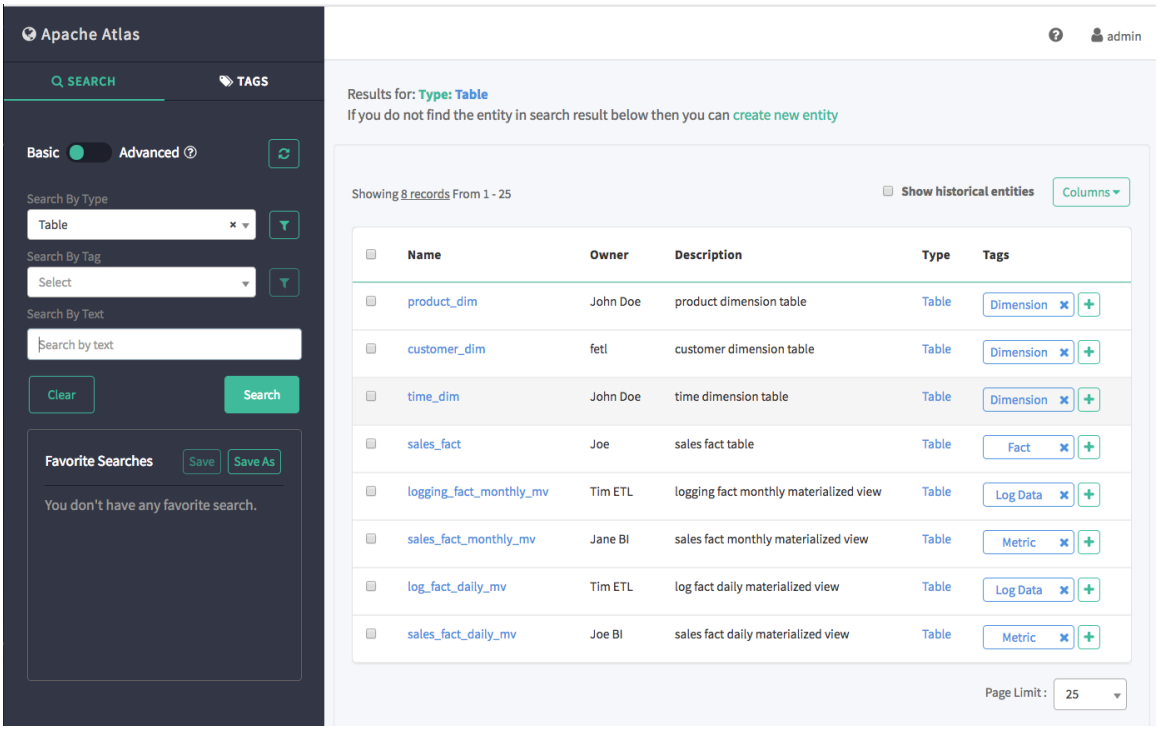
2. Click **Clear** to clear the search settings.



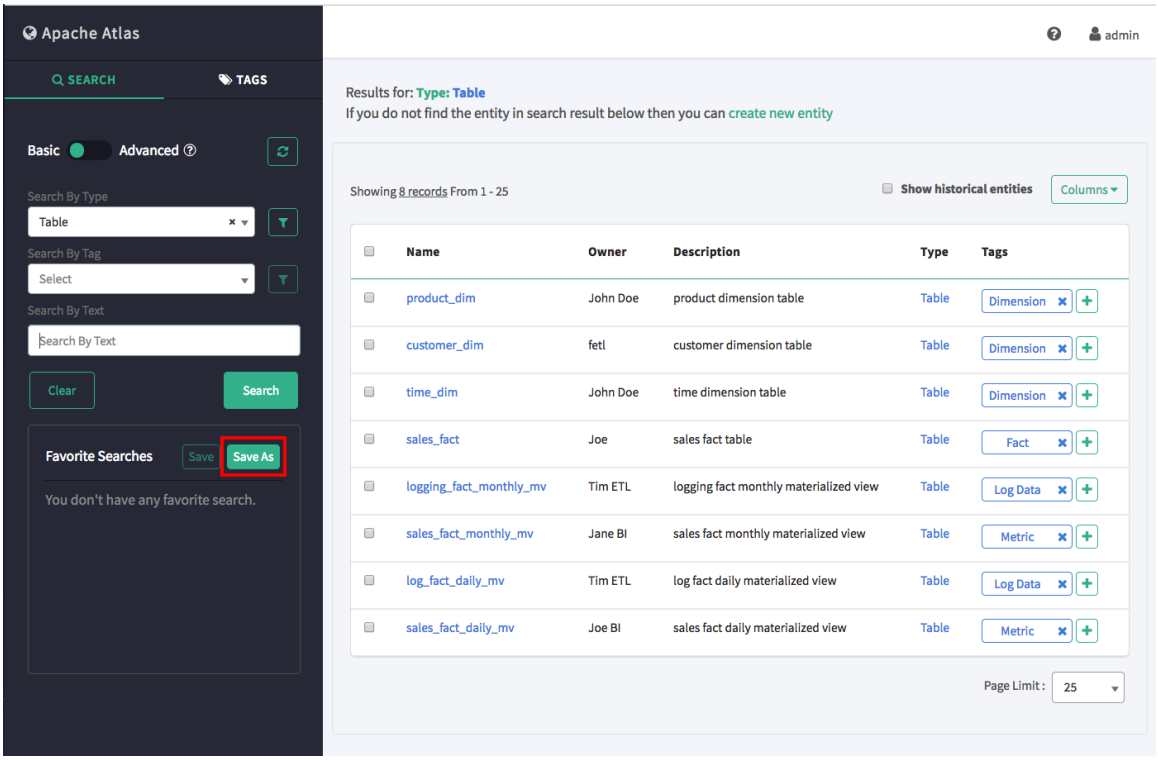
3.2. Saving Searches

You can use the Favorite Searches box to save both Basic and Advanced Atlas searches.

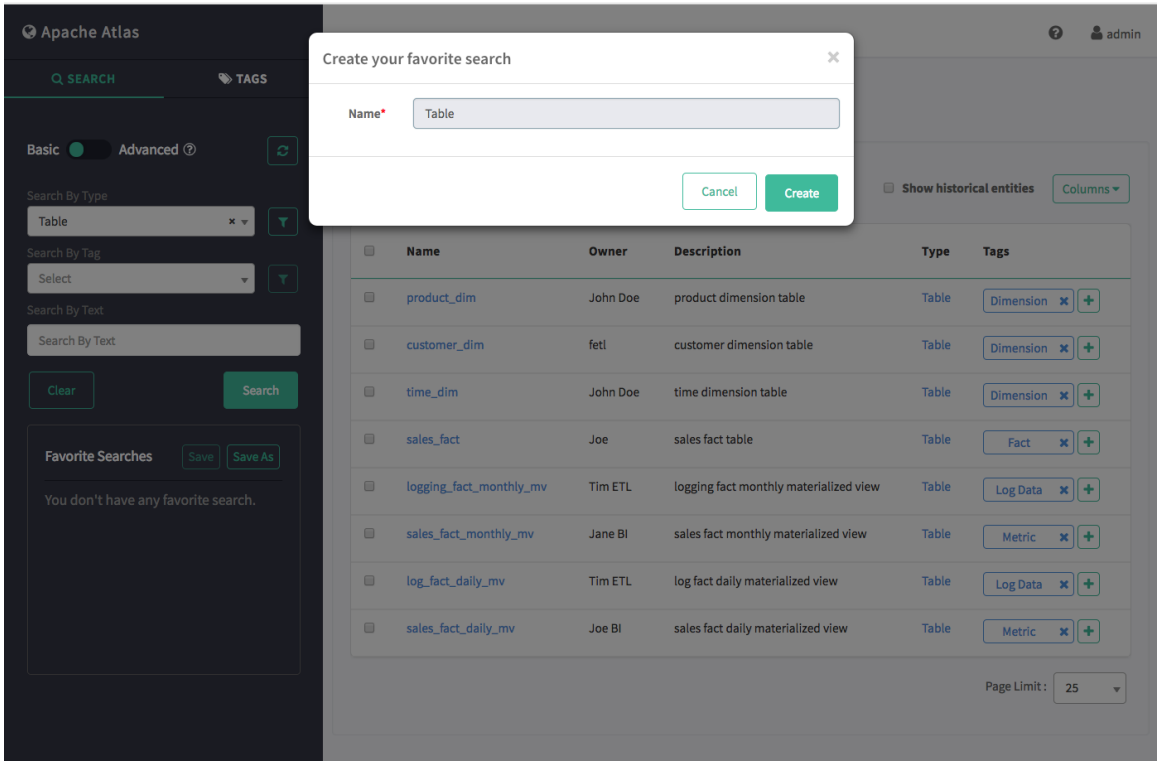
1. To demonstrate saved searches, let's start with a Basic search for the Table entity type.



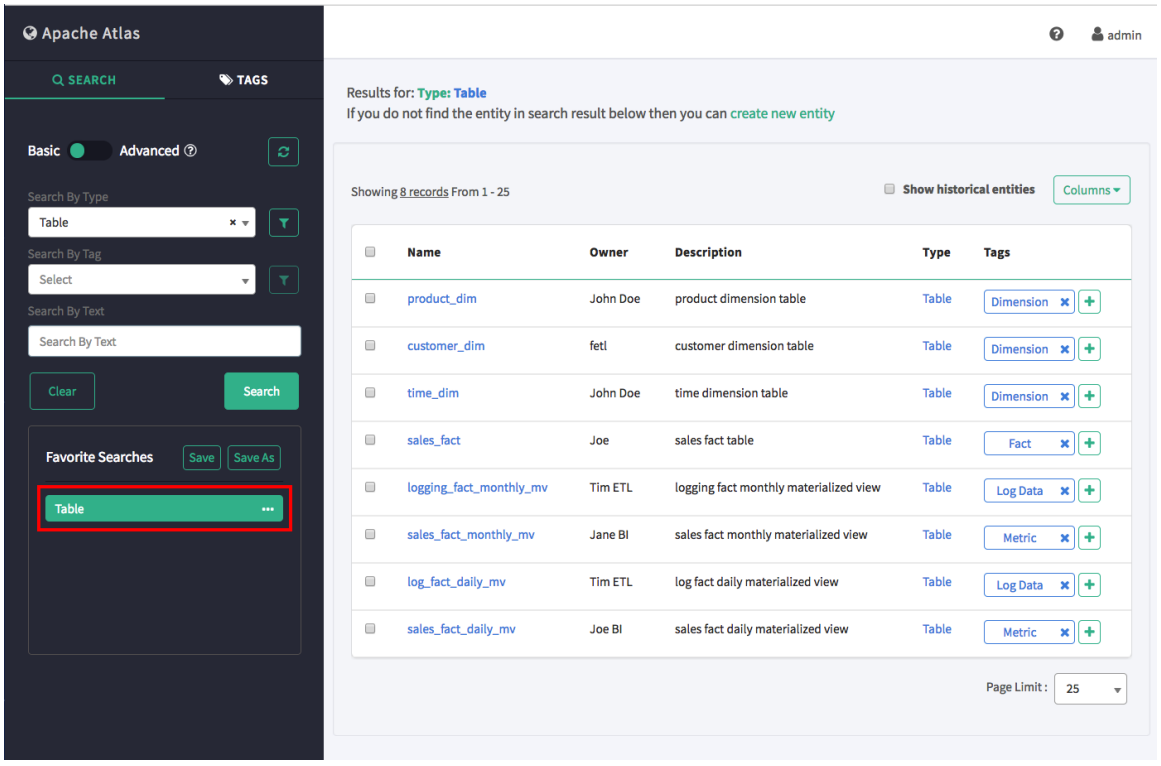
2. To save this search, click **Save As** under Favorite Searches.



3. On the Create Your Favorite Search pop-up, type a name for the search in the **Name** box, then click **Create**. In this example, the search name is "Table".



4. The saved search appears in the Favorite Searches box.

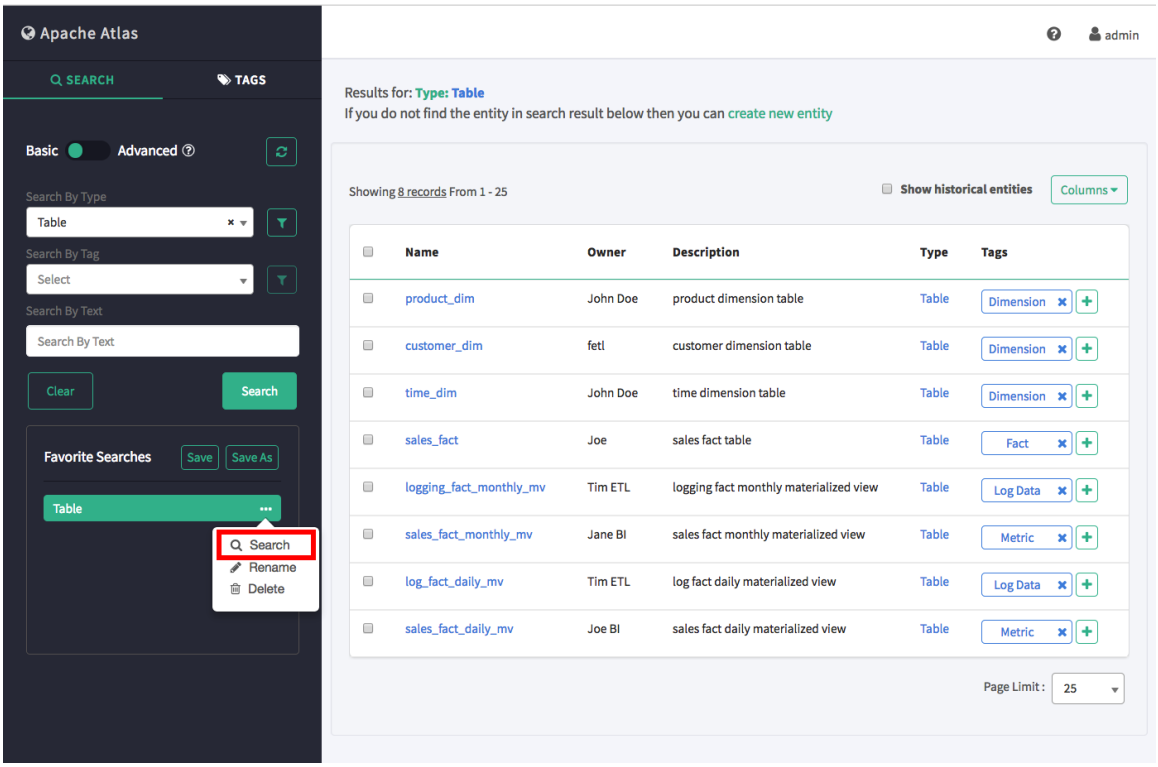


5. To run a saved search:

- Click the search name in the Favorite Searches list, then click **Search**.

  -or-

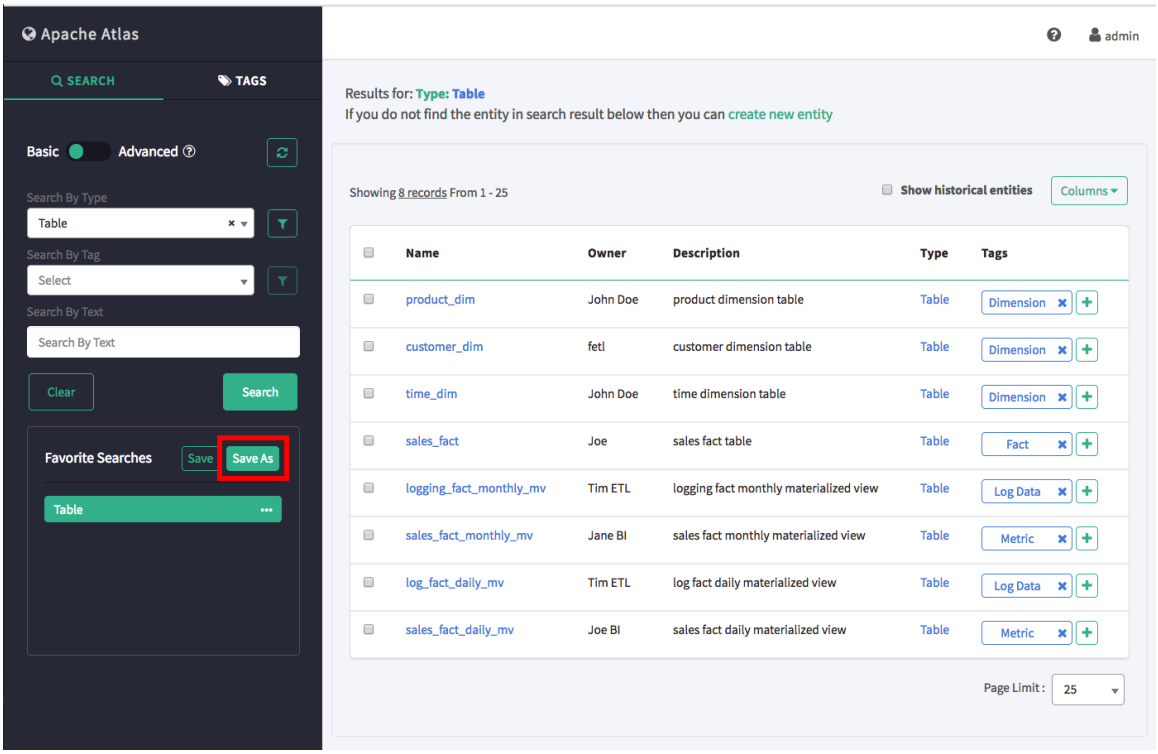
- Click the ellipsis symbol (...) for the saved search, then click **Search** in the drop-down menu.



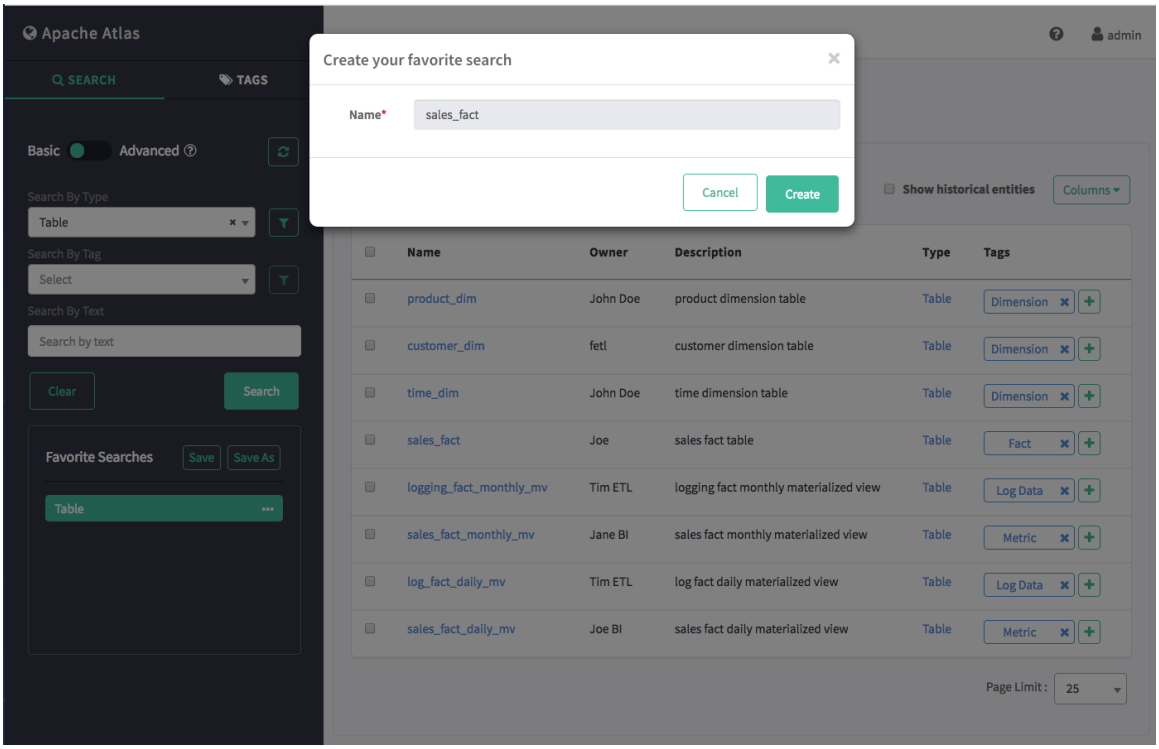
Note

You can also use the ellipsis symbol drop-down menu to rename or delete a saved search.

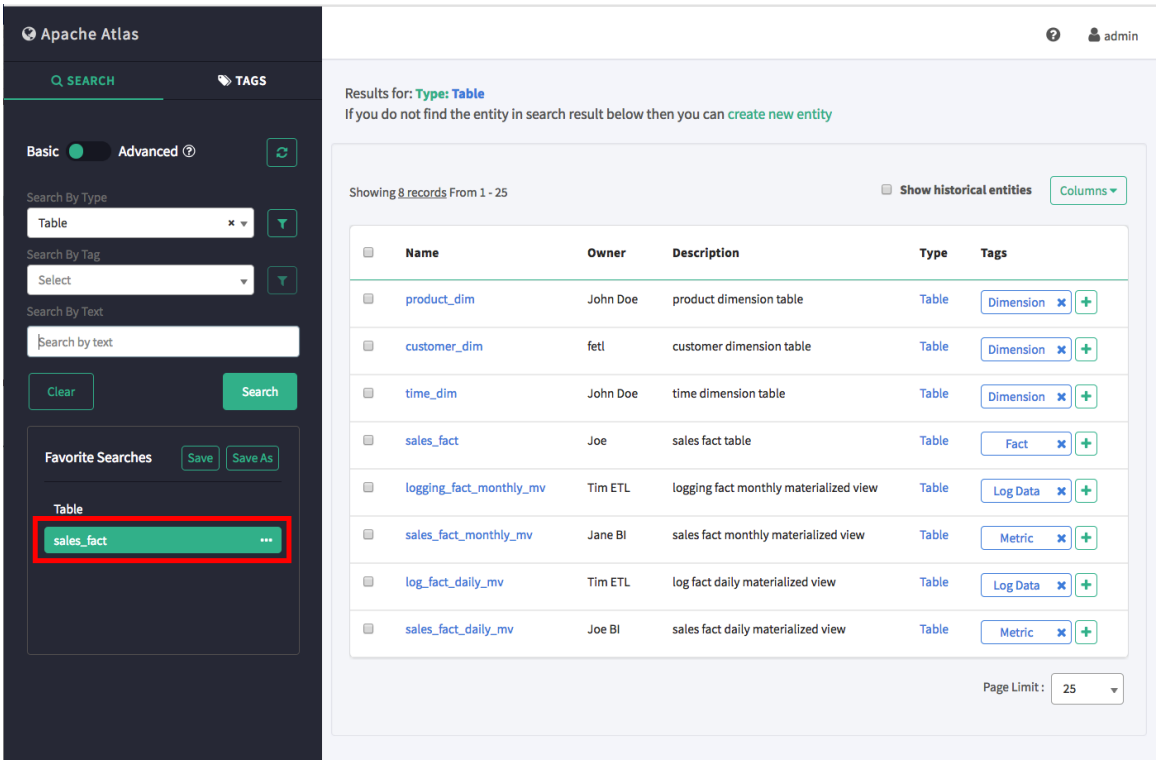
6. Now let's save this search under a new name, then change the search criteria and save the new search. To save a search under a new name, click the search, then click **Save As**.



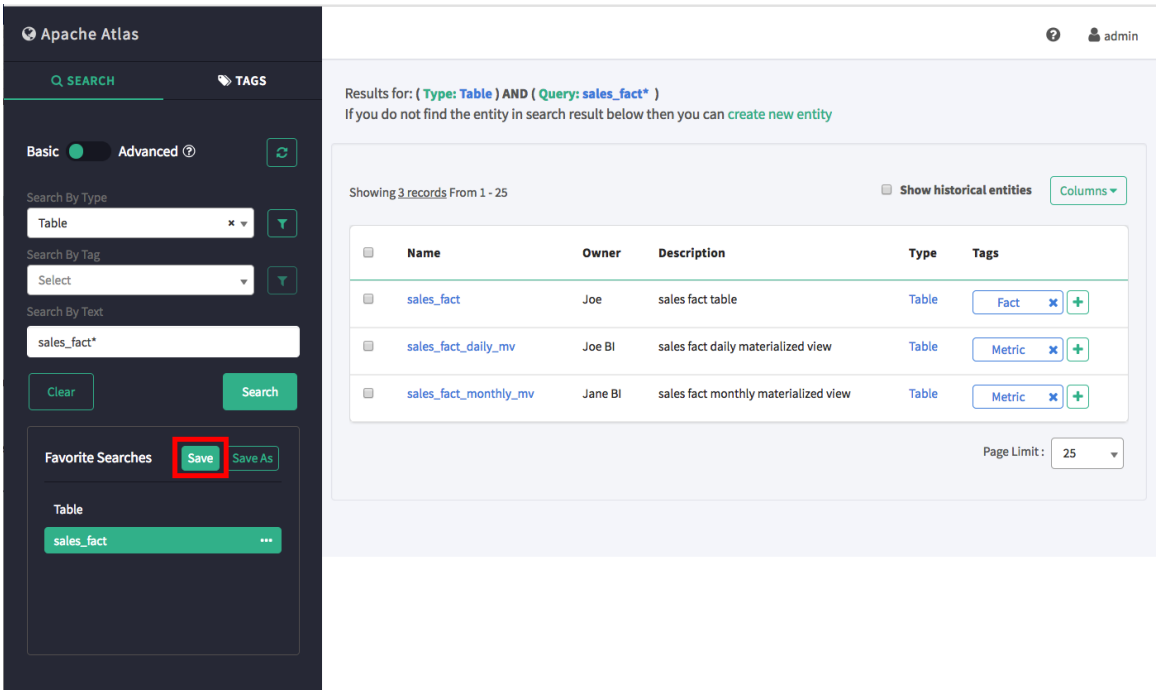
7. On the Create Your Favorite Search pop-up, type a name for the new search in the **Name** box, then click **Create**. In this example, the new search name is "sales_fact".



8. The new search appears in the Favorite Searches box.



9. Next we add a full-text search string to find Table entities whose name contains the text string "sales_fact", then click **Search** to update the search results. To save this new set of search criteria to the "sales_fact" search, click **Save** under Favorite Searches.

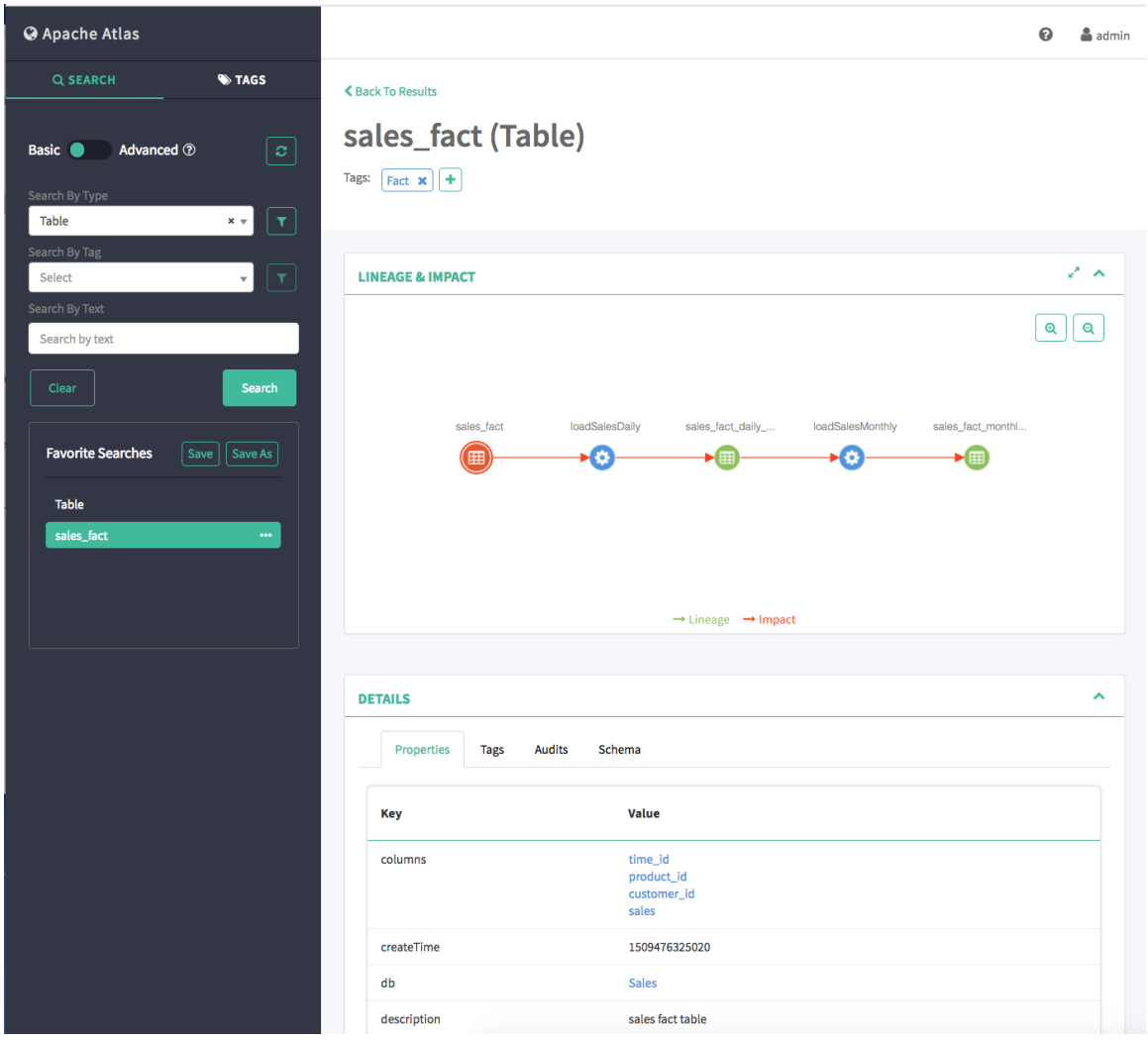


Note

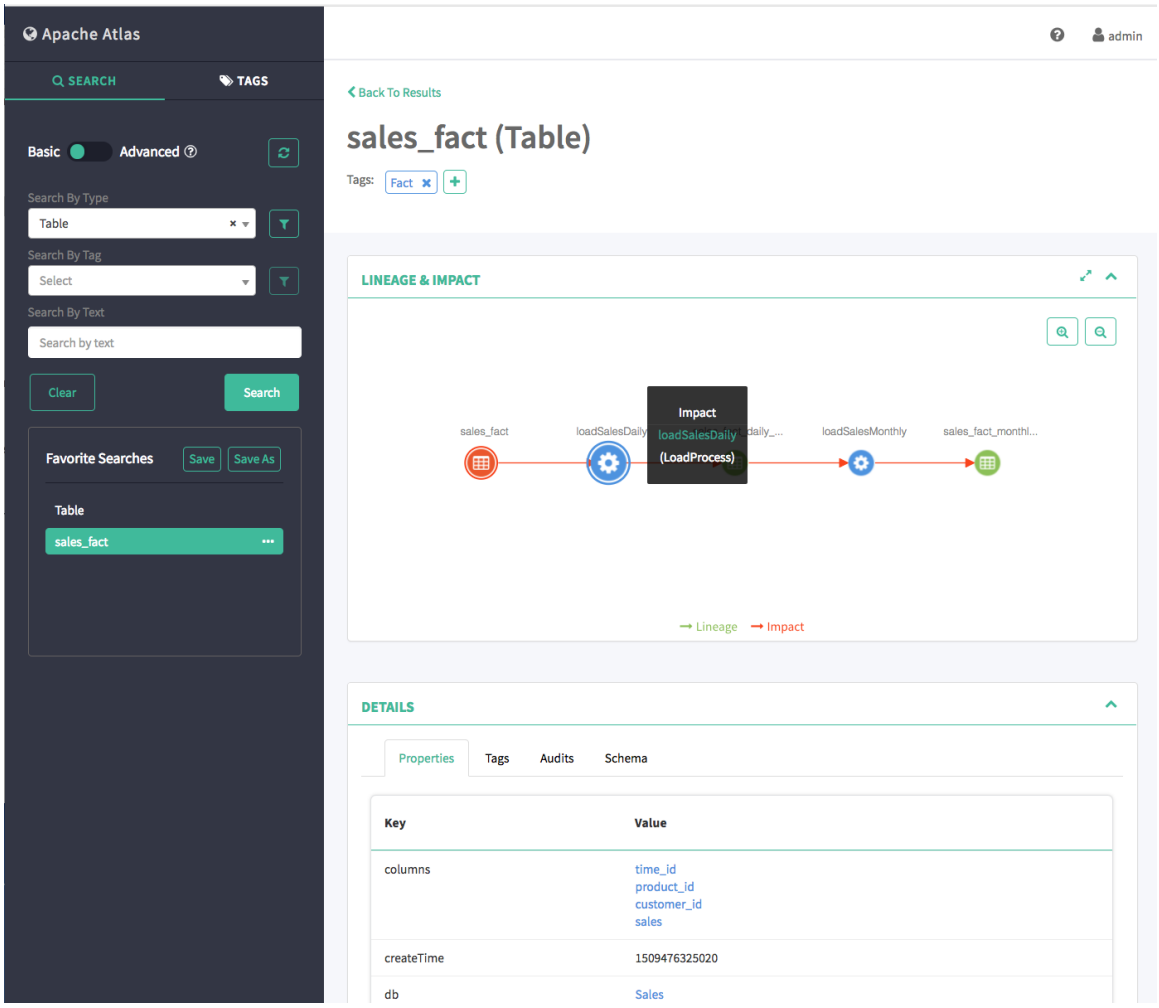
To modify a saved search, click the search name in the Favorite Searches list, update the search criteria, then click **Save** to save the new search settings.

3.3. Viewing Entity Data Lineage & Impact

1. Data lineage and impact is displayed when you select an entity. In the following example, we ran a Type search for `Table`, and then selected the "sales_fact" entity. Data lineage and impact is displayed graphically, with each icon representing an action. You can use the + and - buttons to zoom in and out, and you can also click and drag to move the image.



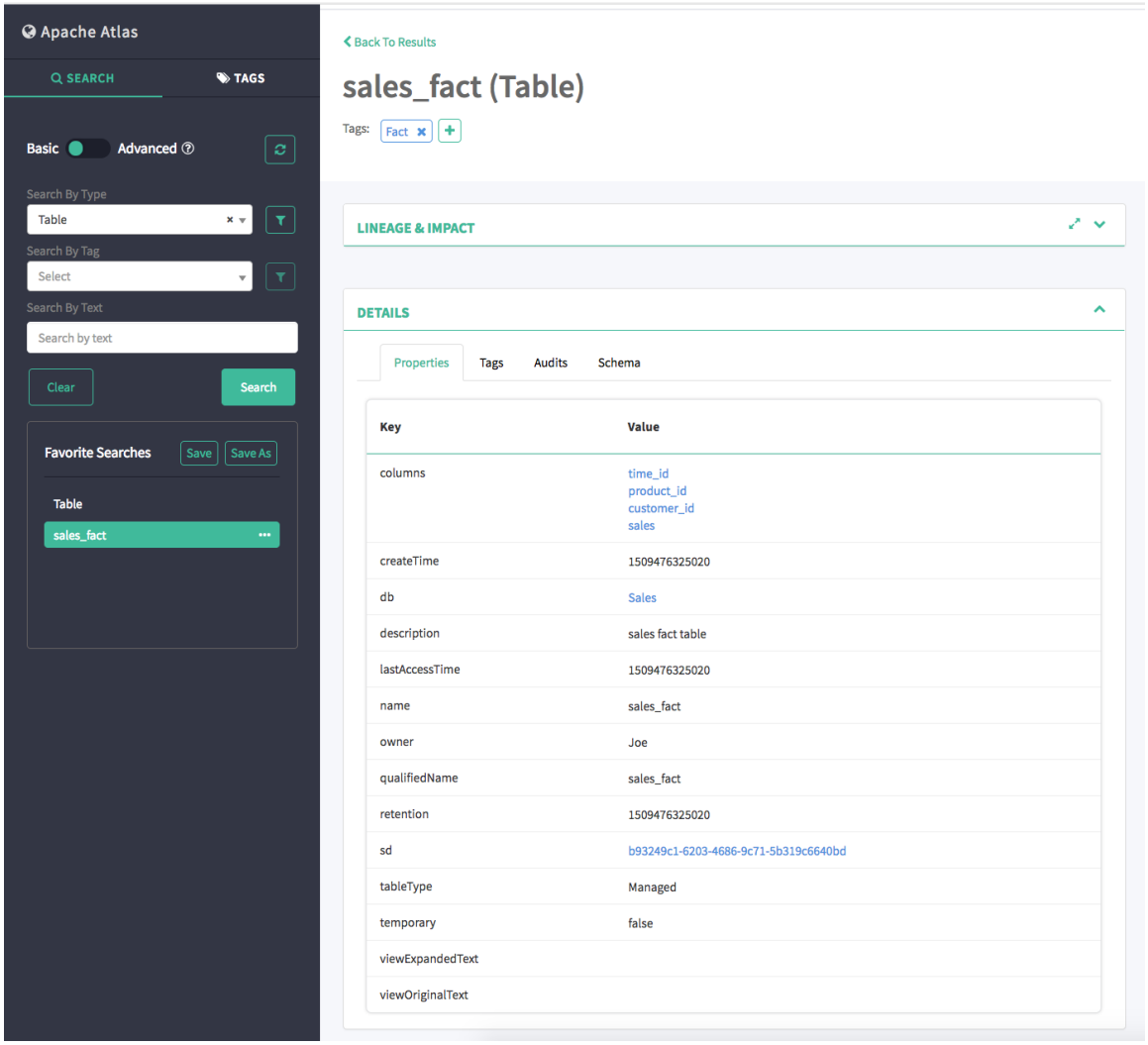
2. Moving the cursor over an icon displays a pop-up with more information about the action that was performed.



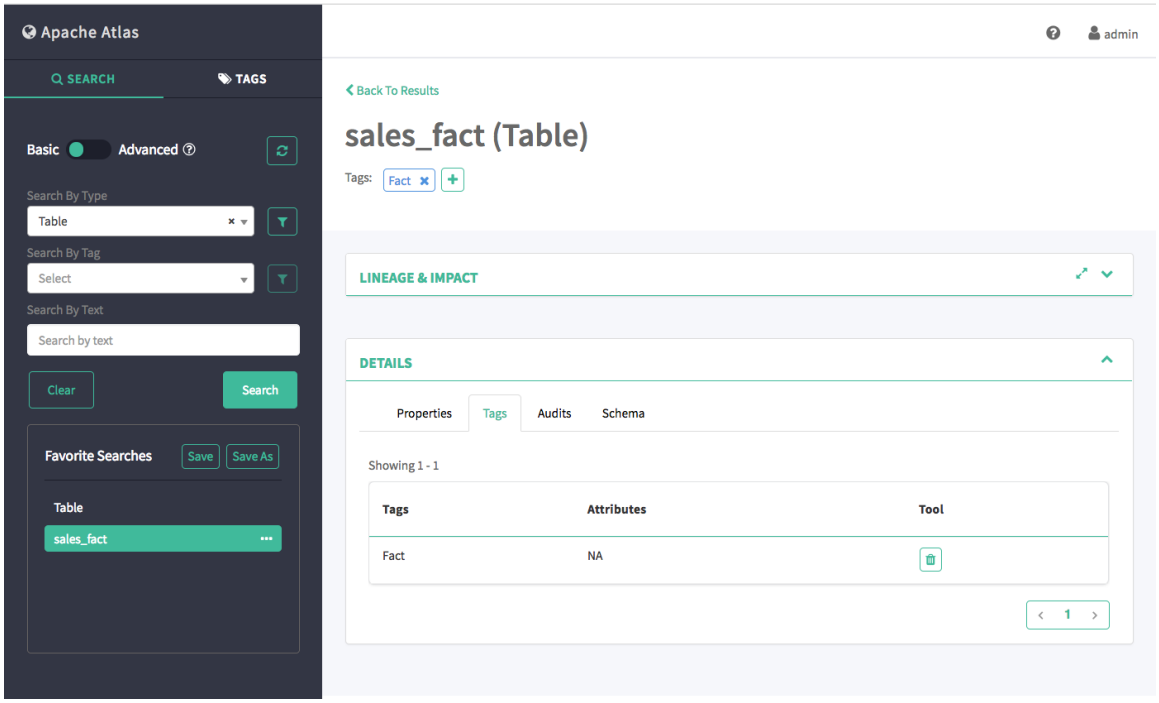
3.4. Viewing Entity Details

When you select an entity, detailed information about the entity is displayed under DETAILS.

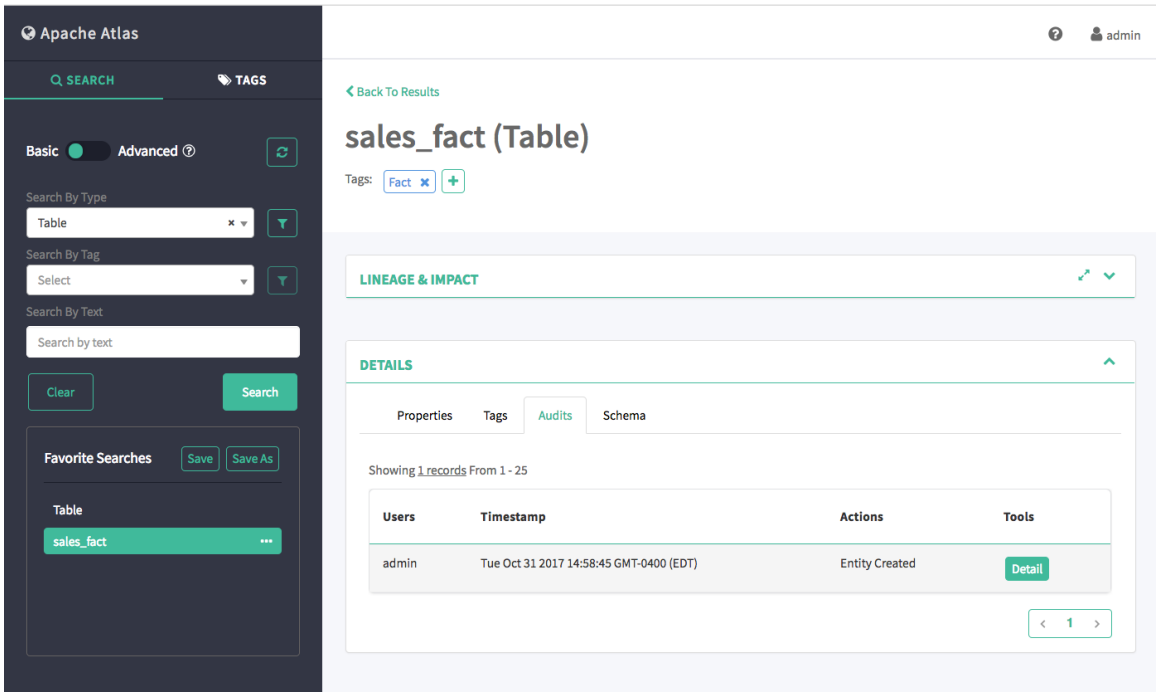
- The Properties tab displays all of the entity properties.



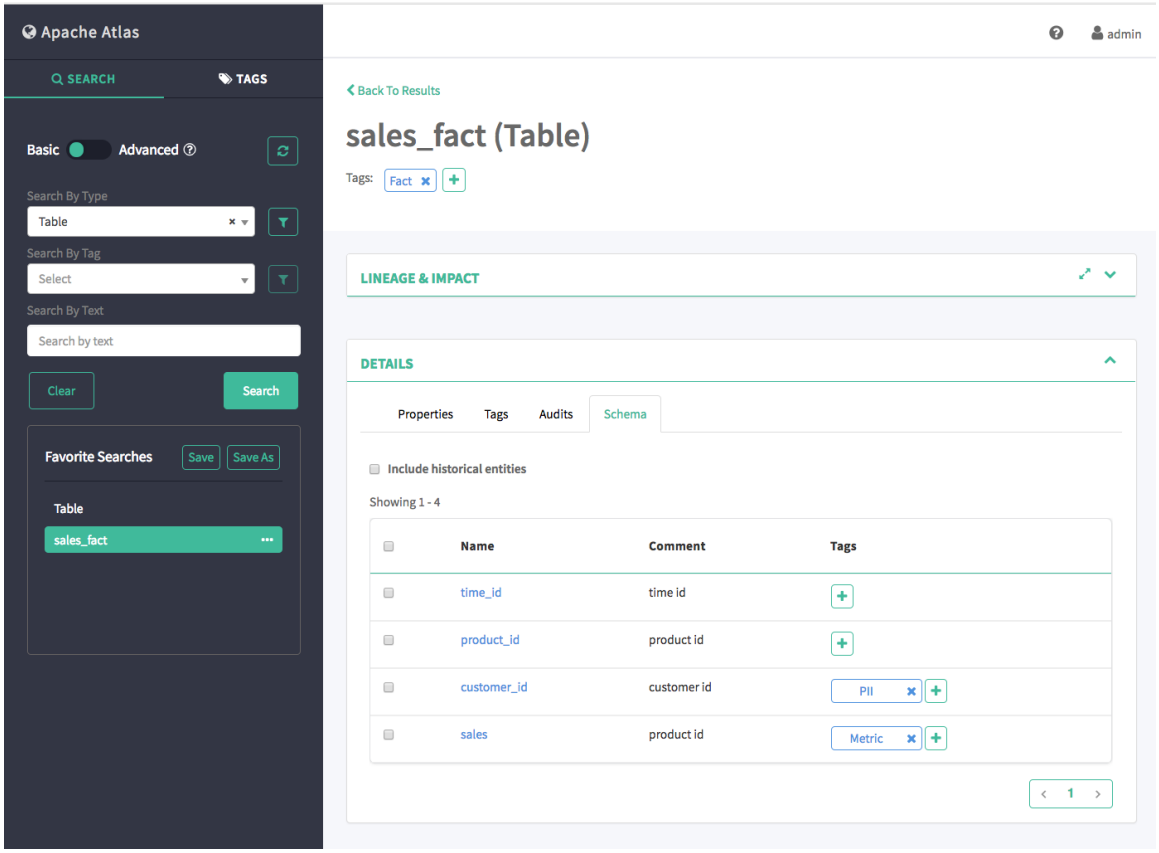
- Click the Tags tab to display the tags associated with the entity. In this case, the "fact" tag has been associated with the "sales_fact" table.



- The Audits tab provides a complete audit trail of all events in the entity history. You can use the Detail button next to each action to view more details about the event.



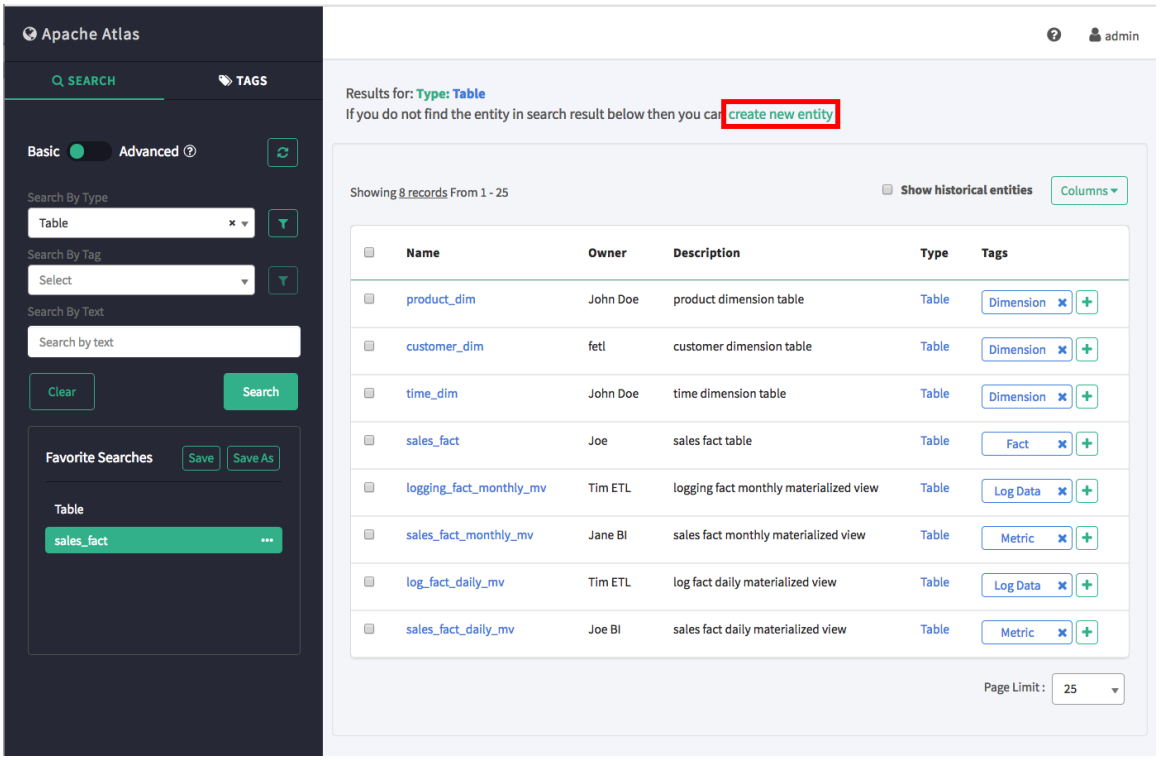
- The Schema tab shows schema information, in this case the columns for the table. We can also see that a PII tag has been associated with the "customer_id" column.



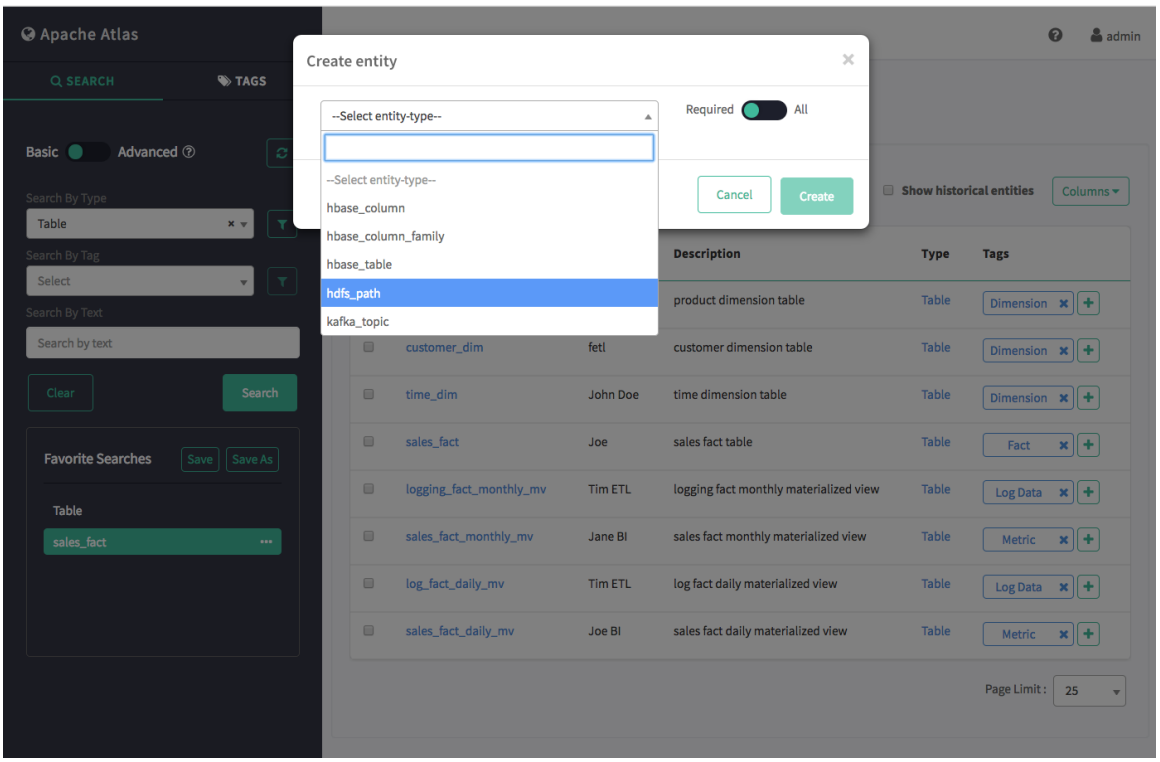
3.5. Manually Creating Entities

Currently there is no Atlas hook for HBase, HDFS, or Kafka. For these components, you must manually create entities in Atlas. You can then associate tags with these entities and control access using Ranger tag-based policies.

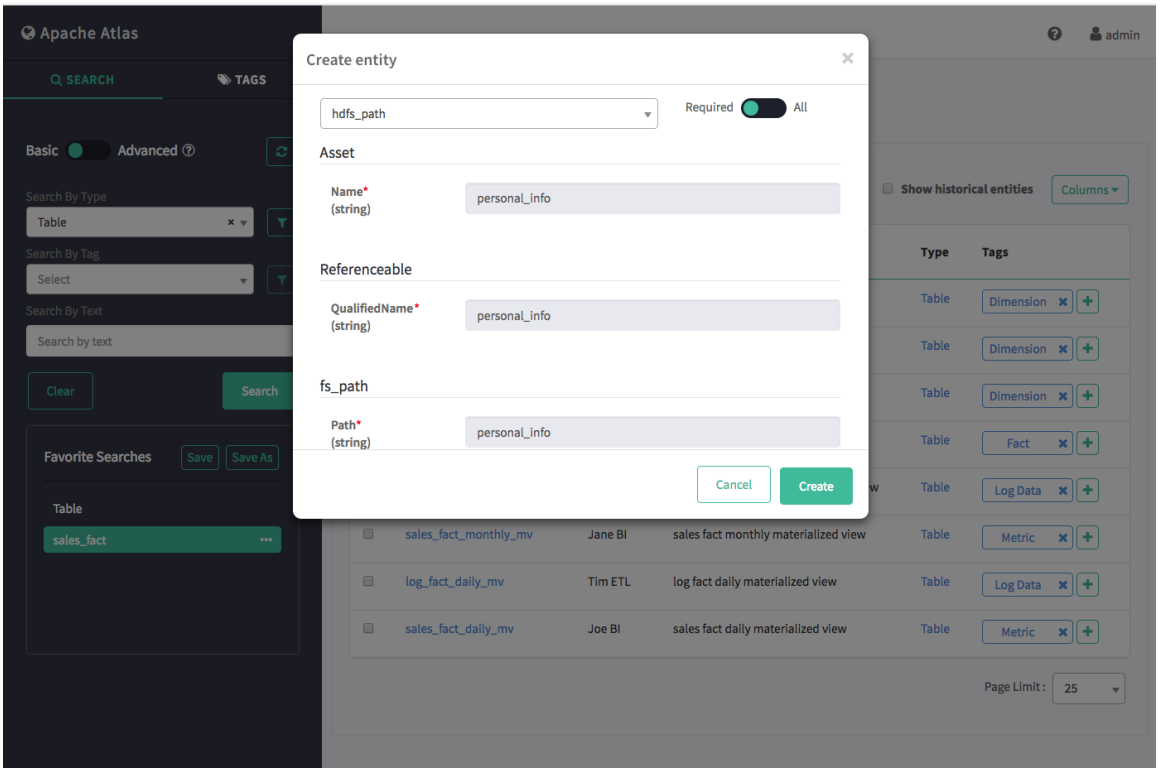
1. On the Atlas web UI Search page, click the **create new entity** link at the top of the page.



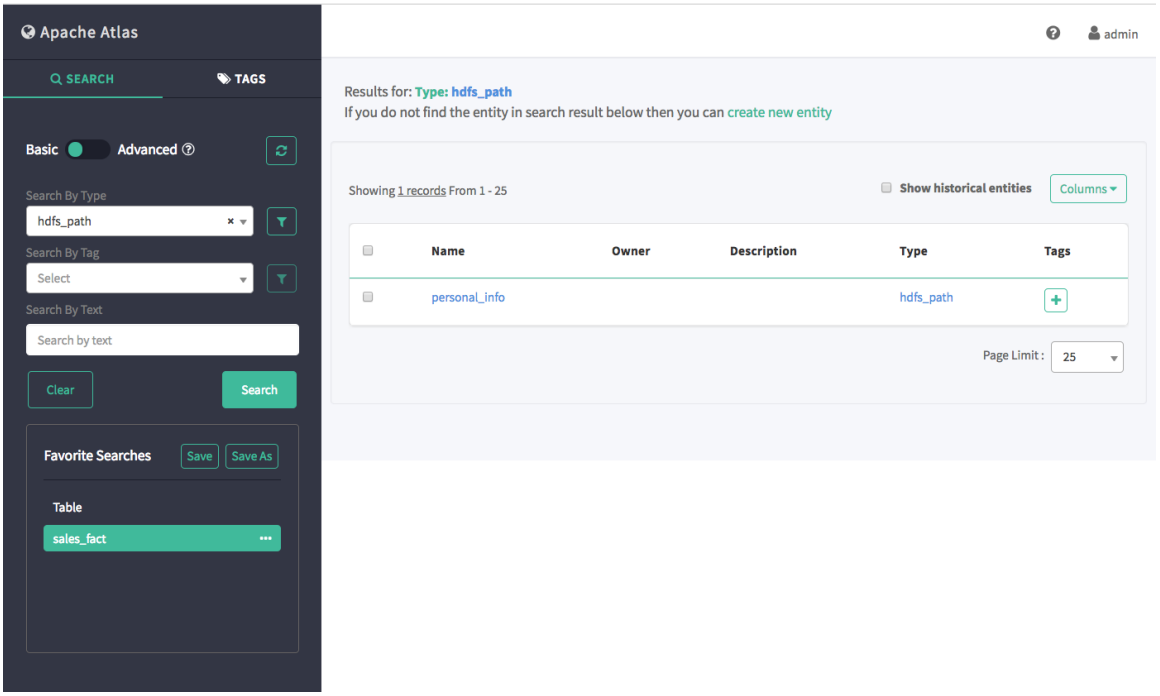
2. On the Create Entity pop-up, select an entity type.



3. Enter the required information for the new entity. Click **All** to display both required and non-required information. Click **Create** to create the new entity.



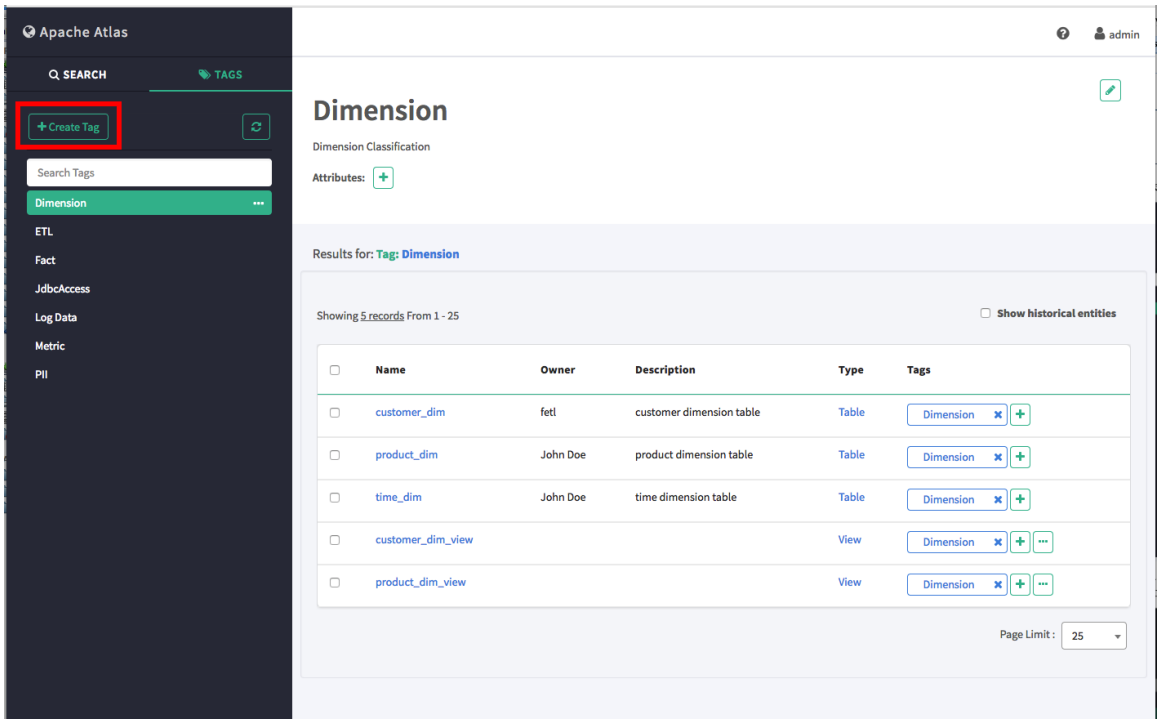
4. The entity is created and returned in search results for the applicable entity type. You can now associate tags with the new entity and control access to the entity with Ranger tag-based policies.



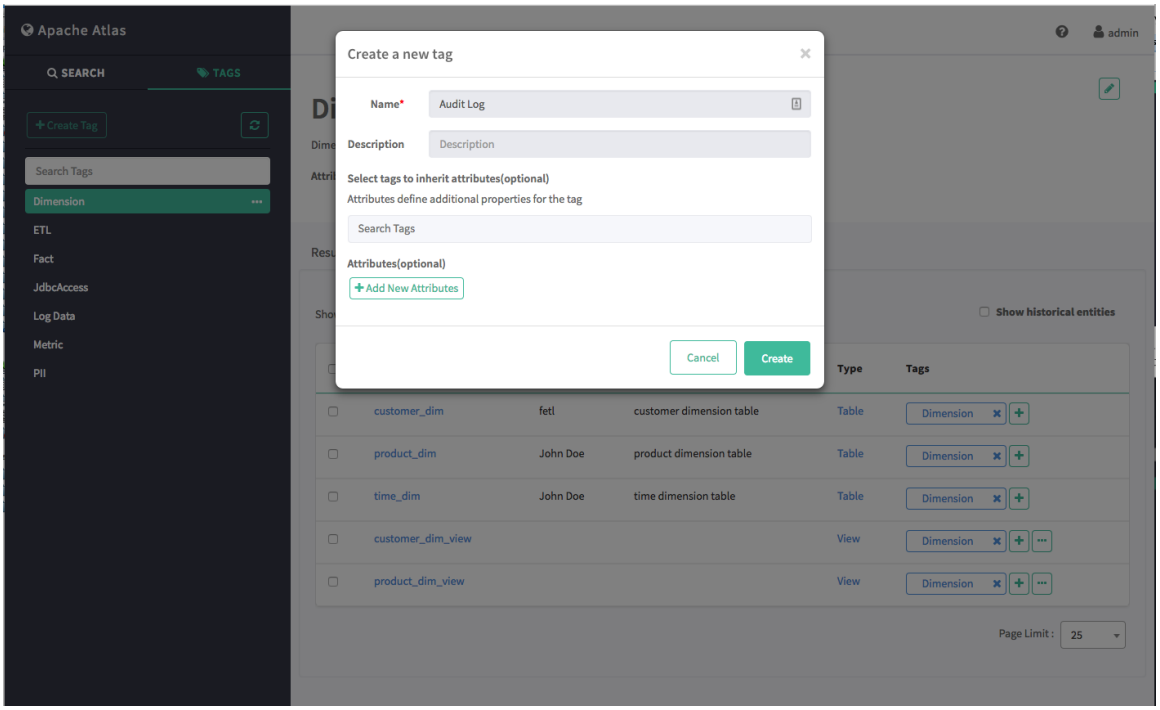
4. Working with Atlas Tags

4.1. Creating Atlas Tags

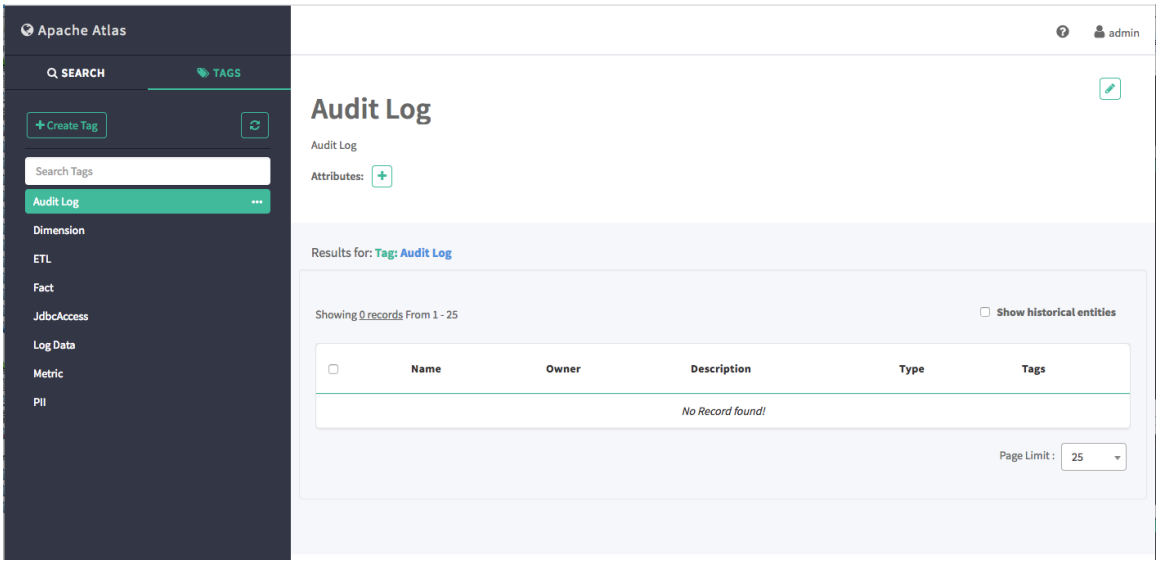
1. On the Atlas web UI, click **TAGS**, then click **Create Tag**.



2. On the Create a New Tag pop-up, type in a name and an optional description for the tag. You can use the **Select tags to inherit attributes** box to inherit attributes from other tags. Click **Add New Attribute** to add one or more new attributes to the tag. Click **Create** to create the new Tag.

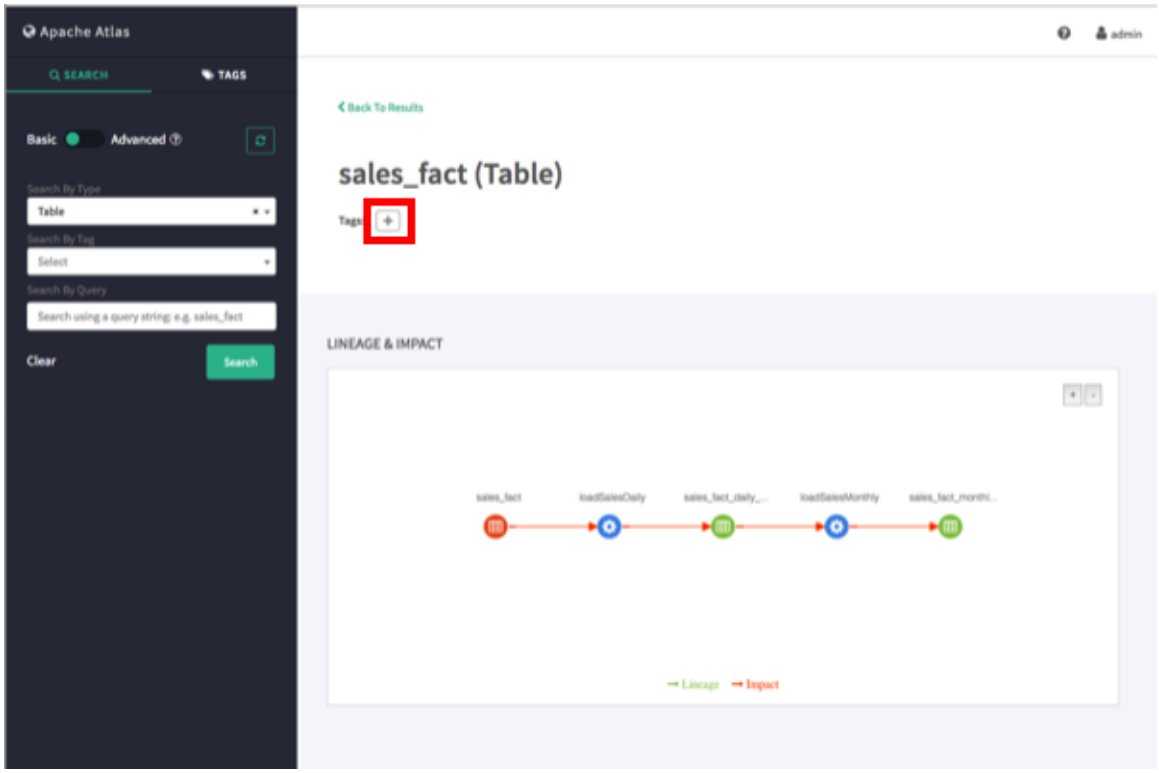


3. The new tag appears in the Tags list.

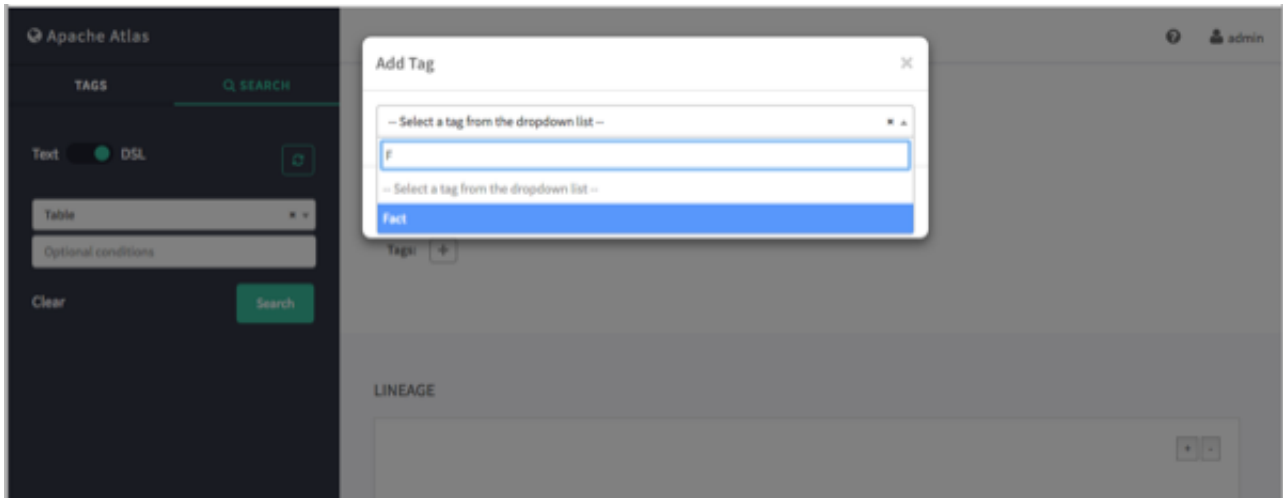


4.2. Associating Tags with Entities

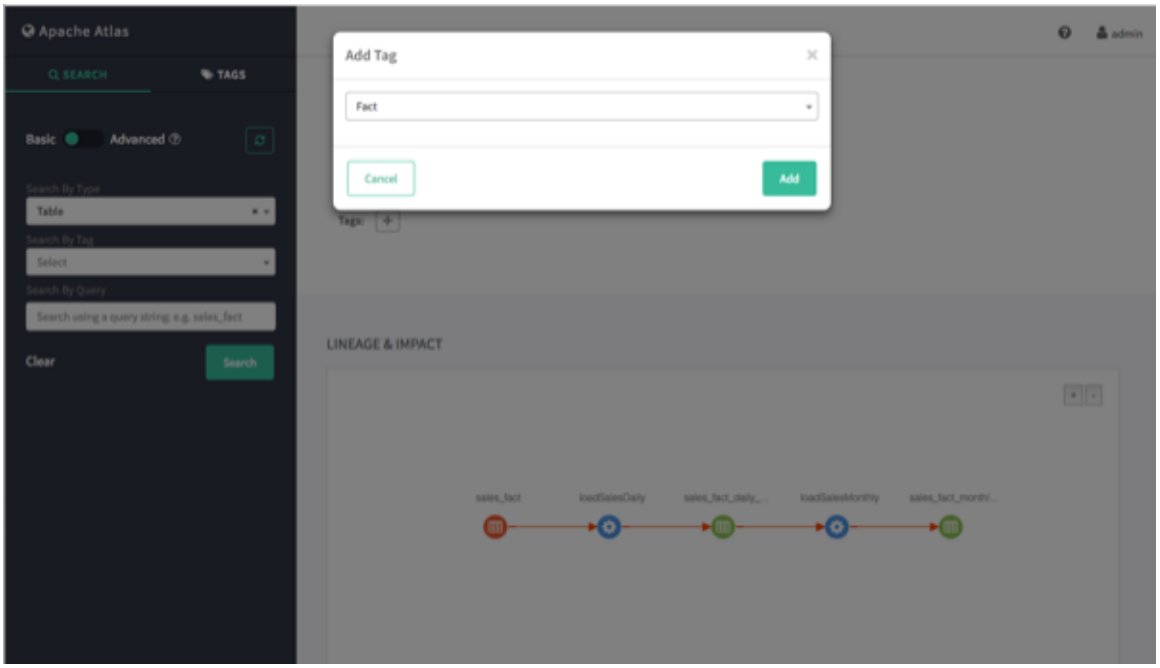
1. Select an asset. In the example below, we searched for all `Table` entities, and then selected the "sales_fact" table from the list of search results. To associate a tag with an asset, click the + icon next to the **Tags:** label.



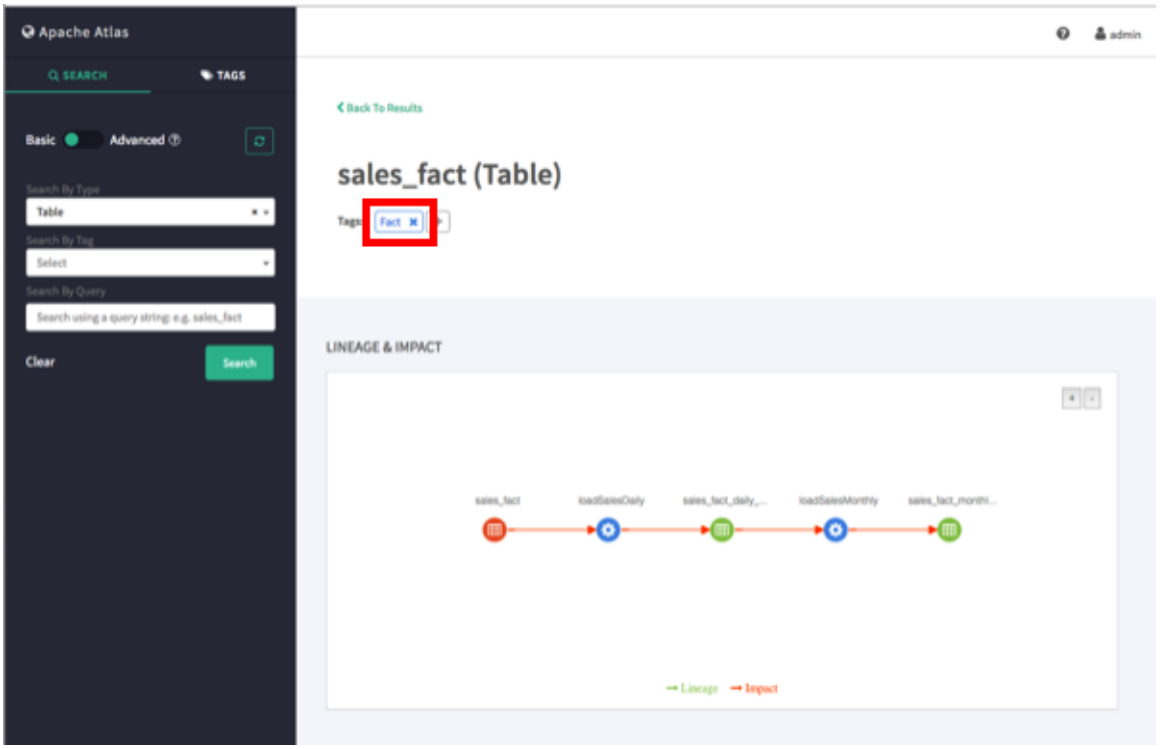
2. On the Add Tag pop-up, click **Select Tag**, then select the tag you would like to associate with the asset. You can filter the list of tags by typing text in the Select Tag box.



3. After you select a tag, the Add Tag pop-up is redisplayed with the selected tag. Click **Add** to associate the tag with the asset.

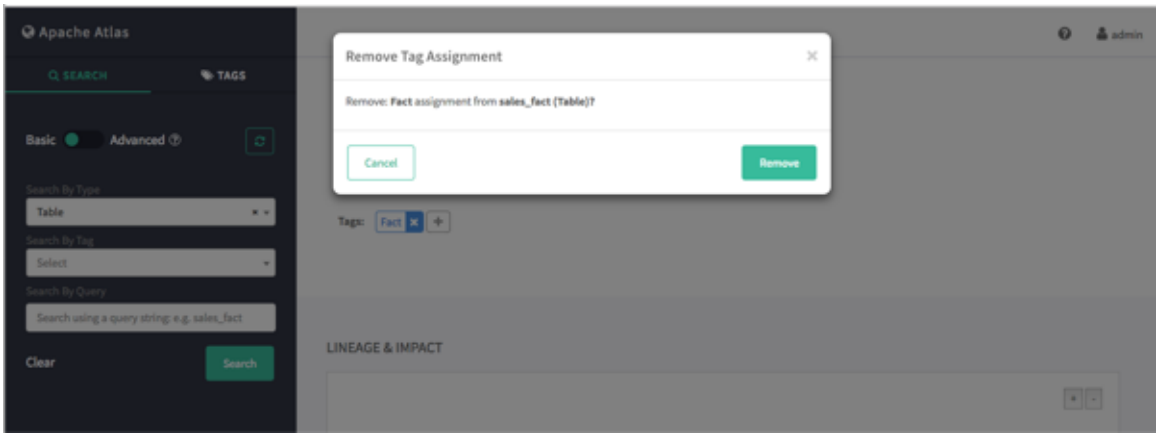


4. The new tag is displayed next to the **Tags:** label on the asset page.



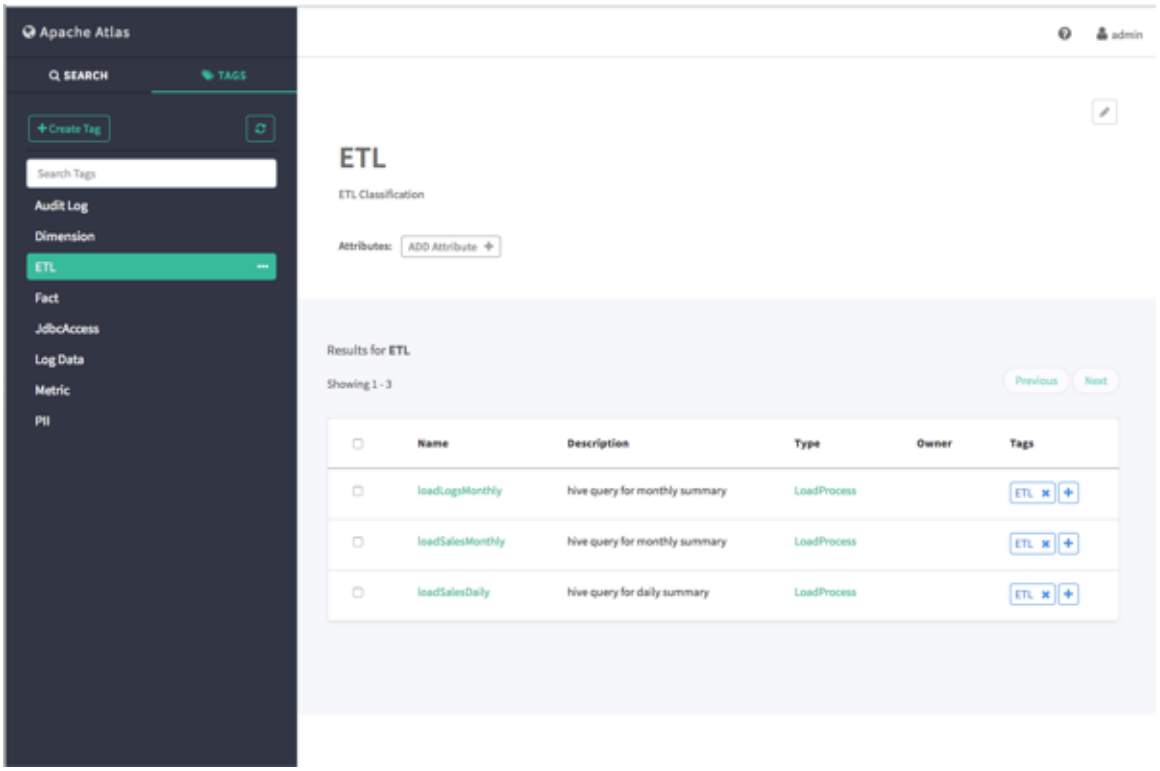
5. You can view details about a tag by clicking the tag name on the tag label.

   To remove a tag from an asset, click the **x** symbol on the tag label, then click **Remove** on the confirmation pop-up. This removes the tag association with the asset, but does not delete the tag itself.

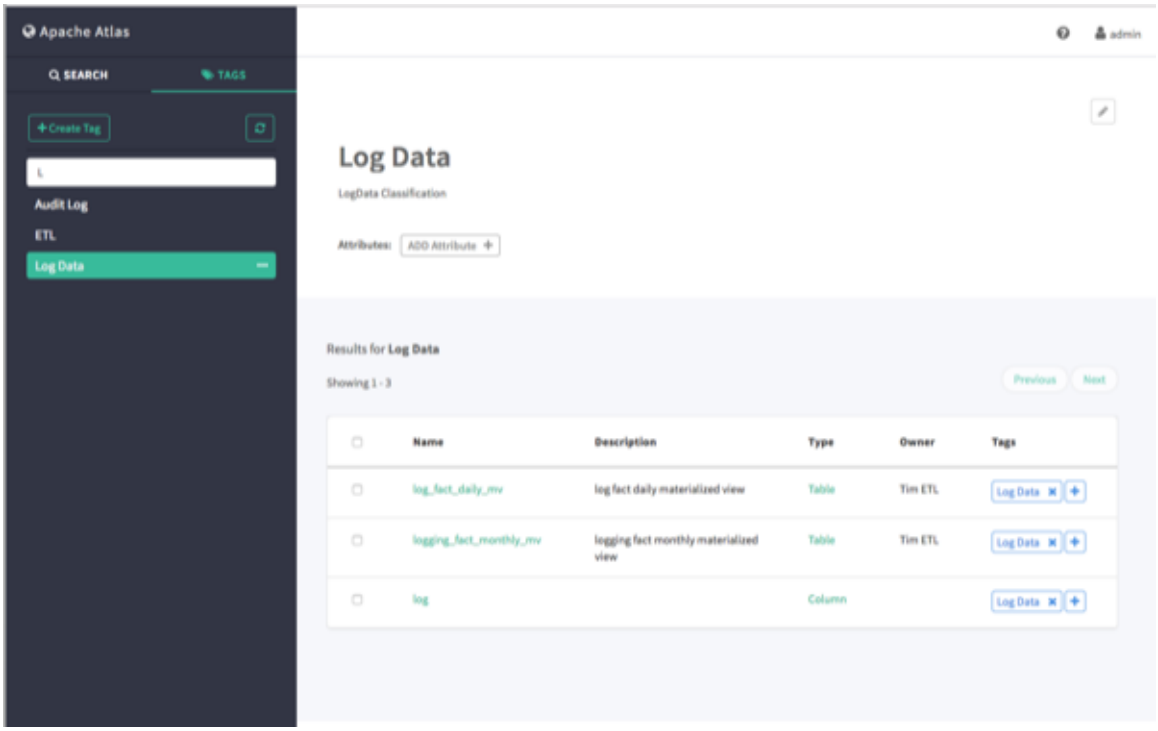


4.3. Searching for Entities Associated with Tags

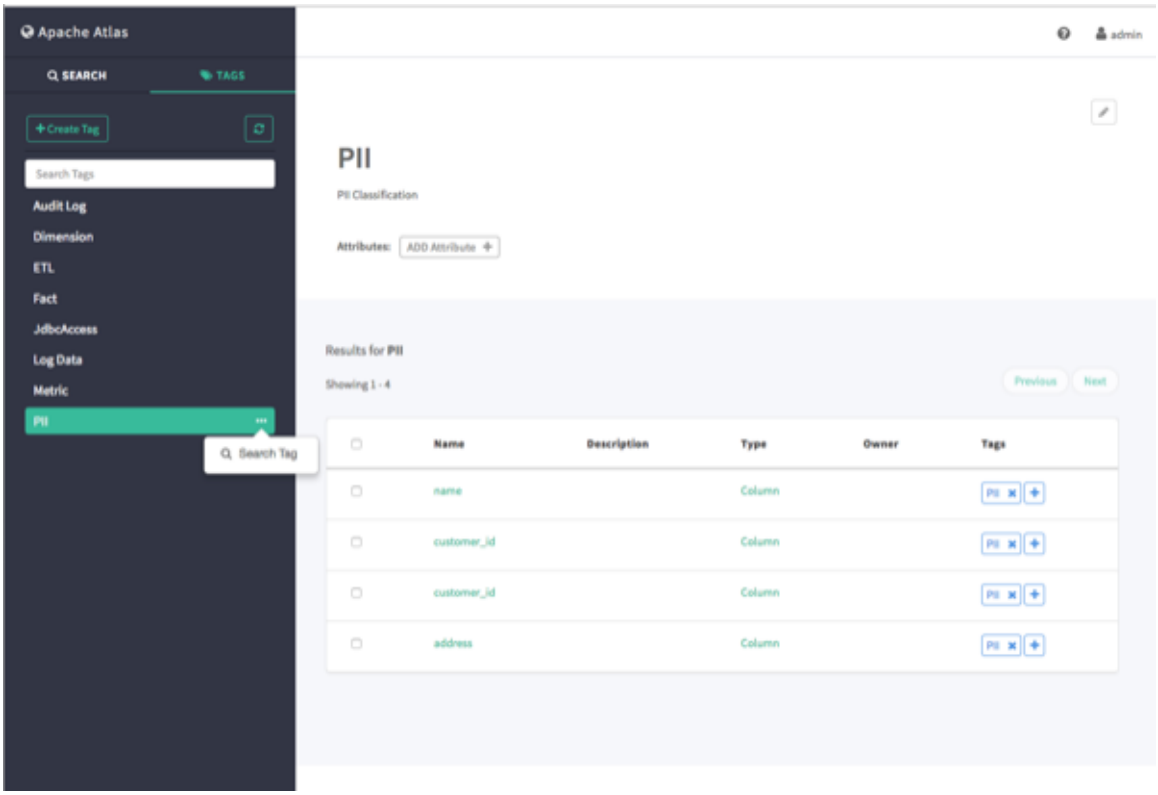
1. To display a list of all of the entities associated with a tag, click the tag name in the Atlas Tags list.



2. To filter the Tags list based on a text string, type the text in the Search Tags box. The list is filtered dynamically as you type to display the tags that contain that text string. You can then click a tag in the filtered list to display the entities associated with that tag.



3. You can also search for entities associated with a tag by clicking the ellipsis symbol for the tag and selecting **Search Tag**. This launches a DSL search query that returns a list of all entities associated with the tag.



5. Apache Atlas REST API

Apache Atlas exposes a variety of REST endpoints that enable you to work with types, entities, lineage, and data discovery. The following resources provide detailed information about the Apache Atlas REST API:

- Apache Atlas REST API
- Apache Atlas Swagger interactive Atlas REST API interface