

Configuring and Using Hive-HDFS ACL Sync

Date published: 2020-07-28

Date modified: 2021-12-13



Legal Notice

© Cloudera Inc. 2024. All rights reserved.

The documentation is and contains Cloudera proprietary information protected by copyright and other intellectual property rights. No license under copyright or any other intellectual property right is granted herein.

Unless otherwise noted, scripts and sample code are licensed under the Apache License, Version 2.0.

Copyright information for Cloudera software may be found within the documentation accompanying each component in a particular release.

Cloudera software includes software from various open source or other third party projects, and may be released under the Apache Software License 2.0 (“ASLv2”), the Affero General Public License version 3 (AGPLv3), or other license terms. Other software included may be released under the terms of alternative open source licenses. Please review the license and notice files accompanying the software for additional licensing information.

Please visit the Cloudera software product page for more information on Cloudera software. For more information on Cloudera support services, please visit either the Support or Sales page. Feel free to contact us directly to discuss your specific needs.

Cloudera reserves the right to change any products at any time, and without notice. Cloudera assumes no responsibility nor liability arising from the use of products, except as expressly agreed to in writing by Cloudera.

Cloudera, Cloudera Altus, HUE, Impala, Cloudera Impala, and other Cloudera marks are registered or unregistered trademarks in the United States and other countries. All other trademarks are the property of their respective owners.

Disclaimer: EXCEPT AS EXPRESSLY PROVIDED IN A WRITTEN AGREEMENT WITH CLOUDERA, CLOUDERA DOES NOT MAKE NOR GIVE ANY REPRESENTATION, WARRANTY, NOR COVENANT OF ANY KIND, WHETHER EXPRESS OR IMPLIED, IN CONNECTION WITH CLOUDERA TECHNOLOGY OR RELATED SUPPORT PROVIDED IN CONNECTION THEREWITH. CLOUDERA DOES NOT WARRANT THAT CLOUDERA PRODUCTS NOR SOFTWARE WILL OPERATE UNINTERRUPTED NOR THAT IT WILL BE FREE FROM DEFECTS NOR ERRORS, THAT IT WILL PROTECT YOUR DATA FROM LOSS, CORRUPTION NOR UNAVAILABILITY, NOR THAT IT WILL MEET ALL OF CUSTOMER’S BUSINESS REQUIREMENTS. WITHOUT LIMITING THE FOREGOING, AND TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, CLOUDERA EXPRESSLY DISCLAIMS ANY AND ALL IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY, QUALITY, NON-INFRINGEMENT, TITLE, AND FITNESS FOR A PARTICULAR PURPOSE AND ANY REPRESENTATION, WARRANTY, OR COVENANT BASED ON COURSE OF DEALING OR USAGE IN TRADE.

Contents

Ranger RMS - HIVE-HDFS ACL Sync Overview.....	4
Analyzing Ranger RMS resources.....	6
How to full sync the Ranger RMS database.....	7
Configure High Availability for Hive-HDFS ACL Sync.....	8
Configure Hive-HDFS ACL Sync.....	14
Hive-HDFS ACL Sync Use Cases.....	15
Hive-HDFS ACL Sync Reference.....	17

Ranger RMS - HIVE-HDFS ACL Sync Overview

Ranger Resource Mapping Server (RMS) enables automatic translation of access policies from Hive to HDFS.

About Hive-HDFS Policy Sync

It is common to have different workloads use the same data – some require authorizations at the table level (Apache Hive queries) and others at the underlying files (Apache Spark jobs). Unfortunately, in such instances you would have to create and maintain separate Ranger policies for both Hive and HDFS, that correspond to each other.

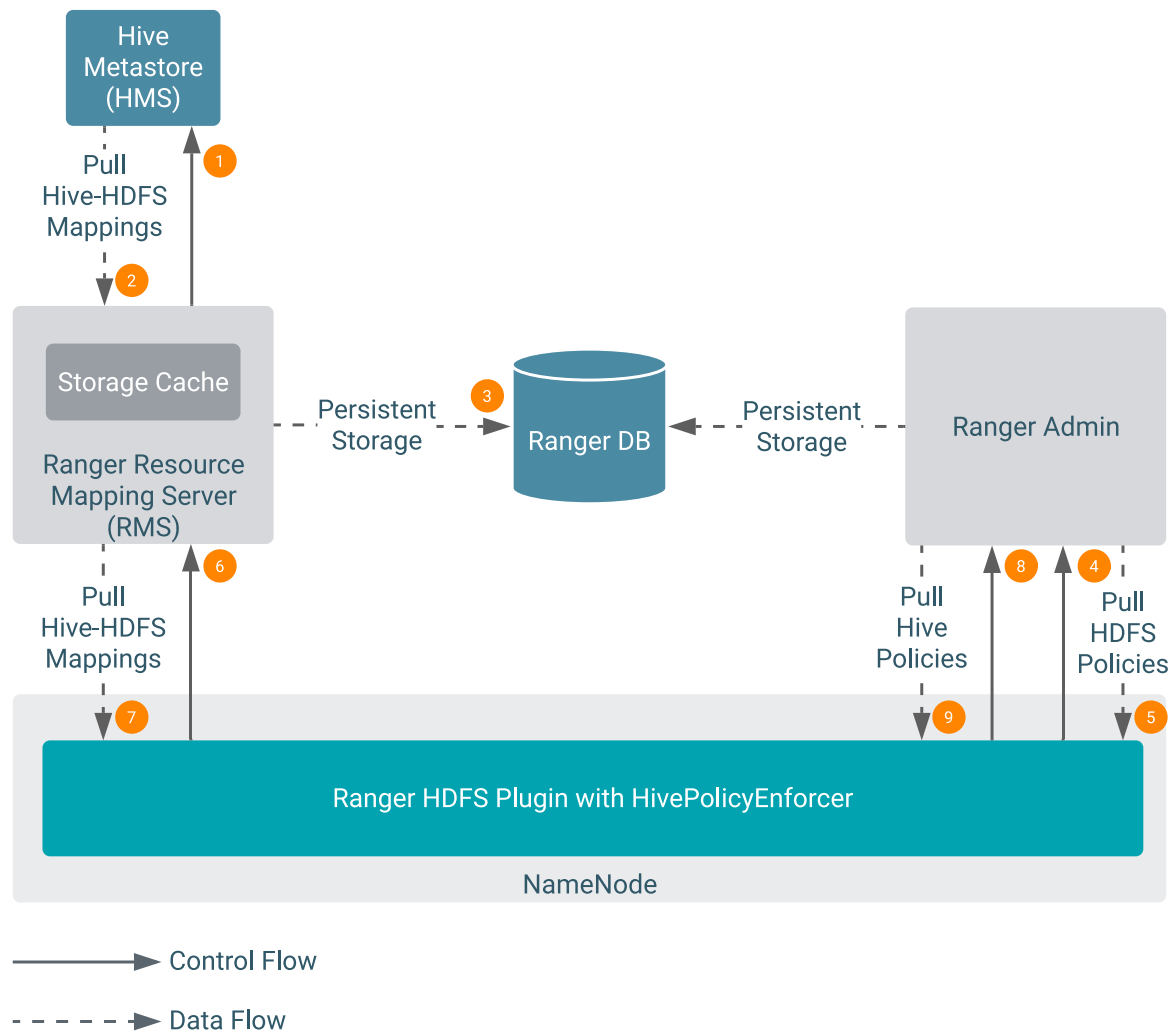
As a result, whenever a change is made on a Hive table policy, the data admin should make a consistent change in the corresponding HDFS policy. Failure to do so could result in security and/or data exposure issues. Ideally the data admin would set a single table policy, and the corresponding file access policies would automatically be kept in sync along with access audits, referring to the table policy that enforced it.

Legacy CDH users had a feature called the Hive-HDFS ACL sync which had Hive policies in Apache Sentry that automatically linked Hive permissions with HDFS ACLs. This was especially convenient for external table data used by Spark or Hive.

Prior to CDP 7.1.6, Ranger only supported manually managing Hive and HDFS policies separately. Ranger RMS (Resource Mapping Server) allows you to authorize access to HDFS directories and files using policies defined for Hive tables. RMS is the service that enables Hive-HDFS Policy Sync.

RMS periodically connects to the Hive Metastore and pulls Hive metadata (database-name, table-name) to HDFS file-name mapping. The Ranger HDFS Plugin (running in the NameNode) has been extended with an additional HivePolicyEnforcer module. The HDFS plugin downloads Hive policies from Ranger Admin, along with the mappings from Ranger RMS. HDFS access is determined by both HDFS policies and Hive policies.

Figure 1: Hive-HDFS ACL Sync using Ranger RMS



Phase I (items 1-3 above)

Ranger RMS periodically connects to the Hive Metastore and pulls Hive metadata (database-name, table-name) to HDFS file-name mapping.

Phase II (items 4-9 above)

The Ranger HDFS Plugin (running in the NameNode) periodically pulls HDFS policies from Ranger Admin. With the introduction of Ranger RMS, the Ranger HDFS Plugin (running in the NameNode) that has been extended with an additional HivePolicyEnforcer module. It now pulls down the Hive-HDFS mappings from RMS and Hive Policies from Ranger Admin.

After phase II completes, the requested HDFS access is determined in the NameNode by the HDFS and Hive policies defined by the Ranger Administrator.

Ranger RMS Assumptions and Limitations

- All partitions of a table are assumed to be under the location specified for the table. Therefore, table permissions will not authorize access to partitions that store data outside the location specified for the table. For example, if a table is located in a /warehouse/foo HDFS directory, all partitions of the table must have locations that are under the /warehouse/foo directory.

- The Ranger RMS service is not set up automatically when a CDP Private Cloud Base cluster is deployed. You must install and configure Ranger RMS separately.
- Ranger policies should be configured (with rangerms user access) before RMS is started and runs the first sync from the Hive Metastore (HMS).
- The Ranger RMS ACL-sync feature supports a single logical HMS, to evaluate HDFS access via Hive permissions. This is aligned with the Sentry implementation in CDH.
- Permissions granted on views (traditional and materialized) do not extend to HDFS access. This is aligned with the Sentry implementation in CDH.
- If a Private Cloud Base deployment supports multiple logical HMS with a single Ranger, Ranger ACL-sync works with only one logical HMS. Permissions granted on databases/tables in other logical HMS instances will not be considered to authorize HDFS access.
- Namenode memory requirements must be increased, based on the number of Hive table mappings downloaded to HDFS Ranger plugin. Additionally, maintaining Hive policies in memory cache will also require additional memory.
- Expect Namenode CPU load to increase, due to additional access evaluation performed to enforce Hive policies and periodic downloading and processing of the Hive table mappings. The latter increase is proportional to the number of table mappings downloaded to HDFS Ranger plugin.

Comparison with Sentry Hive HDFS ACL sync

The RMS ACL Sync feature resembles the Sentry HDFS ACL Sync feature in the way it downloads and keeps track of the Hive table to HDFS location mapping.

It differs from Sentry in the way it completely and transparently supports all features that Ranger policies express. Therefore, support for tag-based policies, security-zones, masking and row-filtering and audit logging is included with this implementation.

Also, the feature is enabled or disabled by a simple configuration on the HDFS side, allowing each installation the option of turning this feature on or off.

Related Information

[Installing Ranger RMS](#)

Analyzing Ranger RMS resources

You can use the tools described in this topic to analyze Ranger RMS issues.

About this task

In CDP 7.1.7 Ranger RMS installations, we have observed numerous identical resource-signatures with different IDs for a single Hive resource due to which evaluation of access policies can be slow. This topic provides a tool set you can use to analyze the database as well as the resource-mapping cache (.json) file to help identify resource data if such a problem exists. This tool set can also help determine whether the source of such duplicate entries is:

- incorrect entries in the Ranger database tables,
- incorrect in-memory cache in Ranger RMS server, or
- incorrect processing of resource-mapping deltas on the plugin side.

Procedure

1. The resource_mapping.json file can be located in the active NameNode host at /var/lib/ranger/hdfs/policy-cache/hdfs_cm_hive_resource_mapping.json path. To find duplicate resource-signatures in resource-mapping.json file:
 - a) Update the json file in readable format

```
python -m json.tool hdfs_cm_hive_resource_mapping.json > pretty_resource_mapping.json
```

- b) To find duplicate entries, use the following grep command:

```
grep -o -E 'resourceSignature.*,' pretty_resource_mapping.json | sort | uniq -c | grep -v '1 resourceSignature' > outputFile.txt
```

2. To find duplicate resource-signature entries in x_rms_service_resource table,

- a) Connect to Ranger database.

To check configured database; go to Cloudera Manager Ranger Configuration Database .

use either of the following queries:

```
select resource_signature, COUNT(resource_signature) from
x_rms_service_resource
group by resource_signature HAVING COUNT(resource_signature) > 1;
```

or

```
SELECT a.id, a.service_resource_elements_text,
a.resource_signature from x_rms_service_resource a where
a.resource_signature in
(select resource_signature from x_rms_service_resource
group by resource_signature HAVING COUNT(resource_signature) >
1) ORDER BY a.resource_signature;
```

3. To find total count of duplicate entries,

- a) use the following query:

```
select sum(occurrences) as total_occurrences from (select
resource_signature, COUNT(resource_signature) as occurrences
from x_rms_service_resource
group by resource_signature HAVING COUNT(resource_signature) > 1) tbl1;
```

How to full sync the Ranger RMS database

You must perform a full-sync of the Ranger RMS database after upgrading RMS to 7.1.8.

About this task

Performing a full-sync in Ranger RMS truncates all the existing data from RMS tables in the Ranger database. The sync process initiates a fresh synchronization from the Hive Metastore (HMS). All available tables and database metadata download from HMS and persist into the Ranger database.

Prior to CDP-7.1.7, Ranger RMS synchronizes only table metadata. Database metadata mappings were not downloaded from HMS. After migrating from CDP versions before CDP-7.1.7 to CDP 7.1.8+, only pre-existing table mappings will be available. Any newly created tables or database mappings will be synchronized in RMS. Any pre-existing database mappings will not be present.



Important: To ensure the pre-existing databases are mapped correctly, you must perform a full-sync after upgrading RMS to 7.1.8.

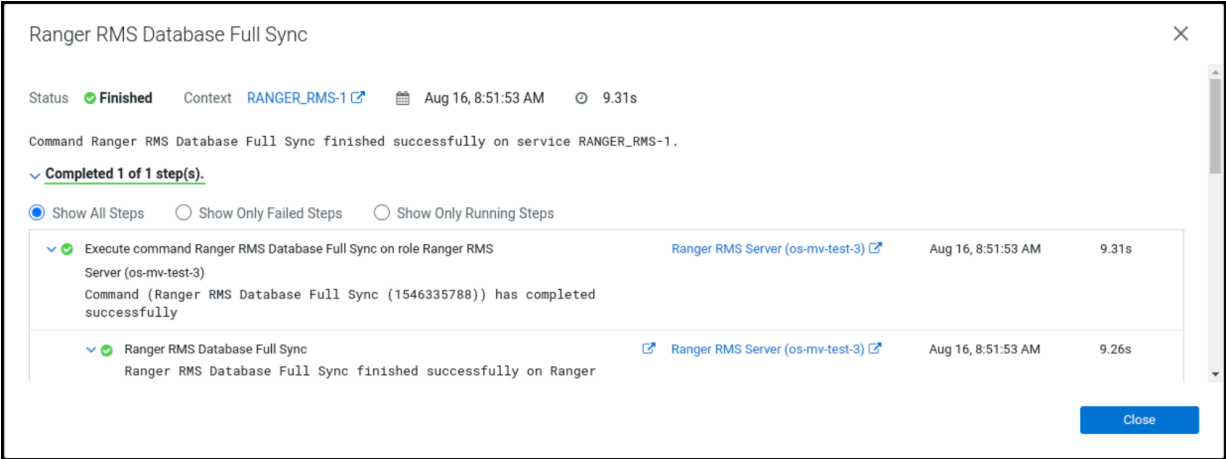
Before you begin

Have a (7.1.8) cluster with Ranger and Ranger RMS service up and running.

Procedure

- 1. In Cloudera Manager Ranger_RMS Actions , click Stop.
- 2. In Ranger_RMS Actions , click Ranger RMS Database Full Sync.
- 3. Confirm that the command completed successfully, as shown in the following example:

Figure 2: Confirming successful Ranger RMS database full sync



Note: You can also confirm the text - '[I] Truncate operation executed successfully on Ranger RMS tables' from the stderr log of the command from Cloudera Manager UI.

- 4. In Cloudera Manager Ranger_RMS , click Start.

Configure High Availability for Hive-HDFS ACL Sync

Use the following steps to configure high availability for the Ranger Resource Mapping Server (RMS) and Hive-HDFS ACL Sync.

Procedure

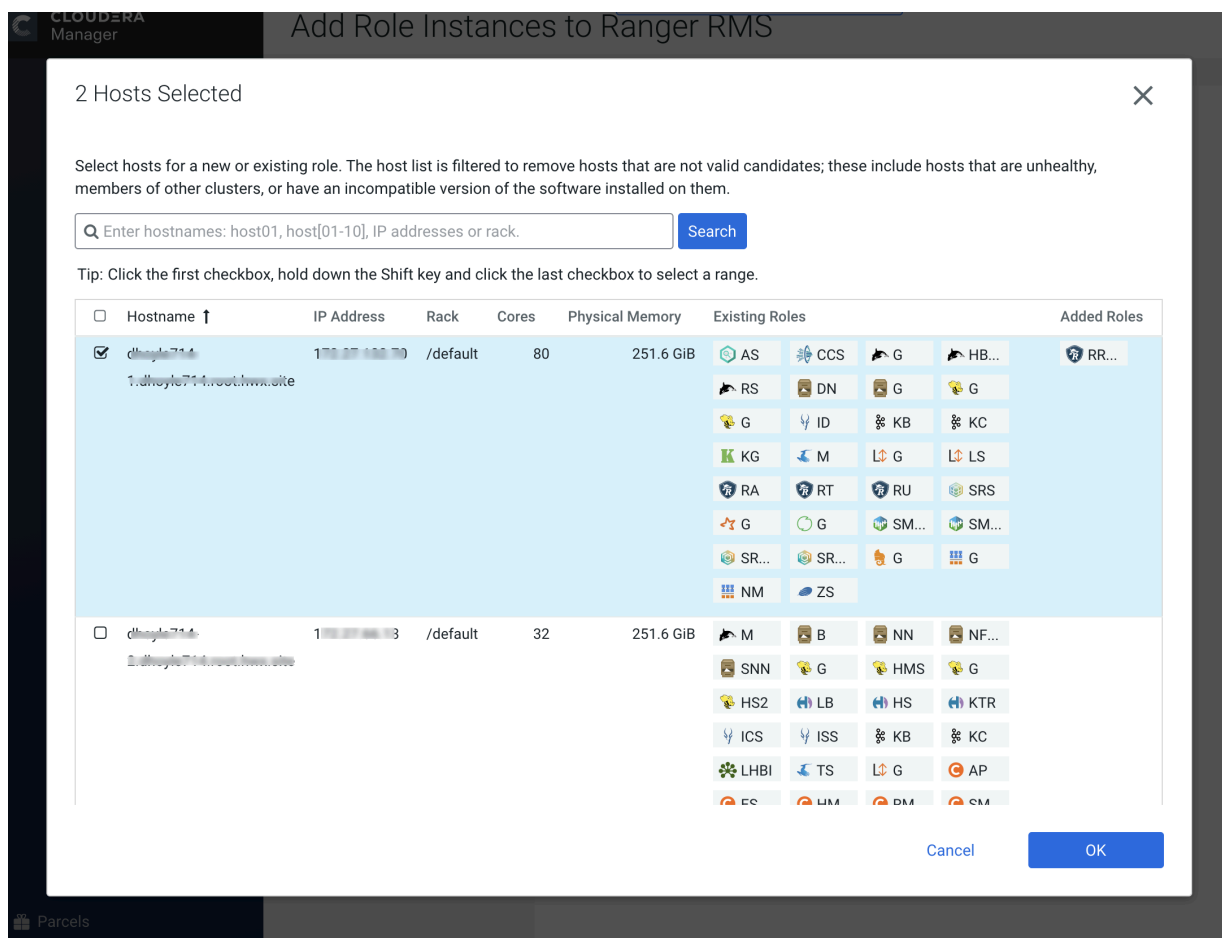
1. In Cloudera Manager, select Ranger RMS, then select Actions > Add Role Instances.

The screenshot shows the Cloudera Manager interface for 'Cluster 1'. The left sidebar contains navigation links: Clusters, Hosts, Diagnostics, Audits, Charts, Replication, Administration, and Private Cloud. The main content area is titled 'Ranger RMS' and includes tabs for Status, Instances, and Configuration. The 'Status' tab is active, showing 'Health Tests' with a green checkmark for 'Ranger RMS Server Health'. Below this is a 'Status Summary' section with two items: 'Ranger RMS Server' (1 Good Health) and 'Hosts' (1 Good Health). The 'Health History' section shows three entries: 'Ranger RMS Server Health Good' (Sep 22 7:29:50 PM), 'Ranger RMS Server Health Disabled' (Sep 16 7:09:58 PM), and 'Ranger RMS Server Health Unknown' (Sep 16 7:09:53 PM). On the right, there are 'Charts' for 'Informational Events' and 'Important Events and Alerts'. The 'Actions' dropdown menu is open, showing options: Start, Restart, Stop, Add Role Instances (highlighted), Rename, and Enter Maintenance Mode.

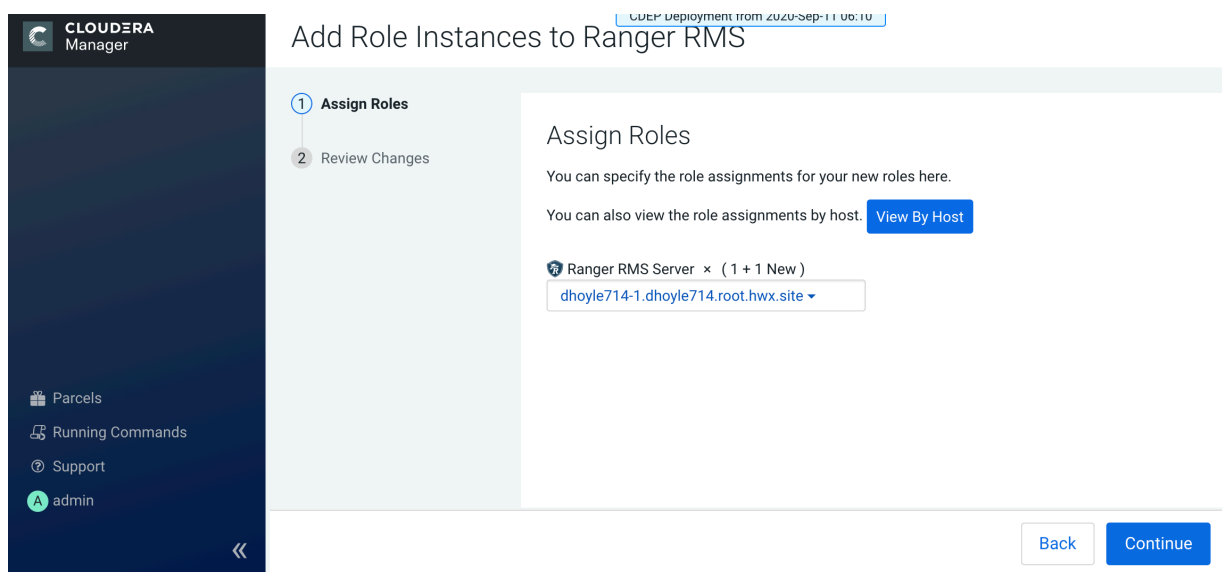
2. On the Add Role Instances page, click Select hosts.

The screenshot shows the 'Add Role Instances to Ranger RMS' page in Cloudera Manager. The left sidebar is the same as the previous screenshot. The main content area is titled 'Add Role Instances to Ranger RMS' and includes a progress indicator with two steps: '1 Assign Roles' (active) and '2 Review Changes'. The 'Assign Roles' section contains the text: 'You can specify the role assignments for your new roles here.' and 'You can also view the role assignments by host. View By Host'. Below this, there is a section for 'Ranger RMS Server x 1' with a 'Select hosts' button highlighted by a red box.

- On the selected hosts page, select a backup Ranger RMS host. A Ranger RM (RR) icon appears in the Added Roles column for the selected host. Click OK to continue.



- The Add Role Instances page is redisplayed with the new backup host. Click Continue.



5. Review the settings on the Review Changes page, then click Continue.

CLUSTER Deployment from 2020-Sep-11 00:10

Add Role Instances to Ranger RMS

Assign Roles

2 Review Changes

Ranger RMS Max Heapsize

ranger_rms_max_heap_size

Ranger RMS Server Default Group

GiB

RMS HTTP Port

ranger-rms.service.http.port

Ranger RMS Server Default Group

RMS HTTPS Port

ranger-rms.service.https.port

Ranger RMS Server Default Group

Ranger RMS Server TLS/SSL Client Trust Store File

ranger-rms.truststore.file

Ranger RMS Server Default Group

Ranger RMS Server TLS/SSL Client Trust Store Password

ranger-rms.truststore.password

Ranger RMS Server Default Group

Enable TLS/SSL for Ranger RMS Server

ranger-rms.service.https.attrib.ssl.enabled

☐ Ranger RMS Server Default Group

Ranger RMS Server TLS/SSL Server JKS Keystore File Location

ranger-rms.service.https.attrib.keystore.file

Ranger RMS Server Default Group

Ranger RMS Server TLS/SSL Server JKS Keystore File Password

ranger-rms.service.https.attrib.keystore.password

Ranger RMS Server Default Group

Back

Continue

Parcels

Running Commands

Support

admin

6. The new role instance appears on the Ranger RMS page.

CLUSTERA
Manager

Search

Clusters

Hosts

Diagnostics

Audits

Charts

Replication

Administration

Private Cloud New

Cluster 1

Ranger RMS

Actions

Status

Instances

Configuration

Commands

Charts Library

Audits

Quick Links

Search

Filters

Last Updated: Sep 28, 3:21:58 PM UTC

Filters

STATUS

Good Health 1

Stopped 1

COMMISSION STATE

MAINTENANCE MODE

RACK ID

ROLE GROUP

ROLE TYPE

STATE

HEALTH TEST

Actions for Selected

Add Role Instances

Role Groups

<input type="checkbox"/>	Status	Role Type	State	Hostname	Commission State	Role Group
<input type="checkbox"/>	✓	Ranger RMS Server	Started	cloudera-7744 10.10.10.10	Commissioned	Ranger RMS Server Default Group
<input type="checkbox"/>	⊙	Ranger RMS Server	Stopped	cloudera-7744 10.10.10.10	Commissioned	Ranger RMS Server Default Group

1 - 2 of 2

7. In Cloudera Manager, select Ranger RMS, then click Configuration.

- a) Select the Ranger RMS Server HA checkbox. In the Ranger RMS Server IDs box, add a comma-separated list of IDs for each RMS server.

The screenshot shows the Ranger RMS configuration page. The 'Ranger RMS Server HA' checkbox is checked. The 'Ranger RMS Server IDs' field contains 'id1,id2'. The 'Ranger RMS Server Default Group' field contains '/ranger-rms'.

- b) Use the Add (+) icons for the Ranger RMS Server Advanced Configuration Snippet (Safety Valve) for ranger-rms-conf/ranger-rms-site.xml property to add entries for each RMS host with its corresponding server ID.

- ranger-rms.server.address.id1=<hostname of RMS server for id1>:8383
- ranger-rms.server.address.id2=<hostname of RMS server for id2>:8383



Note: If SSL is enabled, use port 8484.

The screenshot shows the Ranger RMS Server Advanced Configuration Snippet (Safety Valve) for ranger-rms-conf/ranger-rms-site.xml. It displays two entries for the property ranger-rms.server.address.id1 and ranger-rms.server.address.id2. Both entries have values ending in :8383. The 'Final' checkbox is unchecked for both entries.

8. Click Save Changes, then Click the Restart icon.

9. On the Stale Configurations page, click Restart Stale Services.

10. On the Restart Stale Services page, select the Re-deploy client configuration checkbox, then click Restart Now.

11. A progress indicator page appears while the services are being restarted. When the services have restarted, click Finish.

Related Information

[Installing Ranger RMS](#)

Configure Hive-HDFS ACL Sync

Ranger Resource Mapping Server (RMS) should be fully configured after installation. This topic provides further information about RMS configuration settings and workflows.

Important configuration information

- Ranger RMS enables HDFS access via Ranger Hive policies. Ranger RMS must be configured with the names of HDFS and Hive services (AKA Repos). In your installation, there may be multiple Ranger services created for HDFS and Hive. These can be seen from the Ranger Admin web UI. RMS ACL sync is designed to work on a specific pair of HDFS and Hive Ranger services. Therefore, it is important to identify those service names before Ranger RMS is installed. These names should be configured during the installation of Ranger RMS. The default value for Ranger HDFS service name is `cm_hdfs`, and for the Ranger Hive service the default name is `cm_hive`.
- Before starting the Ranger RMS installation, ensure that the Hive service identified in the installation above allows the `rangerms` user select access to all tables in all databases in default, as well as in all security-zones for the Hive service.
- By default, Ranger RMS tracks only external tables in Hive. To configure Ranger RMS to also track managed Hive tables, add the following configuration setting to Ranger RMS.

```
ranger-rms.HMS.map.managed.tables=true
```



Note:

Locations behind managed tables are granted Read access only, even if the users have Write access at the Hive table level. However, this restriction is not enforced for the `hive` and `impala` users.

- In Cloudera Manager, select **HDFS > Configuration > HDFS Service Advanced Configuration Snippet (Safety Valve)** for `ranger-hdfs-security.xml`, then confirm the following settings:

```
ranger.plugin.hdfs.chained.services = cm_hive
ranger.plugin.hdfs.chained.services.cm_hive.impl = org.apache.ranger.chain
edplugin.hdfs.hive.RangerHdfsHiveChainedPlugin
```



Note: If any of these configurations are changed after Ranger RMS is started and has synchronized with Hive Metastore, the only way to have Ranger RMS use a new configuration is by following these steps:

1. Stop Ranger RMS.
2. Log in to the Ranger RMS database and run delete from `x_rms_mapping_provider`; to remove the only row from this table.
3. Start Ranger RMS.

On restart, Ranger RMS will resynchronize all data from the Hive Metastore. This may take a significant amount of time depending on the number of Hive tables in the Hive Metastore.

Understanding Ranger policies with RMS

At a high level, the Ranger RMS workflow is as follows:

- Ranger policies for the HDFS service are evaluated. If any policy explicitly denies access, access is denied.
- Ranger checks to see if the accessed location maps to a Hive table.

- If it does, Hive policies are evaluated for the mapped Hive table. If there is an HDFS policy allowing access, access is allowed. Otherwise, the default HDFS ACLs determine the access.
- Requested HDFS permission is mapped to Hive permissions as follows:
 - HDFS 'read' ==> Hive 'select'
 - HDFS 'write' ==> Hive 'update' or 'alter'
 - HDFS 'execute' ==> Any Hive permission
- If there is no Hive policy that explicitly allows access to the mapped table, access is denied, otherwise access is allowed.

Appropriate tag policies are considered both during HDFS access evaluation and if needed, during Hive access evaluation phases. Also, one or more log records are generated to indicate which policy, if any, made the access decision.

The following scenarios illustrate how the access permissions are determined. All scenarios assume that the HDFS location is NOT explicitly denied access by a Ranger HDFS policy.

- Location does not correspond to a Hive table.
 - In this case, access will be granted only if a Ranger HDFS policy allows access or HDFS native ACLs allow access. The audit log will show which policy (or Hadoop-acl) made the decision.
- Location corresponds to a Hive table.
 - A Ranger Hive policy explicitly denied access to the mapped table for any of the accesses derived from the original HDFS request.
 - Access will be denied by Hive policy.
 - There is no matching Ranger Hive policy.
 - Access will be denied. Audit log will not specify the policy.
 - Ranger policy masks some columns in the mapped table.
 - Access will be denied. Audit log will show Hive masking policy.
 - Mapped Hive table has a row-filter policy
 - Access will be denied. Audit log will show Hive Row-filter policy.
 - A Ranger Hive policy allows access to the mapped table for the access derived from the original HDFS access request.
 - Access will be granted. If the access was originally granted by HDFS policy, the audit log will show HDFS policy.

Related Information

[Installing Ranger RMS](#)

Hive-HDFS ACL Sync Use Cases

This topic presents a few common use cases for Hive-HDFS ACL Sync.

Use Case 1: RMS Hive policies control access to a table's HDFS directories

Prerequisites:

1. Create a "Customer" Hive table under the default database.
2. Create a "unixuser1" user.
3. User "unixuser1" does not have any policy to allow it access to table "Customer".
4. User "unixuser1" tries to access the Hive data through the hdfs command.

Before setting up RMS:

If HDFS ACLs allow access to the location for Customer table, access will be granted to "unixuser1". The audit log will have "hadoop-acl" as the access enforcer.

After setting up RMS:

Access will not be granted to user "unixuser1". The audit log will not specify denying policy.

Use Case 2: RMS Hive policies propagate tag-based access control on tables to HDFS directories

Prerequisites:

1. Create a "Customer" Hive table under the default database.
2. Create a "unixuser1" user.
3. The tag "SPECIAL_ACCESS" is associated with the "Customer" table.
4. A policy for the tag "SPECIAL_ACCESS" provides Hive select access to "unixuser1".
5. User "unixuser1" tries to read the Hive data through the hdfs command.

Before setting up RMS:

If HDFS ACLs allow access to the location for "Customer" table, access will be granted to "unixuser1". The audit log will have "hadoop-acl" as the access enforcer.

After setting up RMS:

Access will be granted by tag-based policy for "SPECIAL_ACCESS".

Use Case 3: RMS Hive policies propagate tag-based masking on tables and denies access to HDFS directories

Prerequisites:

1. Create a "Customer" Hive table under the default database.
2. Create a "unixuser1" user.
3. The tag "SPECIAL_ACCESS" is associated with the "Customer" table.
4. A policy for the tag "SPECIAL_ACCESS" provides Hive select access to "unixuser1".
5. A masking policy for the "Customer" table is set up so that for "unixuser1" a column "SSN" is redacted.
6. User "unixuser1" tries to read the Hive data through the hdfs command.

Before setting up RMS:

If HDFS ACLs allow access to the location for Customer table, access will be granted to "unixuser1". The audit log will have "hadoop-acl" as the access enforcer.

After setting up RMS:

Access will be denied by the masking policy.

Use Case 4: RMS Hive policies take precedence over HDFS policies

Prerequisites:

1. Create a "Customer" Hive table under the default database.
2. Create a "unixuser1" user.
3. User "unixuser1" has a HDFS policy allowing read access.
4. User "unixuser1" does not have any policy to allow it access to the "Customer" table.
5. User "unixuser1" tries to access the Hive data through the hdfs command.

Before setting up RMS:

Access will be granted by the Ranger HDFS policy.

After setting up RMS:

Access will not be granted to the "unixuser1" user. The audit log will not specify a denying policy.

Hive-HDFS ACL Sync Reference

This topic provides reference information for Hive-HDFS ACL Sync.

Debugging common issues

- To reload Ranger RMS mapping from scratch, perform the following steps.
 1. Stop Ranger RMS.
 2. Log in to the Ranger RMS database and run delete from `x_rms_mapping_provider`; to remove the only row from this table.
 3. Start Ranger RMS.

RMS tables

The following tables are used by Ranger RMS to persist mappings:

- `X_rms_mapping_provider`
- `X_rms_notification`
- `X_rms_resource_mapping`
- `X_rms_service_resource`

Advanced configurations

HDFS plugin side configurations

- `ranger.plugin.hdfs.mapping.hive.authorize.with.only.chained.policies`
 - `true`: Enforce strict Sentry semantics.
 - `false`: If there is no applicable Hive policy, let HDFS determine access.
 - Default setting: `true`
- `ranger.plugin.hdfs.accesstype.mapping.read`
 - A comma-separated list of hive access types that HDFS "read" maps to.
 - Default setting: `select`
- `ranger.plugin.hdfs.accesstype.mapping.write`
 - A comma-separated list of hive access types that HDFS "write" maps to.
 - Default setting: `update,alter`
- `ranger.plugin.hdfs.accesstype.mapping.execute`
 - A comma-separated list of hive access types that HDFS "execute" maps to.
 - Default setting: `_any`
- `ranger.plugin.hdfs.mapping.source.download.interval`
 - The time in milliseconds between mappings download requests from the HDFS Ranger plugin to RMS.
 - Default setting: 30 seconds

By default, the RMS plugin checks for new mapping downloads every 30 seconds, based on this configuration. If you have mapping data (found in the `hdfs_cm_hive_resource_mapping.json` file) of approximately 360MB file size; then performing this operation every 30 seconds could cause an excessive load on the NameNode. After enabling performance logs, we can observe that `saveToCache` takes 11 seconds and `loadFromCache` operations take 7 seconds to complete. The cacheing process takes approximately 18~19 seconds to complete, as shown in the following example performance logs:

```
DEBUG org.apache.ranger.perf.resourcemapping.init: [PERF] RangerMappingR
efresher.loadFromCache(serviceName=cm_hive): 7449
```

```
DEBUG org.apache.ranger.perf.resourcemapping.init: [PERF] RangerMappingRefresher.saveToCache(serviceName=cm_hive): 11787
```

In this case, you should adjust the frequency of download RMS mappings to at least $18 \times 2 = 36$ seconds. A more conservative value = 45 seconds. In this way, you can tune RMS configurations to optimize performance in the NameNode plugin.

Hive service configuration

- `ranger.plugin.audit.excluder.users`
 - This configuration, added in the Hive service-configs, lists the users whose access to Hive or Hive Metastore does not generate audit records. There may be a large number of audit records created when "rangerrms" makes requests to the Hive Metastore when downloading Hive table data. By adding the "rangerrms" user to the comma-separated list of users in this configuration, such audit records will not be generated.

RMS side configurations

Note that changes to any of these requires that RMS is stopped, all rows are deleted from RMS database table "x_rms_mapping_provider" and RMS is restarted. On restart, RMS downloads complete table data from RMS, which may take a significant amount of time depending on the number of tables in HMS.

- `ranger-rms.HMS.source.service.name`
 - The Ranger HDFS service name (default: `cm_hdfs`).
- `ranger-rms.HMS.target.service.name`
 - The Ranger Hive service name (default: `cm_hive`).
- `ranger-rms.HMS.map.managed.tables`
 - `true` – Track managed and external tables.
 - `false` – Track only external tables.
 - Default setting: `false`
- `ranger-rms.polling.notifications.frequency.ms`
 - The time in milliseconds between polls from RMS to HMS for changes to tables.
 - Default setting: 30 seconds