Ranger Auditing

Date published:
Date modified:

https://docs.cloudera.com/

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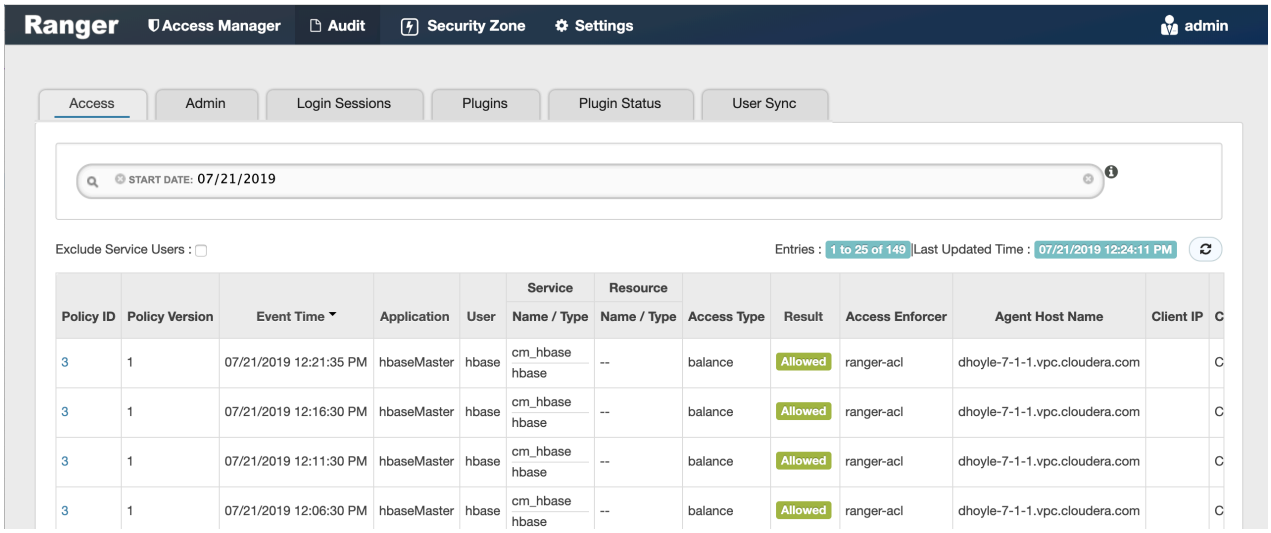
Audit Overview

Apache Ranger provides a centralized framework for collecting access audit history and reporting data, including filtering on various parameters. Ranger enhances audit information obtained from Hadoop components and provides insights through this centralized reporting capability.

Managing Auditing with Ranger

To explore options for auditing policies in Ranger, click Audit in the top menu.



There are six tabs on the Audit page:

- Access
- Admin
- Login sessions
- Plugins
- Plugin Status
- User Sync

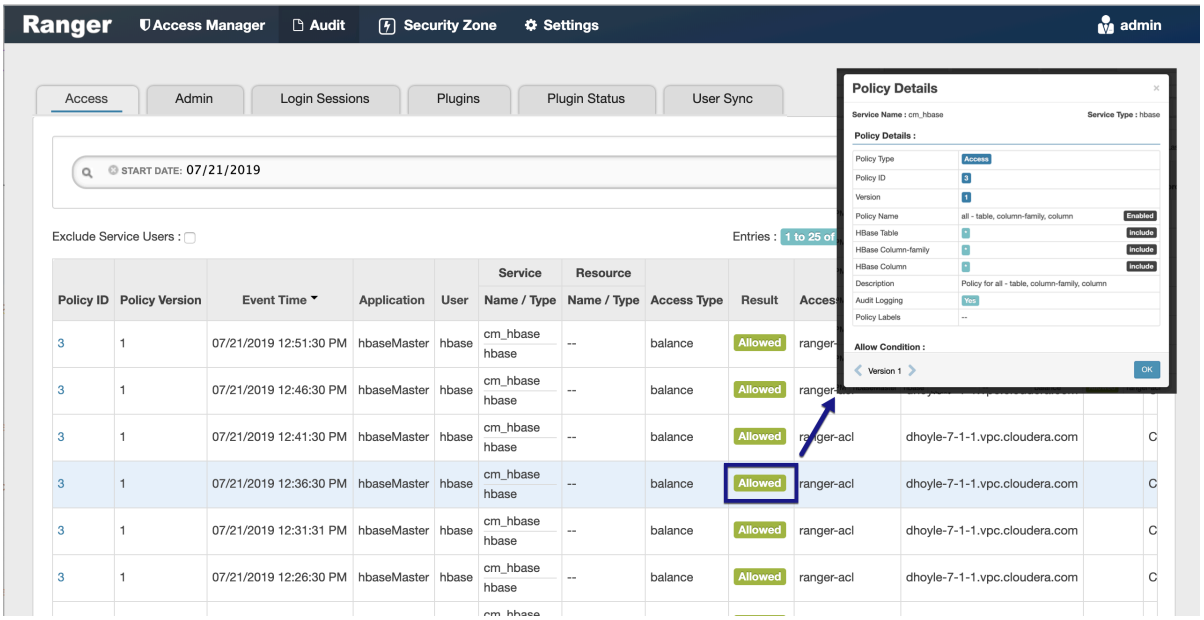
View audit details

How to view operation details in Ranger audits.

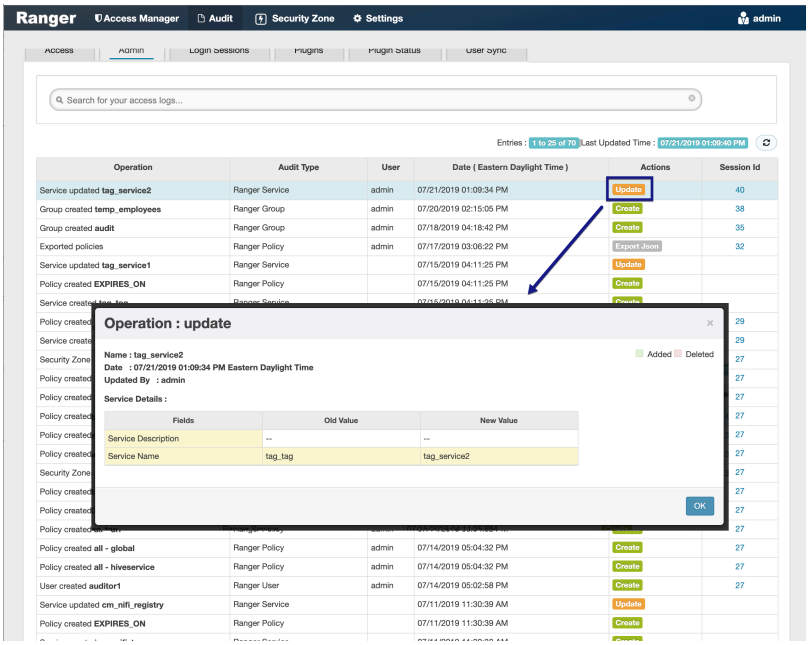
Procedure

To view details for a particular operation, click any tab, then Policy ID, Operation name, or Session ID.

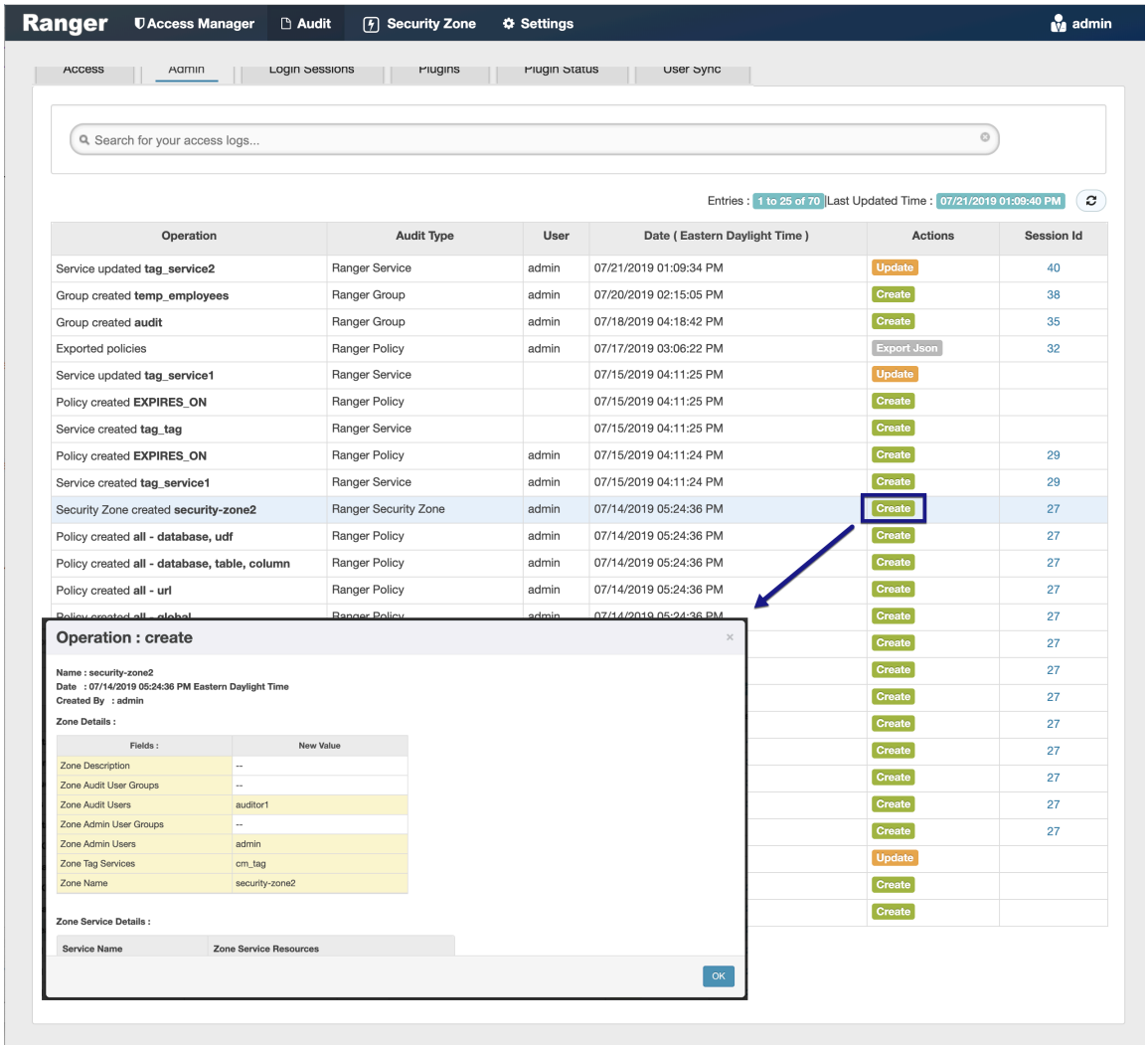
Audit > Access: HBase Table



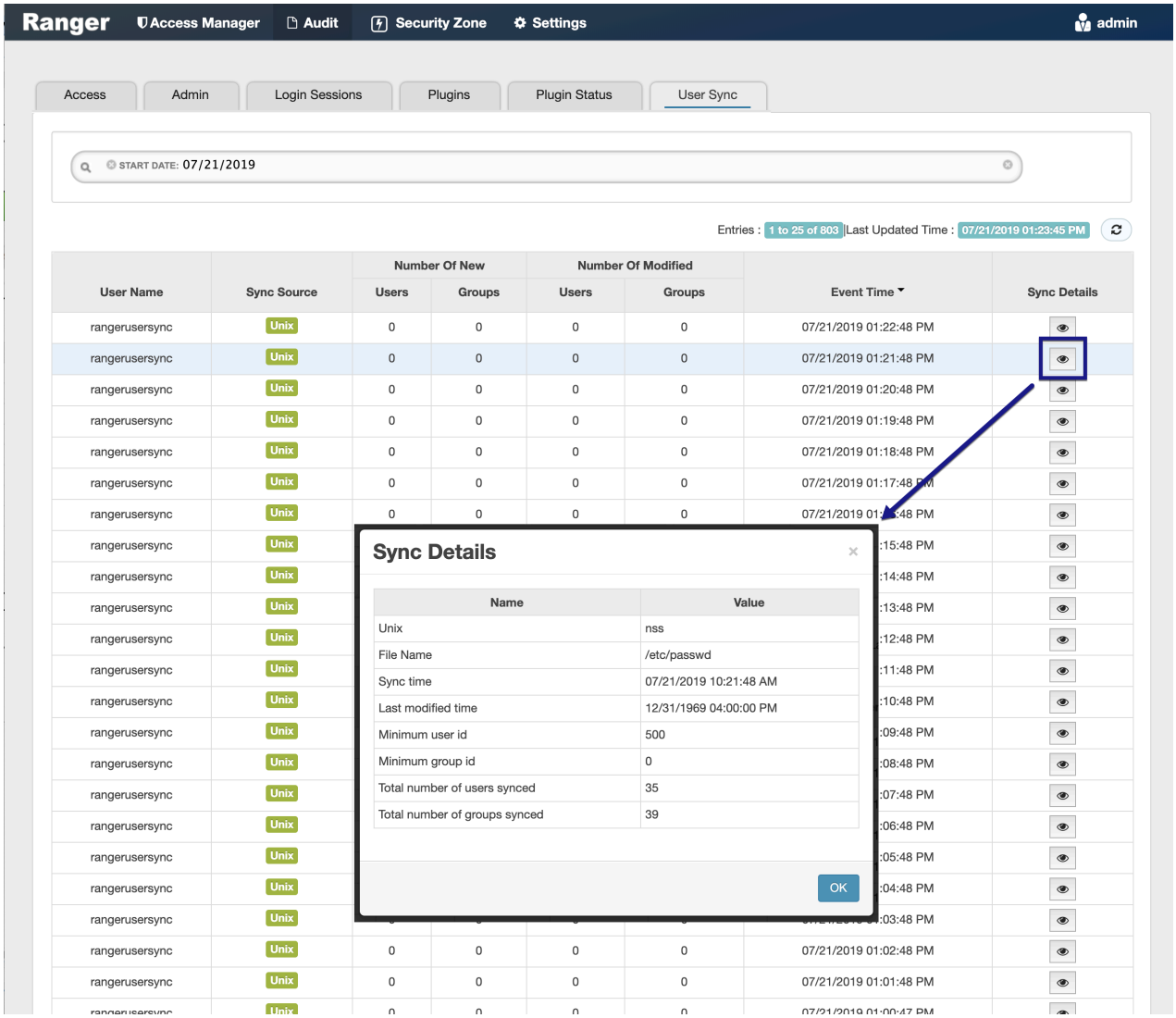
Audit > Admin: Update



Audit > Admin: Create



Audit > User Sync: Sync details



Create a read-only Admin user (Auditor)

Creating a read-only Admin user (Auditor) enables compliance activities because this user can monitor policies and audit events, but cannot make changes.

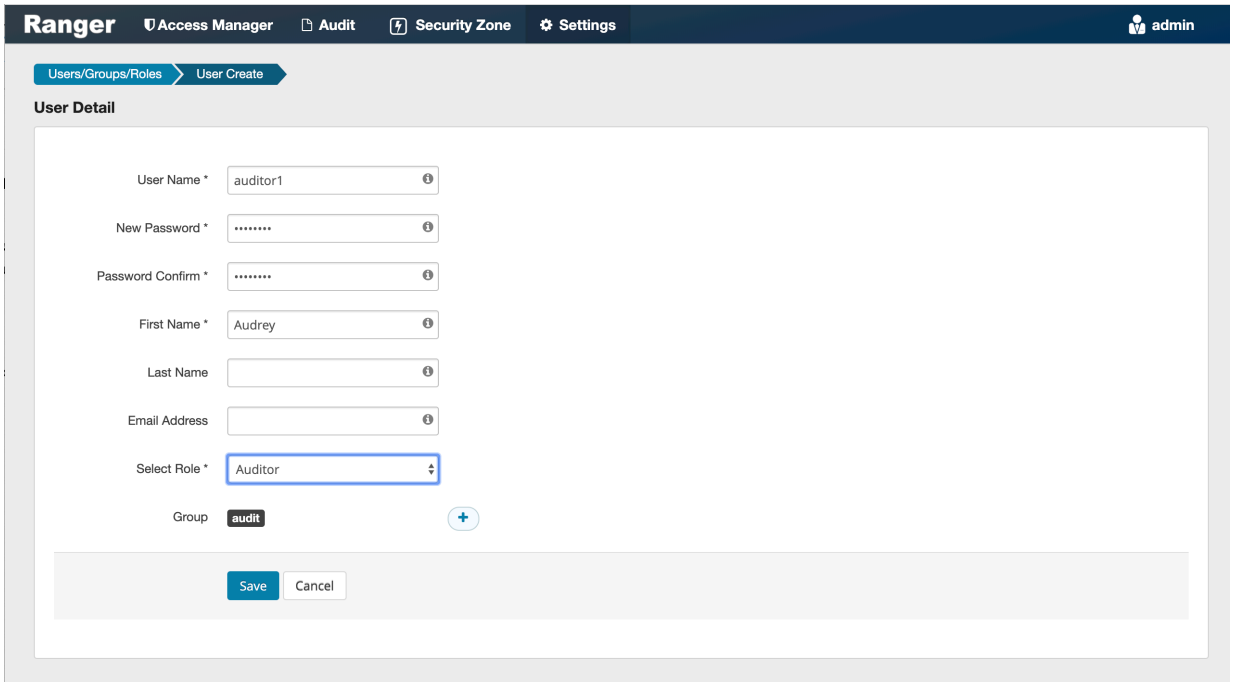
About this task

When a user with the Auditor role logs in, they see a read-only view of Ranger policies and audit events. An Auditor can search and filter on access audit events, and access and view all tabs under Audit to understand access events. They cannot edit users or groups, export/import policies, or make changes of any kind.

Procedure

1. Select Settings > Users/Groups/Roles.
2. Click Add New User.

3. Complete the **User Detail** section, selecting Auditor as the role:



4. Click Save.

Update Ranger audit configration parameters

How to change the default time settings that control how long Ranger keeps audit data collected by solr.

About this task

You can configure parameters that control how much data collected by solr that Ranger will store for auditing purposes.

Table 1: Ranger Audit Configuration Parameters

Parameter Name	Description	Default Setting	Units
ranger.audit.solr.config.ttl	Time To Live for Solr Collection of Ranger Audits	90	days
ranger.audit.solr.config.delete.trigger	Auto Delete Period in seconds for Solr Collection of Ranger Audits for expired documents	1	days (configurable)

Note: "Time To Live for Solr Collection of Ranger Audits" is also known as the Max Retention Days attribute.

Procedure

1. From Cloudera Manager choose Ranger Configuration .
2. In Search, type ranger.audit.solr.config, then press Return.
3. In ranger.audit.solr.config.ttl, set the the number of days to keep audit data.
4. In ranger.audit.solr.config.delete.trigger set the number and units (days, minutes, hours, or seconds) to keep data for expired documents

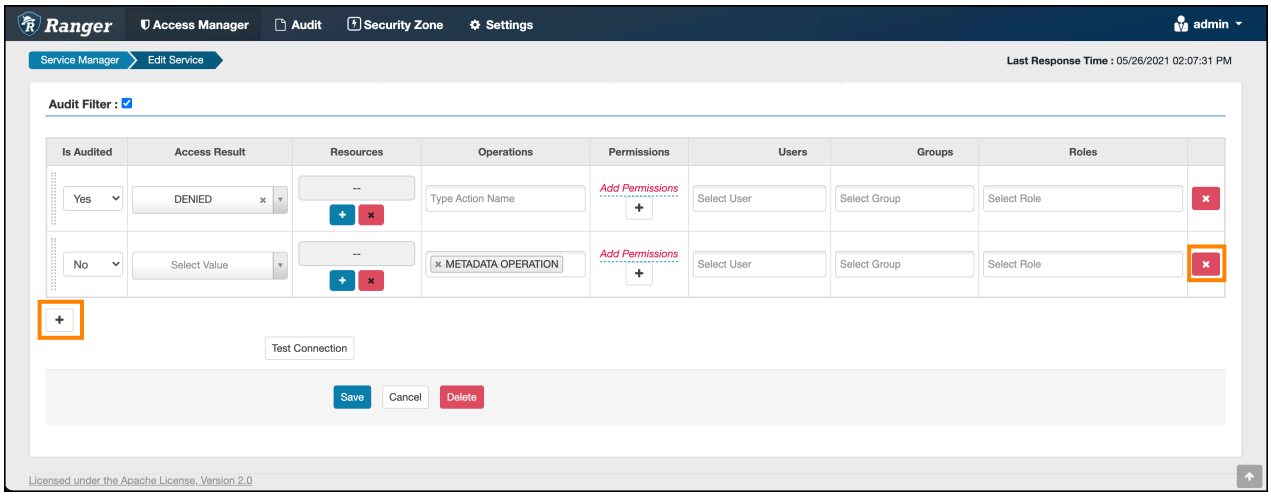
5. Refresh the configuration, using one of the following two options:
   a) Click Refresh Configuration, as prompted or, if Refresh Configuration does not appear,
   b) In Actions, click Update Solr config-set for Ranger, then confirm.

Ranger Audit Filters

You can use Ranger audit filters to control the amount of audit log data collected and stored on your cluster.

About Ranger audit filters

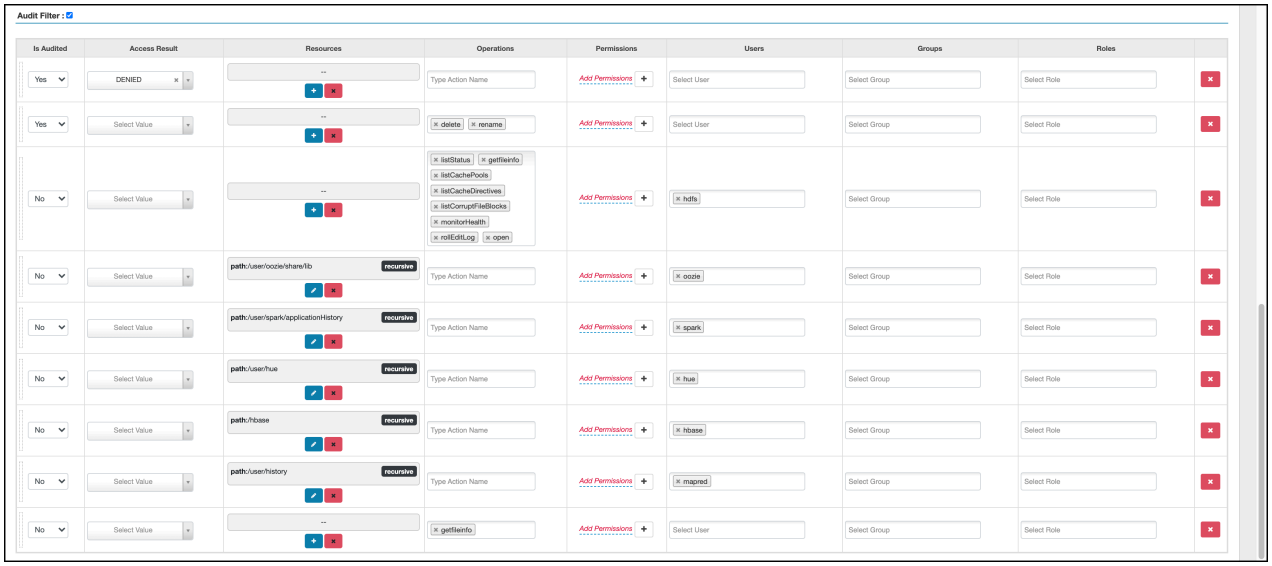
Ranger audit filters allow you to control the amount of audit log data for each Ranger service. Audit filters are defined using a JSON string that is added to each service configuration. The audit filter JSON string is a simplified form of the Ranger policy JSON. Audit filters appear as rows in the Audit Filter section of the Edit Service view for each service. The set of audit filter rows defines the audit log policy for the service. For example, the default audit log policy for the Hadoop SQL service appears in the in the Ranger Admin web UI Service Manager Edit Service when you scroll down to Audit Filter. Audit filter is checked (visible) by default. In this example, the top row defines an audit filter that causes all instances of "access denied" to appear in audit logs. The lower row defines a filter that causes no metadata operations to appear in audit logs. These two filters comprise the default audit filter policy for the Hadoop SQL service.



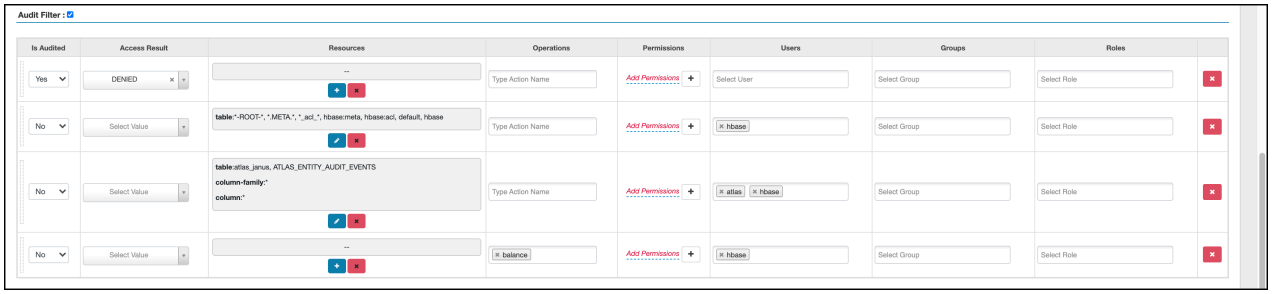
Default audit filters

Default audit filters for the following Ranger service appear in the Edit Services and can then be modified as needed by Admin users.

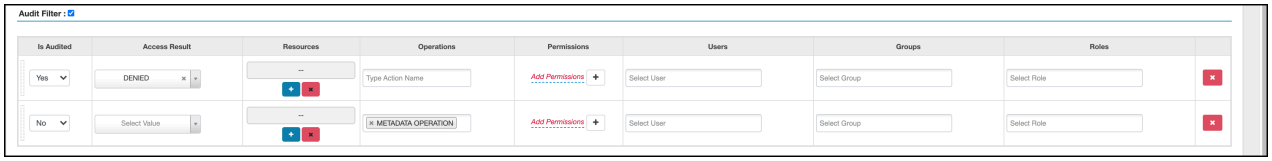
HDFS service:



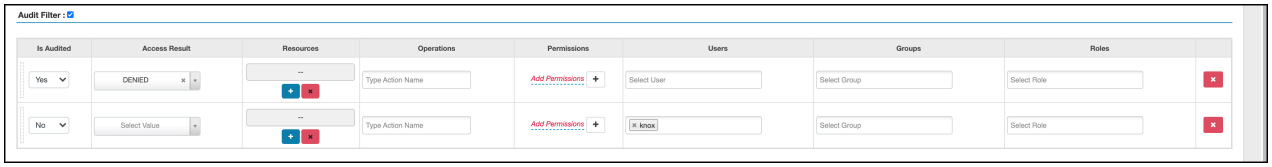
HBase service:



Hadoop SQL service:

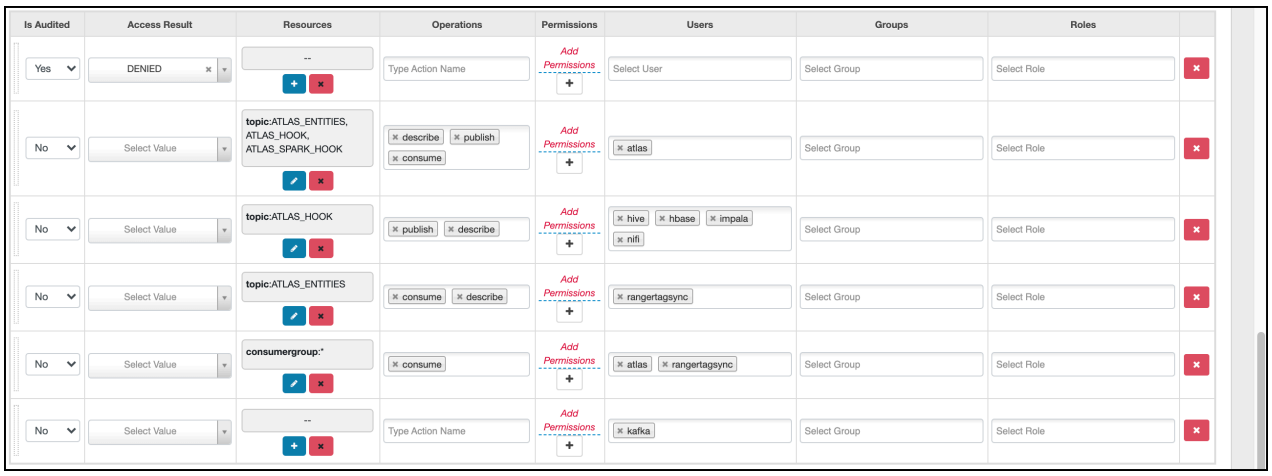


Knox service

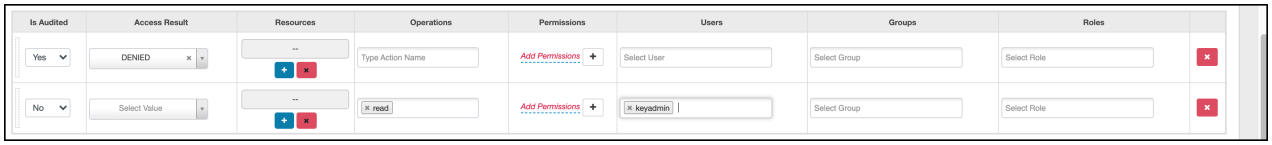


Solr service

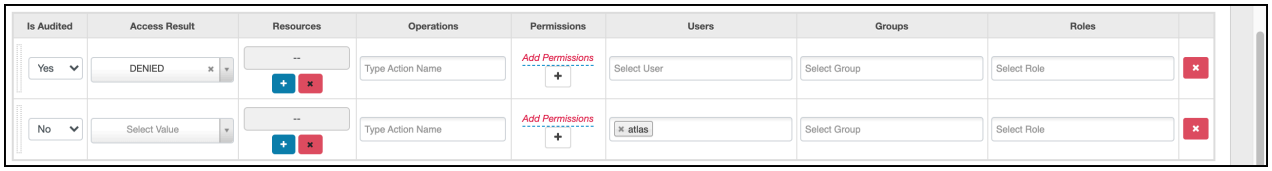
Kafka service:



KMS service



Atlas service



Ozone service

Tag-based service

Default audit filter policies do not exist for Yarn, NiFi, NiFi Registry, Kudu, or schema registry services.

Ranger audit filter policy configuration

To configure an audit filter policy, click the Edit icon for either a resource-, or tag-based service in the Ranger Admin web UI. You configure a Ranger audit filter policy by adding (+), deleting (X), or modifying each audit filter row for the service. The preceding example shows the Add and Delete icons for each filter row. To configure each filter in the policy, use the controls in the filter row to edit filter properties. For example, you can configure:

Is Audited: choose Yes or No

to include or not include a filter in the audit logs for a service

Access Result: choose DENIED, ALLOWED, or NOT_DETERMINED

to include that access result in the audit log filter

Resources: Add or Delete a resource item

to include or remove the resource from the audit log filter

Operations: Add or Remove an action name

to include the action/operation in the audit log filter

(click x to remove an existing operation)

Permissions: Add or Remove permissions

1. Click + in Permissions to open the Add dialog.
2. Select/Unselect required permissions.

For example, in HDFS service select read, write, execute, or All permissions.

Users: click Select User to see a list of defined users

to include one or multiple users in the audit log filter

Groups: click Select Group to see a list of defined groups

to include one or multiple groups in the audit log filter

Roles: click Select Role to see a list of defined roles

to include one or multiple roles in the audit log filter

Audit filter details

- When you save the UI selections described in the preceding list, audit filters are defined as a JSON list. Each service references a unique list.
- For example, ranger.plugin.audit.filters for the HDFS service includes:

```
[
                    {
                    "accessResult":"DENIED",
                    "isAudited":true
                    },
                    {
                    "users":[
                    "unaudited-user1"
                    ],
                    "groups":[
                    "unaudited-group1"
                    ],
                    "roles":[
                    "unaudited-role1"
                    ],
                    "isAudited":false
                    },
                    {
                    "actions":[
                    "listStatus",
                    "getfileinfo"
                    ],
                    "accessTypes":[
                    "execute"
                    ],
                    "isAudited":false
                    },
                    {
                    "resources":{
                    "path":{
                    "values":[
                    "/audited"
                    ],
                    "isRecursive":true
                    }
                    },
                    "isAudited":true
                    },
```

```
{
"resources":{
"path":{
"values":[
"/unaudited"
],
"isRecursive":true
}
},
"isAudited":false
}
]
```

- Each value in the list is an audit filter, which takes the format of a simplified Ranger policy, along with access results fields.
- Audit filters are defined with rules on Ranger policy attributes and access result attributes.
  - Policy attributes: resources, users, groups, roles, accessTypes
  - Access result attributes: isAudited, actions, accessResult
- The following audit filter specifies that accessResult=DENIED will be audited.

  The isAudited flag specifies whether or not to audit.

  ```
  {"accessResult":"DENIED","isAudited":true}
  ```
- The following audit filter specifies that “resource => /unaudited” will not be audited.

  ```
  {"resources":{"path":{"values":["/
  unaudited"],"isRecursive":true}},"isAudited":false}
  ```
- The following audit filter specifies that access to resource database=> sys table=> dump by user “use2” will not be audited.

  ```
  {"resources":{"database":{"values":["sys"]},"table":{"values":
  ["dump"]}},"users":["user2"],"isAudited":false}
  ```
- The following audit filter specifies that access result in actions => listStatus, getfileInfo and accessType => execute will not be audited.

  ```
  {"actions":["listStatus","getfileinfo"],"accessTypes":
  ["execute"],"isAudited":false}
  ```
- The following audit filter specifies that access by user "superuser1" and group "supergroup1" will not be audited.

  ```
  {"users":["superuser1"],"groups":["supergroup1"],"isAudited":false}
  ```
- The following audit filter specifies that access to any resource tagged as NO_AUDIT will not be audited.

  ```
  {"resources":{"tag":{"values":["NO_AUDIT"]}},"isAudited":false}
  ```

Changing Ranger audit storage location and migrating data

How to change the location of existing and future Ranger audit data collected by Solr from HDFS to a local file system or from a local file system to HDFS.

Before you begin

- Stop Atlas from Cloudera Manager.

- If using Kerberos, set the SOLR_PROCESS_DIR environment variable.

```
# export SOLR_PROCESS_DIR=$(ls -1dtr /var/run/cloudera-scm-agent/process/
*SOLR_SERVER | tail -1)
```

About this task

Starting with Cloudera Runtime version 7.1.4 / 7.2.2, the storage location for ranger audit data collected by Solr changed to local file system from HDFS, as was true for previous versions. The default storage location Ranger audit data storage location for Cloudera Runtine-7.1.4+ and Cloudera Runtine-7.2.2+ installations is local file system. After upgrading from an earlier Cloudera platform version, follow these steps to backup and migrate your Ranger audit data and change the location where Solr stores your future Ranger audit records.

- The default value of the index storage in the local file system is /var/lib/solr-infra. You can configure this, using Cloudera Manager Solr Configuration "Solr Data Directory" .
- The default value of the index storage in HDFS is /solr-infra. You can configure this, using Cloudera Manager Solr Configuration "HDFS Data Directory" .

Procedure

1. Create HDFS Directory to store the collection backups.

   As an HDFS super user, run the following commands to create the backup directory:

   ```
   # hdfs dfs -mkdir /solr-backups
   # hdfs dfs -chown solr:solr /solr-backups
   ```
2. Obtain valid kerberos ticket for Solr user.

   ```
   # kinit -kt solr.keytab solr/$(hostname -f)
   ```
3. Download the configs for the collection.

   ```
   # solrctl instancedir --get ranger_audits /tmp/ranger_audits
   # solrctl instancedir --get atlas_configs /tmp/atlas_configs
   ```
4. Modify the solrconfig.xml for each of the configs for which data needs to be stored in HDFS.

   In /tmp/<config_name>/conf created during Step 3., edit properties in the solrconfig.xml file as follows:

   - When migrating your data storage location from a local file system to HDFS, replace these two lines:

     ```
     <directoryFactory name="DirectoryFactory"
      class="${solr.directoryFactory:solr.NRTCachingDirectoryFactory}">
     <lockType>${solr.lock.type:native}</lockType>
     ```

     with

     ```
     <directoryFactory name="DirectoryFactory"
      class="${solr.directoryFactory:org.apache.solr.core.HdfsDirectoryFactory}">
     <lockType>${solr.lock.type:hdfs}</lockType>
     ```
   - When migrating your data storage location from HDFS to a local file system, replace these two lines:

     ```
     <directoryFactory name="DirectoryFactory"
      class="${solr.directoryFactory:org.apache.solr.core.HdfsDirectoryFactory}">
     <lockType>${solr.lock.type:hdfs}</lockType>
     ```

     with

     ```
     <directoryFactory name="DirectoryFactory"
      class="${solr.directoryFactory:solr.NRTCachingDirectoryFactory}">
     <lockType>${solr.lock.type:native}</lockType>
     ```

5. Update the modified configs in Zookeeper.

```
# solrctl --jaas $SOLR_PROCESS_DIR/jaas.conf instancedir --update
 atlas_configs /tmp/atlas_configs
# solrctl --jaas $SOLR_PROCESS_DIR/jaas.conf instancedir --update
 ranger_audits /tmp/ranger_audits
```

6. Backup the Solr collections.

- When migrating your data storage location from a local file system to HDFS, run:

```
# curl -k --negotiate -u : "https://$(hostname
 -f):8995/solr/admin/collections?action=BACKUP&name=vertex_backup&col
lection=vertex_index&
location=hdfs://<Namenode_Hostname>:8020/solr-backups"
```

  In the preceding command, the important points are name, collection, and location:

  name

  specifies the name of the backup. It should be unique per collection

  collection

  specifies the collection name for which the backup will be performed

  location

  specifies the HDFS path, where the backup will be stored

  Repeat the curl command for different collections, modifying the parameters as necessary for each collection.

  The expected output would be -

```
"responseHeader":{
 "status":0,
 "QTime":10567},
"success":{
 "Solr_Server_Hostname:8995_solr":{
   "responseHeader":{
   "status":0,
   "QTime":8959}}}}
```

- When migrating your data storage location from HDFS to a local file system:

  Refer to Back up a Solr collection for specific steps, and make the following adjustments:

  - If TLS is enabled for the Solr service, specify the trust store and password by using the ZKCLI_JVM_FLAGS environment variable before you begin the procedure.

```
# export ZKCLI_JVM_FLAGS="-Djavax.net.ssl.trustStore=/path/to/
truststore.jks -Djavax.net.ssl.trustStorePassword="
```

  - Create Snapshot

```
# solrctl --jaas $SOLR_PROCESS_DIR/jaas.conf collection --create-
snapshot <snapshot_name> -c <collection_name>
```

  - or use the Solr API to take the backup:

```
curl -i -k --negotiate -u : "https://(hostname -f):8995/solr/admin/
collections?
```

```
action=BACKUP&name=ranger_audits_bkp&collection=ranger_audits&location=/
path/to/solr-backups"
```

- Export Snapshot

```
# solrctl --jaas $SOLR_PROCESS_DIR/jaas.conf collection
 --export-snapshot <snapshot_name> -c <collection_name> -d
 <destination_directory>
```

Note: The <destination_directory> is a HDFS path. The ownership of this directory should be solr:solr.

7. Delete the collections from the original location.

   All instances of Solr service should be up, running, and healthy before deleting the collections. Use Cloudera Manager to check for any alerts or warnings for any of the instances. If alerts or warnings exist, fix those before deleting the collection.

```
# solrctl collection --delete edge_index
# solrctl collection --delete vertex_index
# solrctl collection --delete fulltext_index
# solrctl collection --delete ranger_audits
```

8. Verify that the collections are deleted from the original location.

```
# solrctl collection --list
```

   This will give an empty result.

9. Verify that no leftover directories for any of the collections have been deleted.

   - When migrating your data storage location from a local file system to HDFS:

```
# cd /var/lib/solr-infra
```

     Get the value of "Solr Data Directory, using Cloudera Manager Solr Configuration .

```
# ls -ltr
```

   - When migrating your data storage location from HDFS to a local file system, replace these two lines:

```
# hdfs dfs -ls /solr/<collection_name>
```

Note: If any directory name which starts with the collection name deleted in Step 7. exists, delete/move the directory to another path.

10. Restore the collection from backup to the new location.

    Refer to Restore a Solr collection, for more specific steps.

```
# curl -k --negotiate -u : "https://$(hostname
 -f):8995/solr/admin/collections?
action=RESTORE&name=<Name_of_backup>&location=hdfs:/
<<Namenode_Hostname>:8020/solr-backups&collection=<Collection_Name>"
```

```
# solrctl collection --restore ranger_audits
 -l hdfs://<Namenode_Hostname>:8020/solr-backups
```

```
 -b ranger_backup -i ranger1
```

The request id must be unique for each restore operation, as well as for each retry.

To check the status of restore operation:

```
# solrctl collection --request-status <requestId>
```

Note: If the Atlas Collections (vertex_index, fulltext_index and edge_index) restore operations fail, restart the solr service and rerun the restore command. Now, the restart operations should complete successfully.

11. Verify the Atlas & Ranger functionality.

Verify that both Atlas and Ranger audits functions properly, and that you can see the latest audits in Ranger Web UI and latest lineage in Atlas.

- To verify Atlas audits, create a test table in Hive, and then query the collections to see if you are able to view the data.
- You can also query the collections every 20-30 seconds (depending on how other services utilize Atlas/ Ranger), and verify if the "numDocs" value increases at every query.

```
# curl -k --negotiate -u : "https://$(hostname -f):8995/solr/edge_index/
select?q=*%3A*&wt=json&ident=true&rows=0"
# curl -k --negotiate -u : "https://$(hostname -f):8995/solr/vertex_index/
select?q=*%3A*&wt=json&ident=true&rows=0"
# curl -k --negotiate -u : "https://$(hostname -f):8995/solr/
fulltext_index/select?q=*%3A*&wt=json&ident=true&rows=0"
# curl -k --negotiate -u : "https://$(hostname -f):8995/solr/
ranger_audits/select?q=*%3A*&wt=json&ident=true&rows=0"
```