

Cloudera Manager 7.13.2

# Configuring Authentication in Cloudera Manager

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The Cloudera logo is displayed in a bold, orange, sans-serif font. The word "CLOUDERA" is written in all caps, with a stylized 'E' that has a horizontal bar extending to the right.

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## Overview

Authentication is a process that requires users and services to prove their identity when trying to access a system resource.

Organizations typically manage user identity and authentication through various time-tested technologies, including pluggable authentication modules (PAM), Lightweight Directory Access Protocol (LDAP) for identity, directory, and other services, such as group management, and Kerberos for authentication.

Cloudera clusters support integration with all of these technologies. For example, organizations with existing LDAP directory services such as Active Directory (included in Microsoft Windows Server as part of its suite of Active Directory Services) can leverage the organization's existing user accounts and group listings instead of creating new accounts throughout the cluster. Using an external system such as Active Directory or OpenLDAP can support the user role authorization mechanism.

As an alternative to LDAP, you can use pluggable authentication modules (PAM), which are standard Linux modules used for external authentication. In Cloudera Manager, PAM configuration is simpler than LDAP, and systems administrators can add new authentication methods by installing new PAM modules. If you have multiple LDAP servers, you can configure PAM to synchronize with LDAP using System Security Services Daemon (SSSD), as Cloudera Manager does not otherwise support multiple LDAP servers. You can also configure Cloudera Manager to use Apache Knox for authentication and PAM to look up users and roles stored in LDAP.

For authentication, Cloudera supports integration with MIT Kerberos and with Active Directory. Microsoft Active Directory supports Kerberos for authentication in addition to its identity management and directory functionality, that is, LDAP.

Kerberos provides *strong authentication*, strong meaning that cryptographic mechanisms—rather than passwords alone—are used in the exchange between requesting process and service during the authentication process.

These systems are not mutually exclusive. For example, Microsoft Active Directory is an LDAP directory service that also provides Kerberos authentication services, and Kerberos credentials can be stored and managed in an LDAP directory service. Cloudera Manager Server, Cloudera nodes, and Cloudera Enterprise components, such as Apache Hive, Cloudera Data Explorer (Hue), and Impala, can all make use of Kerberos authentication.



**Note:** Cloudera does not provide a Kerberos implementation but rather can use MIT Kerberos, or Microsoft Server Active Directory service and its KDC for authentication. You can also use FreeIPA as a KDC.



**Note:** Cloudera supports Ranger only when it runs on a cluster where Kerberos is enabled to authenticate users.

Configuring the cluster to use Kerberos requires having administrator privileges—and access to—the Kerberos server Key Distribution Center (KDC). The process may require debugging issues between the Cloudera Manager cluster and the KDC.



**Note:** Integrating clusters to use Microsoft Active Directory as a KDC requires the Windows registry setting for AllowTgtSessionKey to be disabled (set to 0). If this registry key has already been enabled, users and credentials are not created—despite the "Successful" message at the end of the configuration/integration process. Before configuring Active Directory for use as KDC, check the value of AllowTgtSessionKey on the Active Directory instance and reset to 0 if necessary.

On each host operating system underlying each node in a cluster, local Linux user:group accounts are created during installation of Cloudera Server and Cloudera services. These accounts may also be referred to as **Hadoop Users**. These local accounts are blocked from normal login access, and have no password set. This means login on these user accounts is not possible. Customers are advised not to set any password on these local service accounts, as doing so would compromise security.

To apply per-node authentication and authorization mechanism consistently across all the nodes of a cluster, local user:group accounts are mapped to user accounts and groups in an LDAP-compliant directory service, such as Active Directory or OpenLDAP.

To facilitate the authentication process from each host system (node in the cluster) to the LDAP directory, Cloudera recommends using additional software mechanisms such as SSSD or Centrify Server Suite.

## Kerberos Security Artifacts Overview

How Cloudera Clusters use Kerberos artifacts such as principals, keytabs, and delegation tokens.

Cloudera recommends using Kerberos for authentication because core Hadoop authentication alone checks only for valid user:group membership in the context of HDFS, but does not authenticate users or services across all network resources, as Kerberos does. Unlike other mechanisms that may be far easier to deploy, the Kerberos protocol authenticates a requesting user or service for a specific period of time only, and each service that the user may want to use requires the appropriate Kerberos artifact in the context of the protocol. This section describes how Cloudera clusters use some of these artifacts, such as Kerberos principals and keytabs for user authentication, and how delegation tokens are used by the system to authenticate jobs on behalf of authenticated users at runtime.

### Kerberos Principals

Each user and service that needs to authenticate to Kerberos needs a *principal*, an entity that uniquely identifies the user or service in the context of possibly multiple Kerberos servers and related subsystems. A principal includes up to three pieces of identifying information, starting with the user or service name (called a *primary*). Typically, the primary portion of the principal consists of the user account name from the operating system, such as jcarlos for the user's Unix account or hdfs for the Linux account associated with the service daemon on the host underlying cluster node.

Principals for users typically consist solely of the primary and the Kerberos *realm* name. The realm is a logical grouping of principals tied to the same Key Distribution Center (KDC) which is configured with many of the same properties, such as supported encryption algorithms. Large organizations may use realms as means of delegating administration to various groups or teams for specific sets of users or functions and distributing the authentication-processing tasks across multiple servers.

Standard practice is to use your organization's domain name as the Kerberos realm name (in all uppercase characters) to easily distinguish it as part of a Kerberos principal, as shown in this user principal pattern:

```
USERNAME@REALM.EXAMPLE.COM
```

The combination of the primary and the realm name can distinguish one user from another. For example, jcarlos@SOME-REALM.EXAMPLE.COM and jcarlos@ANOTHER-REALM.EXAMPLE.COM may be unique individuals within the same organization.

For service role instance identities, the primary is the Unix account name used by Hadoop daemons (hdfs, mapred, and so on) followed by an *instance* name that identifies the specific host on which the service runs. For example, hdfs/hostname.fqdn.example.com@SOME-REALM.EXAMPLE.COM is an example of the principal for an HDFS service instance. The forward slash (/) separates the primary and the instance names using this basic pattern:

```
SERVICE-NAME/HOSTNAME.FQDN.EXAMPLE.COM@REALM.EXAMPLE.COM
```

The HTTP principal needed for Hadoop web service interfaces does not have a Unix local account for its primary but rather is HTTP.

An instance name can also identify users with special roles, such as administrators. For example, the principal jcarlos@SOME-REALM.COM and the principal jcarlos/admin@SOME-REALM.COM each have their own passwords and privileges, and they may or may not be the same individual.

For example, the principal for the HDFS service role instance running on a cluster in an organization with realms for each geographical location might be as follows:

```
hdfs/HOSTNAME.FQDN.EXAMPLE.COM@OAKLAND.EXAMPLE.COM
```

Generally, the service name is the Unix account name used by the given service role instance, such as `hdfs` or `mapred`, as shown above. The HTTP principal for securing web authentication to Hadoop service web interfaces has no Unix account, so the primary for the principal is HTTP.

## Kerberos Keytabs

A *keytab* is a file that contains the principal and the encrypted key for the principal. A keytab file for a Hadoop daemon is unique to each host since the principal names include the hostname. This file is used to authenticate a principal on a host to Kerberos without human interaction or storing a password in a plain text file. Because having access to the keytab file for a principal allows one to act as that principal, access to the keytab files should be tightly secured.

They should be readable by a minimal set of users, should be stored on local disk, and should not be included in host backups, unless access to those backups is as secure as access to the local host.

## Delegation Tokens

Users in a Hadoop cluster authenticate themselves to the NameNode using their Kerberos credentials. However, once the user is authenticated, each job subsequently submitted must also be checked to ensure it comes from an authenticated user. Since there could be a time gap between a job being submitted and the job being executed, during which the user could have logged off, user credentials are passed to the NameNode using delegation tokens that can be used for authentication in the future.

Delegation tokens are a secret key shared with the NameNode, that can be used to impersonate a user to get a job executed. While these tokens can be renewed, new tokens can only be obtained by clients authenticating to the NameNode using Kerberos credentials. By default, delegation tokens are only valid for a day. However, since jobs can last longer than a day, each token specifies a NodeManager as a renewer which is allowed to renew the delegation token once a day, until the job completes, or for a maximum period of 7 days. When the job is complete, the NodeManager requests the NameNode to cancel the delegation token.

### Token Format

The NameNode uses a random `masterKey` to generate delegation tokens. All active tokens are stored in memory with their expiry date (`maxDate`). Delegation tokens can either expire when the current time exceeds the expiry date, or, they can be canceled by the owner of the token. Expired or canceled tokens are then deleted from memory. The `sequenceNumber` serves as a unique ID for the tokens. The following section describes how the Delegation Token is used for authentication.

```
TokenID = {ownerID, renewerID, issueDate, maxDate, sequenceNumber}  
TokenAuthenticator = HMAC-SHA1(masterKey, TokenID)  
Delegation Token = {TokenID, TokenAuthenticator}
```

### Authentication Process

To begin the authentication process, the client first sends the `TokenID` to the NameNode. The NameNode uses this `TokenID` and the `masterKey` to once again generate the corresponding `TokenAuthenticator`, and consequently, the Delegation Token. If the NameNode finds that the token already exists in memory, and that the current time is less than the expiry date (`maxDate`) of the token, then the token is considered valid. If valid, the client and the NameNode will then authenticate each other by using the `TokenAuthenticator` that they possess as the secret key, and MD5 as the protocol. Since the client and NameNode do not actually exchange `TokenAuthenticators` during the process, even if authentication fails, the tokens are not compromised.

## Token Renewal

Delegation tokens must be renewed periodically by the designated renewer (renewerID). For example, if a NodeManager is the designated renewer, the NodeManager will first authenticate itself to the NameNode. It will then send the token to be authenticated to the NameNode. The NameNode verifies the following information before renewing the token:

- The NodeManager requesting renewal is the same as the one identified in the token by renewerID.
- The TokenAuthenticator generated by the NameNode using the TokenID and the masterKey matches the one previously stored by the NameNode.
- The current time must be less than the time specified by maxDate.

If the token renewal request is successful, the NameNode sets the new expiry date to  $\min(\text{current time} + \text{renew period}, \text{maxDate})$ . If the NameNode was restarted at any time, it will have lost all previous tokens from memory. In this case, the token will be saved to memory once again, this time with a new expiry date. Hence, designated renewers must renew all tokens with the NameNode after a restart, and before relaunching any failed tasks.

A designated renewer can also revive an expired or canceled token as long as the current time does not exceed maxDate. The NameNode cannot tell the difference between a token that was canceled, or has expired, and one that was erased from memory due to a restart, since only the masterKey persists in memory. The masterKey must be updated regularly.

# Kerberos Configuration Strategies for Cloudera

An overview of integration options when configuring Kerberos for Cloudera.

**Table 1: Kerberos Configuration Strategies for Cloudera**

	A. Direct integration of Cloudera Manager with AD/MIT/IPA KDC	B. Keytab retrieval through "keytab retrieval script"	C. Manual deployment / configuration of keytab for services
Brief description of functionality	Cloudera Manager can create/delete service principals directly in the KDC as needed, and Cloudera Manager will retrieve the keytabs for the created principals automatically.	Cloudera Manager will call an external script to retrieve a keytab for a given principal.	Cloudera Manager will maintain keytab/kerberos related configuration for services with either the A or B column methods, but we will override the default location of the keytab with a "Safety Valve" option.
Example	<p>This is the default/recommended setup.</p> <ul style="list-style-type: none"> <li>• Cloudera Manager will store/track the available keytabs, and can create missing principals/keytabs after new services/role instances are added.</li> <li>• Cloudera Manager can recreate existing principals / keytabs if needed for some reason.</li> </ul>	<ul style="list-style-type: none"> <li>• Where direct integration with AD / KDC is not feasible due to internal restrictions/policy.</li> <li>• Could be used integrate Cloudera Manager with unsupported KDC types.</li> </ul>	Could be used where customizations are needed to the keytabs due to external factors.
Principal naming convention	<p>Kerberos principals used by Cloudera are following this naming convention: <code>service/fqdn@REALM</code>. Most services use a single username across the cluster (like "hdfs" or "hive") for all roles of the service. The host part will vary based on the available hosts in the cluster, so a single service will likely need multiple principals, where the username part is the same, and the hostname will match one of the hosts where this service is running on. The default usernames used by the services can be found in "Hadoop Users (user:group) and Kerberos Principals".</p>		

	A. Direct integration of Cloudera Manager with AD/MIT/IPA KDC	B. Keytab retrieval through "keytab retrieval script"	C. Manual deployment / configuration of keytab for services
Scripts involved	<p>Cloudera Manager invokes these external shell scripts to perform credential management:</p> <p>Base directory: /opt/cloudera/cm/bin</p> <p>delete_credentials_ad.sh</p> <p>delete_credentials_ipa.sh</p> <p>delete_credentials.sh</p> <p>gen_credentials_ad.sh</p> <p>gen_credentials_ipa.sh</p> <p>gen_credentials.sh</p> <p>import_credentials_ipa.sh</p> <p>import_credentials.sh</p> <p>merge_credentials.sh</p>	<p>The "custom keytab retrieval script" will get a single principal name matching the above naming convention, and it should write the matching keytab to a directory also passed as an option to the script.</p> <p>There is a basic sample script provided in "Using a custom Kerberos keytab retrieval scrip".</p>	None
Persistent storage of keytabs	Keytabs that are successfully retrieved will be stored in the Cloudera Manager-backed database to be deployed and used on demand.		None. Required keytabs should be stored on the hosts manually.
On-demand keytab merging	<p>In case a service (role instance) requires multiple principals for operation, Cloudera Manager will merge the individual keytabs into a single combined keytab automatically.</p> <p>For example: HDFS namenode uses both the "hdfs" and "HTTP" principal for operation. Cloudera Manager will create a merged keytab that contains both these principals.</p>		None. In case a service (role instance) requires multiple principals for operation, keytabs provided for the services (role instance) are needed to be merged manually.
On-demand keytab deployment	Cloudera Manager will automatically deploy the required configuration and keytab files into the process directory of the given role instance through the Cloudera Manager Agent when starting a service/role instance.		None. All required keytabs will need to be present on the host(s) for a service before starting it. Cloudera Manager should be used to configure the location of these keytab files though.
Keytab filename	<p>The keytab file &amp; filename will be managed by Cloudera Manager. The keytab file will be deployed by the Cloudera Manager agent to the services process folder automatically.</p> <p>The filenames used by Cloudera Manager can be found in "Hadoop Users (user:group) and Kerberos Principals".</p>		The name & location of the keytab file has to be specified manually, so it can be anything allowed by POSIX conventions.
Keytab file ownership and permissions	<p>The "System User" of the respective service needs read-write access for the keytab file. Cloudera Manager will set the proper owner/group on the file with permission mode 600 (read-write for owner, no access for group/others)</p> <p>Default owner/group and permissions can also be found in "Hadoop Users (user:group) and Kerberos Principals".</p>		The "System User" of the respective service needs read-write access for the keytab file. The proper permission and ownership of the file needs to be set manually.

### Related Information

[Hadoop Users \(user:group\) and Kerberos Principals](#)

[Using a custom Kerberos keytab retrieval script](#)

## Configuring Authentication in Cloudera Manager

Overview of configuring Cloudera authentication.

Cloudera clusters can be configured to use Kerberos for authentication using a manual configuration process or by using the configuration wizard available from the Cloudera Manager Admin Console. Cloudera recommends using the wizard because it automates many of the configuration and deployment tasks. In addition, enabling Kerberos the cluster using the wizard also enables Kerberos authentication for all Cloudera components set up on the cluster.



**Warning:** Before enabling Kerberos authentication, configure Cloudera Manager for TLS/SSL. Failure to do so results in Kerberos keytabs being transferred over the network unencrypted.

### Cloudera Manager Kerberos Wizard Overview

The Cloudera Manager Kerberos wizard starts by verifying various details of the Kerberos instance that will be used by the cluster. Before using the wizard, be sure to gather all the details about the Kerberos service or engage the Kerberos administrator for help during this process. There are many details of the Kerberos instance, and you will need to enter them in the wizard pages.

The wizard requires a working KDC, either an MIT KDC, a FreeIPA server, or an Active Directory KDC. Make sure that the KDC is set up and working prior to starting the wizard. Administrator-level privileges to the Kerberos instance are required to complete the prompts of the wizard. If you do not have access to credentials with these privileges, the Kerberos administrator will need to assist you.

Given the information provided to the wizard entry screens, the configuration wizard does the following:

- Configures the necessary properties in all configuration files—`core-site.xml`, `hdfs-site.xml`, `mapred-site.xml`, and `taskcontroller.cfg`—to set Kerberos as the authentication mechanism for the cluster
- Configures the necessary properties in the `oozie-site.xml` and `hue.ini` files for Oozie and Cloudera Data Explorer (Hue) for Kerberos authentication
- Creates principal and keytab files for core system users, such as `hdfs` and `mapred`, and for Cloudera services
- Distributes the keytab files to each host in the cluster
- Creates keytab files for oozie and hue users and deploys to the appropriate hosts that support these client-focused services
- Distributes a configured `krb5.conf` to all nodes in the cluster
- Stops all services
- Deploys client configurations
- Restarts all services throughout the cluster

Keytab file for...	Principals
hdfs	hdfs, host
mapred	mapred, host
oozie	oozie, HTTP
hue	hue

The host principal is the same in both `hdfs` and `mapred` keytab files.

After making the configuration changes and deploying the keytabs, and configuration files to the appropriate nodes in the cluster, Cloudera Manager starts all services to stand up the cluster.

- To use the Kerberos configuration wizard, see “Enabling Kerberos Authentication for Cloudera”.
- To configure Kerberos authentication manually, see “How to Configure Clusters to Use Kerberos for Authentication”.



**Note:** Authorization through Apache Ranger is just one element of a secure production cluster: Cloudera supports Ranger only when it runs on a cluster where Kerberos is enabled to authenticate users.

### Related Information

[Enabling Kerberos Authentication for Cloudera](#)

[How to Configure Clusters to Use Kerberos for Authentication](#)

## Cloudera Manager user accounts

Access to Cloudera Manager features is controlled by user accounts. A user account identifies how a user is authenticated and determines what privileges are granted to the user.

Minimum Required Role: [User Administrator](#) (also provided by Full Administrator) This feature is not available when using Cloudera Manager to manage Data Hub clusters.

When you are logged in to the Cloudera Manager Admin Console, the username you are logged in as is located at the far right of the top navigation bar.

A user with the User Administrator or Full Administrator role manages user accounts through the AdministrationUsers page. View active user sessions on the User Sessions tab.

## User Authentication

Cloudera Manager provides several mechanisms for authenticating users. You can configure Cloudera Manager to authenticate users against the Cloudera Manager database or against an external authentication service. The external authentication service can be an LDAP server (Active Directory or an OpenLDAP compatible directory), or you can specify another external service. Cloudera Manager also supports using the Security Assertion Markup Language (SAML) to enable single sign-on.

If you are using LDAP or another external service, you can configure Cloudera Manager so that it can use both methods of authentication (internal database and external service), and you can determine the order in which it performs these searches. If you select an external authentication mechanism, Full Administrator users can always authenticate against the Cloudera Manager database. This prevents locking everyone out if the authentication settings are misconfigured, such as with a bad LDAP URL.

With external authentication, you can restrict login access to members of specific groups, and can specify groups whose members are automatically given Full Administrator access to Cloudera Manager.

Users accounts in the Cloudera Manager database page show Cloudera Manager in the User Type column. User accounts in an LDAP directory or other external authentication mechanism show External in the User Type column.

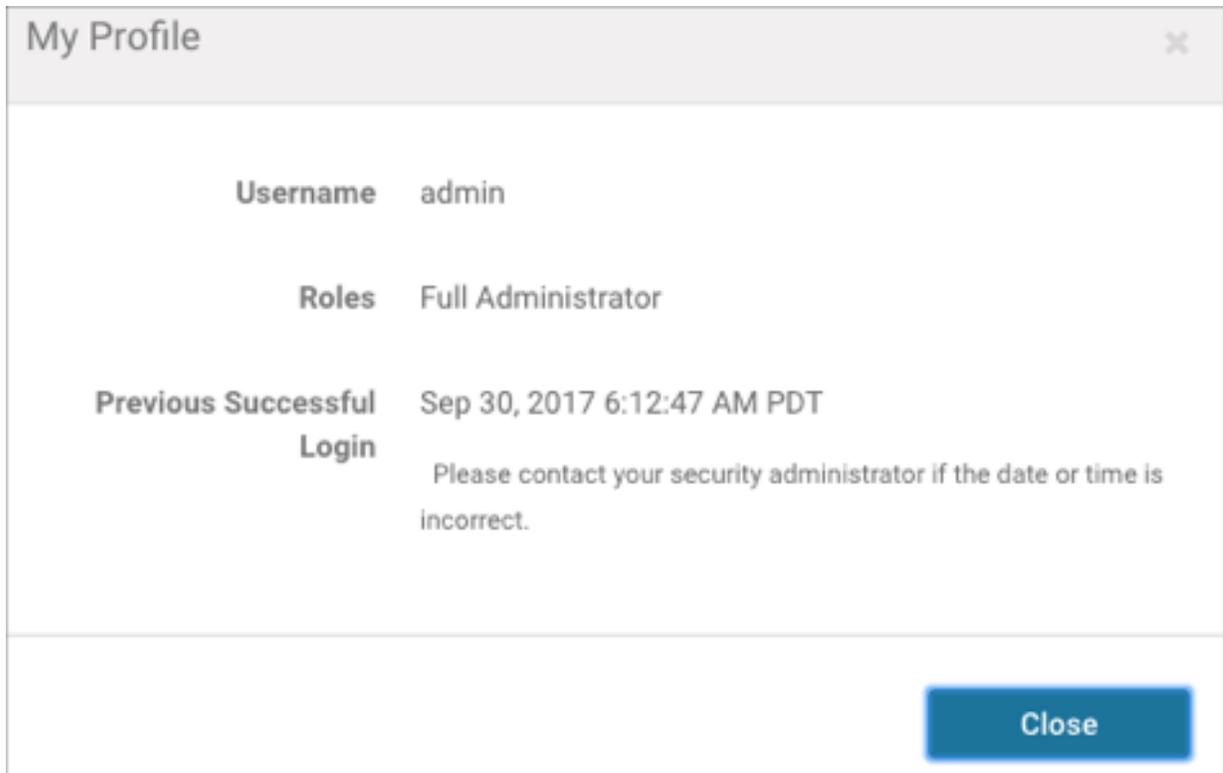
## User Roles

User accounts include the user's role, which determines the Cloudera Manager features visible to the user, the actions the user can perform, and, for certain roles, what clusters actions can be performed on. All tasks in the Cloudera Manager documentation indicate which role is required to perform the task.

## Determining the Role of the Currently Logged in User

1. Click the logged-in username at the far right of the top navigation bar.

2. Select My Profile. The role displays. For example:



### Changing the Logged-In Internal User Password

1. Click the logged-in username at the far right of the top navigation bar and select Change Password.
2. Enter the current password and a new password twice, and then click OK.

### Adding an Internal User Account

1. Select AdministrationUsers.
2. Click the Add User button.
3. Enter a username and password.
4. In the Role drop-down menu, select a role for the new user.
5. Click Add.

### Assigning User Roles

1. Select AdministrationUsers.
2. Check the checkbox next to one or more usernames.
3. Select Actions for SelectedAssign User Roles.
4. In the drop-down menu, select the role.
5. Click the Assign Role button.

### Changing an Internal User Account Password

1. Select AdministrationUsers.
2. Click the Change Password button next to a username with User Type Cloudera Manager.
3. Type the new password and repeat it to confirm.
4. Click the Update button to make the change.

## Deleting Internal User Accounts

1. Select AdministrationUsers.
2. Check the checkbox next to one or more usernames with User Type Cloudera Manager.
3. Select Actions for SelectedDelete.
4. Click the OK button. (There is no confirmation of the action.)

## Viewing User Sessions

1. Select AdministrationUsers.
2. Click the tab User Sessions.

## Configuring external authentication and authorization for Cloudera Manager

Cloudera Manager supports user authentication against an internal database and against an external service. The following sections describe how to configure the supported external services.

### Configuring PAM authentication with LDAP and SSSD

You can configure PAM authentication with one or more Active Directory/LDAP servers using System Security Services Daemon (SSSD). SSSD is a system service that allows the Cloudera Manager Server host to access a remote LDAP directory or Active Directory domain.

#### About this task

For more information on SSSD, see Red Hat documentation.

#### Procedure

1. Configure SSSD on the Cloudera Manager server host. Run the following command to check if the remote user has been synchronized to the server host:  
`id <remote_username>`
2. In Cloudera Manager, click Administration Settings External Authentication .
3. Verify that the Authentication Backend Order property is not set to "Database Only."
4. Verify that the Authorization Backend Order property is not set to "Database Only." If set to Database Only, the external group mapping will not work.
5. Select PAM as the external authentication type.
6. If you have a specific PAM configuration you wish to use for Cloudera Manager, modify the PAM Service Name property with that configuration's name (it should correspond to a file residing in /etc/pam.d/). Otherwise, use the default value, login.
7. Save the changes.
8. Add your group mapping roles. Click AdministrationUsers & RolesLDAP/PAM Groups, then Add LDAP/PAM Group Mapping.
9. When finished, restart the Cloudera Manager Server:  
`sudo systemctl restart cloudera-scm-server`

### Configuring PAM authentication with Linux users

You can configure PAM authentication to allow built-in Linux users to log in to Cloudera Manager.

## Procedure

### 1. Configure the Cloudera Manager Server host:

- a) The Linux user who is running Cloudera Manager (for example, cloudera-scm) must have read access to the system shadow file. Run the following command on the Cloudera Manager Server host to check the shadow file group permission::

```
ls -l /etc/shadow
----r-----+ 1 root root 1738 Jul 16 17:09 /etc/shadow
```

The above example shows that the root group of the shadow file is the owner group and not the shadow group. The 'r' indicates that the user in the root group can have read access to the shadow file.

If you see something like ----- 1 root root 1611 Jul 16 17:09 /etc/shadow, no group read permission is assigned. Add that permission to the file by running the following command:

```
chmod g+r /etc/shadow
```

### 2. Add the user to the owner group:

```
usermod -a -G root cloudera-scm
```

If the owner group is the shadow group:

```
usermod -a -G shadow cloudera-scm
```

### 3. In Cloudera Manager, click Administration Settings External Authentication .

### 4. Verify that the Authentication Backend Order property is not set to "Database Only."

### 5. Verify that the Authorization Backend Order property is not set to "Database Only." If set to Database Only, the external group mapping will not work.

### 6. Select PAM as the external authentication type.

### 7. If you have a specific PAM configuration you wish to use for Cloudera Manager, modify the PAM Service Name property with that configuration's name (it should correspond to a file residing in /etc/pam.d/). Otherwise, use the default value, login.

### 8. Save the changes.

### 9. When finished, restart the Cloudera Manager Server:

```
sudo systemctl restart cloudera-scm-server
```

### 10. To test the configuration, log into Cloudera Manager with a Linux user and run the following commands in the host server console to create a user and assign groups to the user:

- a) Create the user:

```
useradd testUser
passwd testUser
```

- b) Assign groups to the user:

```
groupadd testGroup
usermod -a -G testGroup testUser
```

### 11. In Cloudera Manager, map roles to the groups that your user belongs to. Click Administration Users & Roles LDAP/PAM Groups , then Add LDAP/PAM Group Mapping.

## Results

You can now login to Cloudera Manager using the Linux user you just created.

## Configuring PAM authentication using Apache Knox

You can configure Cloudera Manager to authenticate through Apache Knox, with authorization provided by LDAP through PAM.

### Procedure

1. In Cloudera Manager, click Administration Settings External Authentication .
2. Search for the property Enable SPNEGO/Kerberos Authentication for the Admin Console and API, and select the checkbox to enable it.
3. Search for "Knox Proxy" to view the Knox properties that you need to configure.
4. Set the Allowed Groups for Knox Proxy property to the appropriate LDAP group values.
5. Set the Allowed Users for Knox Proxy property to the appropriate users.
6. Set the Allowed Hosts for Knox Proxy property to the appropriate host values (IP address or FQDN).
7. Cloudera Manager checks whether PUT/POST requests come from the same referers. To relax that restriction, set the Cloudera Manager Frontend URL property ( Administration Settings ) to the Knox host and port (for example, "https://bsmith-knox2-1.bsmith-knox2.root.hwx.site:8443").
8. Verify that the Authorization Backend Order property is not set to "Database Only." If set to Database Only, the external group mapping will not work.
9. Restart the Cloudera Manager Server:  

```
sudo systemctl restart cloudera-scm-server
```
10. In Cloudera Manager, map roles to the groups that your user belongs to. Click Administration Users & Roles LDAP/PAM Groups , then Add LDAP/PAM Group Mapping.

## Configure authentication using Active Directory

How to configure authentication using Active Directory in Cloudera Manager.

### Procedure

1. Log in to the Cloudera Manager Admin Console.
2. Select Administration Settings
3. Select External Authentication in the Category filter.
4. For Authentication Backend Order, select the order in which Cloudera Manager should look up authentication credentials for login attempts.

The Authentication Backend Order options are :

- Database Only
  - External then Database
  - Database then External
  - External Only (with emergency Administrator access)
  - External Only (without emergency Administrator access)
5. For External Authentication Type, select Active Directory.
  6. In the LDAP URL property, enter the URL of the Active Directory server.
  7. In the Active Directory Domain property, provide the domain to authenticate against.  
  
LDAP URL and Active Directory are the only settings required to allow anyone in Active Directory to log in to Cloudera Manager.  
  
For example, if you set LDAP URL to ldap://adserver.example.com and the Active Directory Domain to ADREALM.EXAMPLE.COM, users can log into Cloudera Manager using just their username, such as sampleuser. They no longer require the complete string: sampleuser@ADREALM.EXAMPLE.COM.
  8. Restart the Cloudera Manager Server.

## Configure authentication using an LDAP-compliant identity service

How to configure authentication using LDAP in Cloudera Manager.

### About this task

An LDAP-compliant identity/directory service, such as OpenLDAP, provides different options for enabling Cloudera Manager to look-up user accounts and groups in the directory:

- Use a single Distinguished Name (DN) as a base for matching user names in the directory, or
- Search filter options let you search for a particular user based on somewhat broader search criteria – for example Cloudera Manager users could be members of different groups or organizational units (OUs), so a single pattern does not find all those users. Search filter options also let you find all the groups to which a user belongs, to help determine if that user should have login or admin access.



**Note:** The LDAP Distinguished Name Pattern property is deprecated. Leave this field empty while configuring authentication using LDAP in Cloudera Manager.

### Procedure

1. Log in to Cloudera Manager Admin Console.
2. Select Administration Settings .
3. Select External Authentication for the Category filter to display the settings.
4. For Authentication Backend Order, select the order in which Cloudera Manager should look up authentication credentials for login attempts.
5. For External Authentication Type, select LDAP.
6. In the LDAP URL property, provide the URL of the LDAP server and (optionally) the base Distinguished Name (DN) (the search base) as part of the URL — for example `ldap://ldap-server.corp.com/dc=corp,dc=com`.
7. If your server does not allow anonymous binding, provide the user DN and password to be used to bind to the directory. These are the LDAP Bind User Distinguished Name and LDAP Bind Password properties. By default, Cloudera Manager assumes anonymous binding.
8. Search for users and groups. You can search using User or Group search filters, using the LDAP User Search Base, LDAP User Search Filter, LDAP Group Search Base and LDAP Group Search Filter settings. These allow you to combine a base DN with a search filter to allow a greater range of search targets.

For example, if you want to authenticate users who may be in one of multiple OUs, the search filter mechanism will allow this. You can specify the User Search Base DN as `dc=corp,dc=com` and the user search filter as `uid={0}`. Then Cloudera Manager will search for the user anywhere in the tree starting from the Base DN. Suppose you have two OUs—`ou=Engineering` and `ou=Operations`—Cloudera Manager will find User "foo" if it exists in either of these OUs, that is, `uid=foo,ou=Engineering,dc=corp,dc=com` or `uid=foo,ou=Operations,dc=corp,dc=com`.

The Groups filters let you search to determine if a DN or username is a member of a target group. In this case, the filter you provide can be something like `member={0}` where {0} will be replaced with the DN of the user you are authenticating. For a filter requiring the username, {1} may be used, as `memberUid={1}`. This will return a list of groups the user belongs to, which will be compared to the list in the group properties.

9. Save the configuration changes.
10. In Administration Users & Roles LDAP/PAM Groups , choose Test LDAP User.  
You will be prompted to provide a username and password for an LDAP user in order to test whether that user can be authenticated.
11. Restart the Cloudera Manager Server.

### Configuring Cloudera Manager to Use LDAPS

#### About this task

If the LDAP server certificate has been signed by a trusted Certificate Authority, steps 1 and 2 below may not be necessary.

## Procedure

1. Copy the CA certificate file to the Cloudera Manager Server host.
2. Import the CA certificate(s) from the CA certificate file to the local truststore. The default truststore is located in the `$JAVA_HOME/jre/lib/security/cacerts` file.

This contains the default CA information shipped with the JDK. Create an alternate default file called `jssecacerts` in the same location as the `cacerts` file. You can now safely append CA certificates for any private or public CAs not present in the default `cacerts` file, while keeping the original file intact.

For our example, we will follow this recommendation by copying the default `cacerts` file into the new `jssecacerts` file, and then importing the CA certificate to this alternate truststore.

```
cp $JAVA_HOME/jre/lib/security/cacerts $JAVA_HOME/jre/lib/security/jssecacerts
```

```
$ /usr/java/latest/bin/keytool -import -alias NT_DOMAIN_NAME
-keystore /usr/java/latest/jre/lib/security/jssecacerts -f
file PATH_TO_CA_CERT
```



**Note:** The default password for the `cacerts` store is `changeit`. The `-alias` does not always need to be the domain name.

Alternatively, you can use the Java options: `javax.net.ssl.trustStore` and `javax.net.ssl.trustStorePassword`. Open the `/etc/default/cloudera-scm-server` file and add the following options:

```
export CMF_JAVA_OPTS="-Xmx2G -XX:MaxPermSize=256m -XX:+HeapDumpOnOutOfMemoryError
-XX:HeapDumpPath=/tmp -Djavax.net.ssl.trustStore=/usr/java/default/jre/lib/security/jssecacerts
-Djavax.net.ssl.trustStorePassword=changeit"
```

3. Configure the LDAP URL property to use `ldaps://LDAP_SERVER` instead of `ldap://LDAP_SERVER`
4. Restart the Cloudera Manager Server.

## Configure authentication using Kerberos (SPNEGO)

Cloudera Manager 6.3 and higher support Kerberos authentication using SPNEGO for the Admin Console as well as the API.

### Before you begin



#### Important:

With SPNEGO enabled, the Swagger-based Java and Python SDKs, as well as the older deprecated Java SDK, can still authenticate using HTTP Basic Authentication. The older deprecated Python SDK cannot. Do not enable SPNEGO if you are relying on the deprecated Python client for any operations.



**Note:** When the External Authentication Type is *ACTIVE DIRECTORY*, group lookups for authorization do not occur for Kerberos SPNEGO users. Kerberos users must be mapped explicitly to CM roles in Administration Settings Users & Roles . The alternative is to use *LDAP* as the External Authentication Type. The LDAP type supports most LDAPv3 compliant servers, including Active Directory.

## Procedure

1. If you have not already done so, enable Kerberos for cluster services.
2. Navigate to Administration > Settings.
3. Enter SPNEGO in the Search field.
4. Select the Enable SPNEGO/Kerberos Authentication for the Admin Console and API checkbox. Leave the other SPNEGO settings blank to allow Cloudera Manager to automatically generate the principal and keytab.

5. Click Save Changes.
6. Restart Cloudera Manager Server.

## Configure authentication using an external program

How to configure authentication using an external program in Cloudera Manager.

### About this task

Cloudera Manager can use a custom external authentication program. Typically, this may be a custom script that interacts with a custom authentication service. Cloudera Manager will call the external program with the username as the first command line argument. The password is passed over stdin. Each positive value exit code can be mapped to Cloudera Manager user roles. A negative value is returned for failure to authenticate. Valid values for the exit code are between 0 and 127.

### Procedure

1. Log in to Cloudera Manager Admin Console.
2. Select Administration Settings
3. Select External Authentication for the Category filter to display the settings.
4. For External Authentication Type, select External Program.
5. Provide a path to the external program in the External Authentication Program Path property.

### What to do next

After you configure authentication for Cloudera Manager, configure authorization for the authenticated users. This is done by mapping the authenticated users to Cloudera Manager user roles.

## Configure authentication using SAML

How to configure authentication using SAML in Cloudera Manager..

### Before you begin

### About this task

Cloudera Manager supports the Security Assertion Markup Language (SAML), an XML-based open standard data format for exchanging authentication and authorization data between parties, in particular, between an identity provider (IDP) and a service provider (SP). The SAML specification defines three roles: the principal (typically a user), the IDP, and the SP. In the use case addressed by SAML, the principal (user agent) requests a service from the service provider. The service provider requests and obtains an identity assertion from the IDP. On the basis of this assertion, the SP can make an access control decision—in other words it can decide whether to perform some service for the connected principal.

The primary SAML use case is called web browser single sign-on (SSO) and single logout (SLO). A user wielding a user agent (usually a web browser) requests a web resource protected by a SAML SP. The SP, wanting to know the identity of the requesting user, issues an authentication request to a SAML IDP through the user agent. In the context of this terminology, Cloudera Manager operates as a SP. This topic discusses the Cloudera Manager part of the configuration process; it assumes that you are familiar with SAML and SAML configuration in a general sense, and that you have a functioning IDP already deployed.

**Note:**

- Cloudera Manager supports both SP- and IDP-initiated SSO.
- Cloudera Manager supports SP initiated SLO, that is the logout action in Cloudera Manager will send a single-logout request to the IDP.
- SAML authentication has been tested with specific configurations of Okta, OneLogin and Microsoft Azure AD. While SAML is a standard, there is a great deal of variability in configuration between different IDP products, so it is possible that other IDP implementations, or other configurations of Okta, OneLogin and Microsoft Azure AD, might not interoperate with Cloudera Manager.
- To bypass SSO if SAML configuration is incorrect or not working, you can login using a Cloudera Manager local account using the URL: `http://CM_HOST:7180/cmf/localLogin`

## Prepare Files

### About this task

You will need to prepare the following files and information, and provide these to Cloudera Manager:

- A Java keystore containing a private key for Cloudera Manager to use to sign/encrypt SAML messages.
- The SAML metadata XML file from your IDP. This file must contain the IDP Entity ID, IDP SSO URL, IDP SLO URL and public certificates needed to verify the sign/encrypt key used by your IDP per the SAML Metadata Interoperability Profile. For example, if you are using the Shibboleth IdP, the metadata file is available at: `https://<IdPHOST>:8080/idp/shibboleth`.



**Note:** For guidance on how to obtain the metadata XML file from your IDP, either contact your IDP administrator or consult the documentation for the version of the IDP you are using.

- The entity ID that should be used to uniquely identify the Cloudera Manager instance
- How the user ID is passed in the SAML authentication response:
  - As an attribute. If so, what identifier is used.
  - As the NameID.
- The method by which the Cloudera Manager role will be established:
  - From an attribute in the authentication response:
    - What identifier will be used for the attribute
    - What values will be passed to indicate each role
  - From an external script that will be called for each use:
    - The script takes user ID as \$1
    - The script sets an exit code to reflect successful authentication. Valid values for the exit codes are between 0 and 127. These values are used in Cloudera Manager to map authenticated users to user roles within Cloudera Manager.

## Configure Cloudera Manager

### Before you begin

**Important:**

Before you configure SAML authentication, ensure that TLS encryption is enabled for Cloudera Manager. SAML authentication requires TLS encryption to secure communication between the service provider (SP) and the identity provider (IDP).

To enable TLS encryption, follow one of these methods:

- [Configuring TLS Encryption for Cloudera Manager Using Auto-TLS](#)
- [Manually Configuring TLS Encryption for Cloudera Manager](#)

## Procedure

1. Log in to Cloudera Manager Admin Console.
2. Select Administration Settings .
3. Select External Authentication for the Category filter to display the settings.
4. Set the External Authentication Type property to SAML (the Authentication Backend Order property is ignored for SAML).
5. Set the Path to SAML IDP Metadata File property to point to the IDP metadata file.
6. Set the Path to SAML Keystore File property to point to the Java keystore prepared earlier.
7. Ensure that the IDP Metadata file and SAML Keystore file have executable permissions.
8. In the SAML Keystore Password property, set the keystore password.
9. In the Alias of SAML Sign/Encrypt Private Key property, set the alias used to identify the private key for Cloudera Manager to use.
10. In the SAML Sign/Encrypt Private Key Password property, set the private key password.
11. Set the SAML Entity ID property which is unique to each Cloudera Manager.
12. In the Source of User ID in SAML Response property, set whether the user ID will be obtained from an attribute or the NameID.  
If an attribute will be used, set the attribute name in the SAML attribute identifier for user ID property. The default value is the normal OID used for user IDs and so may not need to be changed.
13. In the SAML Role assignment mechanism property, set whether the role assignment will be done from an attribute or an external script.
  - If an attribute will be used:
    - In the SAML attribute identifier for user role property, set the attribute name if necessary. The default value is the normal OID used for OrganizationalUnits and so may not need to be changed.
    - If an external script will be used, set the path to that script in the Path to SAML Role Assignment Script property. Make sure that the script is executable (an executable binary is fine - it does not need to be a shell script).
14. Save the changes. Cloudera Manager will run a set of validations that ensure it can find the metadata XML and the keystore, and that the passwords are correct. If you see a validation error, correct the problem before proceeding.
15. Restart the Cloudera Manager Server.

## What to do next

After you configure authentication for Cloudera Manager, configure authorization for the authenticated users. This is done by mapping the authenticated users to Cloudera Manager user roles.

## Configuring the IDP

### About this task

After the Cloudera Manager Server is restarted, it will attempt to redirect to the IDP login page instead of showing the normal CM page. This may or may not succeed, depending on how the IDP is configured. In either case, the IDP will need to be configured to recognize CM before authentication will actually succeed. The details of this process are specific to each IDP implementation - refer to your IDP documentation for details.

## Procedure

1. Download the Cloudera Manager's SAML metadata XML file from `http://HOSTNAME:7180/saml/metadata/{sp-entity-id}`.
2. Inspect the metadata file and ensure that any URLs contained in the file can be resolved by users' web browsers. The IDP will redirect web browsers to these URLs at various points in the process. If the browser cannot resolve

them, authentication will fail. If the URLs are incorrect, you can manually fix the XML file or set the Entity Base URL in the CM configuration to the right value, and then re-download the file.

3. Provide this metadata file to your IDP using whatever mechanism your IDP provides.
4. Ensure that the IDP has access to whatever public certificates are necessary to validate the private key that was provided to Cloudera Manager earlier.
5. Ensure that the IDP is configured to provide the User ID and Role using the attribute names that Cloudera Manager was configured to expect, if relevant.
6. Ensure the changes to the IDP configuration have taken effect (a restart may be necessary).

## Verifying Authentication and Authorization

### Procedure

1. Return to the Cloudera Manager Admin Console and refresh the login page.
2. Attempt to log in with credentials for a user that is entitled. The authentication should complete and you should see the Home Status tab.
3. If authentication fails, you will see an IDP provided error message. Cloudera Manager is not involved in this part of the process, and you must ensure the IDP is working correctly to complete the authentication.
4. If authentication succeeds but the user is not authorized to use Cloudera Manager, they will be taken to an error page by Cloudera Manager that explains the situation. If an user who should be authorized sees this error, then you will need to verify their role configuration, and ensure that it is being properly communicated to Cloudera Manager, whether by attribute or external script. The Cloudera Manager log will provide details on failures to establish a user's role. If any errors occur during role mapping, Cloudera Manager will assume the user is unauthorized.

## Enabling Kerberos Authentication for Cloudera

How to use the Cloudera Manager Kerberos wizard to set up authentication.

Minimum Required Role: [Cluster Administrator](#) (also provided by Full Administrator)

Cloudera Manager provides a wizard for integrating your organization's Kerberos instance with your cluster to provide authentication services.

Kerberos must already be deployed in your organization and the Kerberos key distribution center (KDC) must be ready to use, with a realm established. If you are using Red Hat Identity Management/FreeIPA, all of your cluster hosts must already be joined to the IPA domain. For Cloudera Data Explorer (Hue) and Oozie, the Kerberos realm must support renewable tickets.



**Important:** Before integrating Kerberos with your cluster, configure TLS encryption between Cloudera Manager Server and all Cloudera Manager Agent host systems in the cluster. During the Kerberos integration process, Cloudera Manager Server sends keytab files to the Cloudera Manager Agent hosts, and TLS encrypts the network communication so these files are protected.

Cloudera Manager clusters can be integrated with MIT Kerberos, Red Hat Identity Management (or the upstream FreeIPA), or Microsoft Active Directory.

For Active Directory, you must have administrative privileges to the Active Directory instance for initial setup and for on-going management, or you will need to have the help of your AD administrator prior to and during the integration process. For example, administrative access is needed to access the Active Directory KDC, create principals, and troubleshoot Kerberos TGT/TGS-ticket-renewal and take care of any other issues that may arise.

For Red Hat IdM, make sure that all cluster hosts are joined to the IPA domain. You can join a host to the domain by installing the freeipa-client package and then running the ipa-client-install script.

Kerberos client OS-specific packages must be installed on all cluster hosts and client hosts that will authenticate using Kerberos.

OS	Packages Required
RHEL and compatible OSs	<ul style="list-style-type: none"> <li>• openldap-clients on the Cloudera Manager Server host</li> <li>• krb5-workstation, krb5-libs on ALL hosts</li> <li>• (Red Hat IdM/FreeIPA only) freeipa-client on all cluster hosts</li> </ul>
SLES	<ul style="list-style-type: none"> <li>• openldap2-client on the Cloudera Manager Server host</li> <li>• krb5-client on ALL hosts</li> <li>• (Red Hat IdM/FreeIPA only) freeipa-client on all cluster hosts</li> </ul>
Ubuntu	<ul style="list-style-type: none"> <li>• ldap-utils on the Cloudera Manager Server host</li> <li>• krb5-user on ALL hosts</li> <li>• (Red Hat IdM/FreeIPA only) freeipa-client on all cluster hosts</li> </ul>

Cloudera supports the Kerberos version that ships with each supported operating system listed in “Operating System Requirements”.

### Related Information

[Operating System Requirements](#)

## Step 1: Install Cloudera Manager and Cloudera

Cloudera strongly recommends that you install and configure the Cloudera Manager Server and Cloudera Manager Agents and Cloudera to set up a fully-functional Cloudera cluster before trying to configure Kerberos authentication for the cluster.

### Required user:group settings for security

Learn about the user:group settings for security.

### About this task

When you install the Cloudera packages and the Cloudera Manager Agents on your cluster hosts, Cloudera Manager takes some steps to provide system security such as creating the OS user:group accounts and setting directory permissions as shown in the table below. These user accounts and directory permissions work with the Hadoop Kerberos security requirements.

This User	Runs These Roles
hdfs	NameNode, DataNodes, and Secondary NameNode
mapred	JobTracker and TaskTrackers (MR1) and Job History Server (YARN)
yarn	ResourceManager and NodeManagers (YARN)
oozie	Oozie Server
hue	Hue Server, Beeswax Server, Authorization Manager, and Job Designer

The hdfs user has HDFS superuser privileges.

When you install the Cloudera Manager Server on the server host, a new Unix user account called cloudera-scm is created automatically to support security. The Cloudera Manager Server uses this account to create host principals and deploy the keytabs on your cluster.

Depending on whether you installed Cloudera and Cloudera Manager at the same time or not, use one of the following sections for information on configuring directory ownerships on cluster hosts.

### New Installation, Cloudera Manager and Cloudera Together

Installing a new Cloudera Manager cluster with Cloudera components at the same time can save you some of the user:group configuration required if you install them separately. The installation process creates the necessary user accounts on the Linux host system for the service daemons. At the end of the installation process when each cluster node starts up, the Cloudera Manager Agent process on the host automatically configures the directory ownership

as shown in the table below, and the Hadoop daemons can then automatically set permissions for their respective directories. Do not change the directory owners on the cluster. They must be configured exactly as shown below.

Directory Specified in this Property	Owner
dfs.namenode.name.dir	hdfs:hadoop
dfs.data.dir	hdfs:hadoop
mapred.local.dir	mapred:hadoop
mapred.system.dir in HDFS	mapred:hadoop
yarn.nodemanager.local-dirs	yarn:yarn
yarn.nodemanager.log-dirs	yarn:yarn
oozie.service.JPAService.jdbc.url (if using Derby)	oozie:oozie
[[database]] name	hue:hue
javax.jdo.option.ConnectionURL	hue:hue

## Step 2: Create the Kerberos Principal for Cloudera Manager Server

How to create a Kerberos principal for Cloudera Manager Server.

### About this task

At the end of the integration process using the configuration wizard, Cloudera Manager Server will create host principals and deploy keytabs for all services configured on the cluster, which means that Cloudera Manager Server requires a principal that has privileges to create these other accounts.



**Note:** This task requires administrator privileges on the Kerberos instance. If you do not have administrator privileges, ask your Kerberos administrator to setup the principal and password for you. You will need to enter the principal name and password into the wizard later in the install process.

If an administrator principal to act on behalf of Cloudera Manager cannot be created on the Kerberos KDC for whatever reason, Cloudera Manager cannot create or manage principals and keytabs for Cloudera services. That means these principals must be created manually on the Kerberos KDC and then imported (retrieved) by Cloudera Manager. See “Using a custom Kerberos keytab retrieval script” for details about this process.



**Note:** The steps below summarize the process of adding a principal specifically for Cloudera Manager Server to an MIT KDC and an Active Directory KDC. See documentation from MIT, Microsoft, or the appropriate vendor for more detailed information.

### Related Information

[Using a custom Kerberos keytab retrieval script](#)

### Creating a Principal in Active Directory

#### About this task

Check the Microsoft documentation for specific details for your Active Directory KDC. The general process is as follows:

#### Procedure

1. Create an Organizational Unit (OU) in your Active Directory KDC service that will contain the principals for use by the Cloudera cluster.
2. Add a new user account to Active Directory, for example, *USERNAME@EXAMPLE.COM*. Set the password for the user to never expire.
3. Use the Delegate Control wizard in Active Directory to grant this new user permission to Create, Delete, and Manage User Accounts in the OU created in step 1. Make sure that these permissions are only applied to that specific OU, and nowhere else.

## Creating a Principal in an MIT KDC

### About this task

For MIT Kerberos, administrator principals are defined in the `/var/kerberos/krb5kdc/kadm5.acl` file on the KDC host. The default entry is:

```
*/admin@EXAMPLE.COM *
```

In this example, principals that include the instance name `admin` designate a user account as an administrator, such as `JDOE/admin@EXAMPLE.COM`.

If you modify the `kadm5.acl` file, such as replacing `EXAMPLE.COM` with your realm name, make sure to restart the `kadmin` service:

- RHEL 7 Compatible:

```
systemctl restart kadmin
```

- All Others:

```
service kadmin restart
```

Create the Cloudera Manager Server administrator principal as shown below, using the `admin` instance name and your realm name. If your `kadm5.acl` file defines a different pattern for administrators, make sure that the principal you create matches that pattern.

For MIT Kerberos KDC on a remote host:



**Note:** To connect to a remote KDC using the `kadmin` command, your currently authenticated Kerberos principal must be an existing Kerberos administrator. If you do not have an existing admin principal, you must run `kadmin.local` as described below.

```
kadmin
kadmin: addprinc -pw PASSWORD cloudera-scm/admin@EXAMPLE.COM
```

For MIT Kerberos KDC on the local host:



**Note:** The `kadmin.local` command must be run as root on the same host as the KDC.

```
kadmin.local
kadmin.local: addprinc -pw PASSWORD cloudera-scm/admin@EXAMPLE.COM
```

## Creating a Principal in Red Hat Identity Management (FreeIPA)

### About this task

If you are using Red Hat IdM or FreeIPA, the wizard creates its own user account with the necessary privileges. To do so, it requires admin credentials the first time. These admin credentials are not stored, and are used only to create a new user and role (named `cmadin-<RANDOM_ID>` and `cmadminrole`, respectively) and retrieve its keytab. Cloudera Manager stores this keytab for future Kerberos operations, such as regenerating the credentials of the Cloudera service accounts.

Because the wizard creates the principal it requires, you do not need to manually create an admin principal for Cloudera Manager at this time.

For additional information, refer to the Red Hat documentation:

- RHEL 7: “Linux Domain Identity, Authentication, and Policy Guide”
- RHEL 6: “Identity Management Guide”

## Step 3: Enable Kerberos using the wizard

How to enable Kerberos using the Cloudera Manager wizard.

### Related Information

[Step 2: Create the Kerberos Principal for Cloudera Manager Server Customizing Kerberos Principals and System Users](#)

### 1. Getting Started

Learn about the tasks you need to perform before you enable Kerberos using the Cloudera Manager wizard.

#### Before you begin

- Set up a working KDC in Step 1 of the wizard as described below. Cloudera Manager supports authentication with MIT KDC, Active Directory, and Red Hat Identity Management/FreeIPA.
- Configure the KDC to allow renewable tickets with non-zero ticket lifetimes.

Active Directory allows renewable tickets with non-zero lifetimes by default. You can verify this by checking Domain Security Settings Account Policies Kerberos Policy in Active Directory.

For MIT KDC, make sure you have the following lines in the `kdc.conf`.

```
max_life = 1d
max_renewable_life = 7d
```

- If you are using Active Directory, make sure LDAP over TLS/SSL (LDAPS) is enabled for the Domain Controllers.
- Host names must be in lowercase. If you use uppercase letters in any host name, the cluster services will not start after enabling Kerberos.
- Create an account for Cloudera Manager that has the permissions to create other accounts in the KDC. This should have been completed as part of “Step 3: Create the Kerberos Principal for Cloudera Manager Server”.



#### Important:

If YARN Resource Manager HA has been enabled in a non-secure cluster, before enabling Kerberos you must clear the StateStore znode in ZooKeeper, as follows:

1. Go to the Cloudera Manager Admin Console home page, click to the right of the YARN service and select Stop.
2. When you see a Finished status, the service has stopped.
3. Go to the YARN service and select Actions Format State Store .
4. When the command completes, click Close.



#### Note:

Minimum Required Role: [Full Administrator](#). This feature is not available when using Cloudera Manager to manage Data Hub clusters.

## Procedure

1. To start the Kerberos wizard, open the Cloudera Manager Admin Console, click the options menu for the applicable cluster, then click Enable Kerberos.

The screenshot displays the Cloudera Manager Admin Console interface. On the left is a dark sidebar with navigation options: Clusters, Hosts, Diagnostics, Audits, Charts, Replication, and Administration. The main content area is titled 'Home' and shows a list of services for 'Cluster 1'. A dropdown menu is open for 'Cluster 1', with a red box highlighting the three-dot options menu icon at the top right of the cluster header. A blue arrow points from this icon to the 'Enable Kerberos' option in the dropdown menu, which is also highlighted with a red box. Other options in the menu include 'Add Service', 'Add Hosts', 'Add Compute Cluster', 'Start', 'Stop', 'Restart', 'Rolling Restart', 'Deploy Client Configuration', 'Deploy Kerberos Client Configuration', 'Deploy Client Configs and Refresh', 'Refresh Cluster', 'Refresh Dynamic Resource Pools', 'Upgrade Cluster', 'Inspect Hosts in Cluster', 'Delete Kerberos Credentials', 'Configure the Cluster for Auto-TLS', and 'Set up HDFS Data At Rest Encryption'. On the right side of the console, there are three charts: 'Cluster CPU' (showing percent usage), 'Cluster Disk IO' (showing bytes/second), and 'Cluster Network IO' (showing bytes/second).

- After you open the Kerberos wizard, a Getting Started page appears. Select the applicable KDC type to display configuration steps for your specific type of KDC. When you have completed all of the configuration steps, select the I have completed all the above steps check box, then click Continue.

The screenshot shows the Cloudera Manager interface for enabling Kerberos on Cluster 1. The left sidebar contains a navigation menu with steps 1 through 8. Step 1, 'Getting Started', is currently active. The main content area displays the 'Getting Started' section, which includes a blue information box, a list of prerequisites, a 'KDC Type' selection (with 'Active Directory' selected), and terminal command boxes for RHEL/CentOS, SUSE, and Ubuntu. At the bottom, there is a green box with a checked checkbox for 'I have completed all the above steps.' and buttons for 'Cancel', 'Back', and 'Continue'.

**CLUSTER 1**

Enable Kerberos for Cluster 1

1 Getting Started  
2 Enter KDC Information  
3 Manage krb5.conf  
4 Enter Account Credentials  
5 Command Details  
6 Configure Kerberos  
7 Command Details  
8 Summary

CDEP Deployment from 2019-Nov-14 09:20  
Parcels  
Recent Commands  
Support  
admin

Getting Started

**i** This wizard walks you through the steps to configure Cloudera Manager and the cluster to use Kerberos for authentication. All services in the cluster, as well as the Cloudera Management Service, are restarted as part of the wizard.

Before using the wizard, ensure that you have performed the following steps:

- Read the [documentation](#) about enabling Kerberos.
- Set up a working KDC (Key Distribution Center) and specify the **KDC Type**:

KDC Type  MIT KDC  Active Directory  Red Hat IPA ?  
[Undo](#)

- Configure the KDC to have **non-zero ticket lifetime and renewal lifetime**. Clusters will not work properly if tickets are not renewable.
- Configure the KDC to have an account that has **permissions to create other accounts**.
- Install OpenLdap client libraries on the **Cloudera Manager Server host** if you want to use Active Directory.

6. `# RHEL / CentOS`  
`$ yum install openldap-clients krb5-workstation krb5-libs`

`# SUSE`  
`$ zypper install openldap2-client krb5-client`

`# Ubuntu`  
`$ apt-get install ldap-utils krb5-user`

I have completed all the above steps.

Cancel ← Back Continue →

## 2. Enter KDC Information

Learn about how to enter configuration information for the KDC you are using.

## About this task



### Note:

- If you have multiple Domain Controllers (in case of AD) or MIT KDC servers, only enter the name of any one of them in the KDC Server Host field. Cloudera Manager will use that server only for creating accounts. Do not use a round-robin DNS for KDCs in the `krb5.conf` file. If you choose to use Cloudera Manager to manage the `krb5.conf` file, you can specify the additional Domain Controllers using the Advanced Configuration Snippet (Safety Valve) for the Default Realm in `krb5.conf` property as explained below. Fault tolerance and load balancing can be achieved by specifying more than one (usually 2-3) KDCs, using their FQDNs or IP addresses. This, along with a `kdc_timeout` parameter of 3-5 seconds, allows all Kerberos clients (including Java GSS-API) to attempt communication with the next KDC in the event of a KDC failure.
- If you are using Active Directory with multiple Domain Controllers behind a load balancer:
  1. KDC Server Host: Enter the name of the load balancer in this field. Hadoop daemons will use the load balancer for authentication.
  2. Active Directory Domain Controller Override: Specify the name of any one Domain Controller in this field. Cloudera Manager will use this override to create accounts.
- Make sure the entries for the Kerberos Encryption Types field matches what your KDC supports.
- If you are using an Active Directory KDC, you can configure Active Directory account properties such as `objectClass` and `accountExpires` directly from the Cloudera Manager UI. You can also enable Cloudera Manager to delete existing AD accounts so that new ones can be created when Kerberos credentials are being regenerated.
- To use AES encryption, make sure you have deployed JCE Unlimited Strength Policy File, which is automatically included in Open JDK 1.8 232 (provided by Cloudera at the time of install) and up, but may not be available on some of the earlier JDK 1.8 releases.

## Procedure

- In the Active Directory KDC example below, we entered values for the Kerberos Security Realm, the KDC Server Host, and the Active Directory Suffix, and also selected the Active Directory Delete Accounts on Credential Regeneration check box.

- Click Continue to proceed.

### 3. Manage krb5.conf

Learn about how to manage the krb5.conf file on your cluster.

#### About this task

You can use this page to specify whether or not Cloudera Manager deploys and manages the krb5.conf file on your cluster.

## Procedure

- If you select the Manage krb5.conf through Cloudera Manager check box, you can use this page to configure the krb5.conf file properties. In particular, the safety valves on this page can be used to configure cross-realm authentication.

To configure multiple KDCs (as mentioned in the previous section), you can specify the additional Domain Controllers using the Advanced Configuration Snippet (Safety Valve) for the Default Realm in krb5.conf property box. For example:

```
kdc = kdc2.supportlab.cloudera.com
kdc = kdc3.supportlab.cloudera.com
```

```
kdc = kdcN.supportlab.cloudera.com
```

**CLUSTER**  
CLUSTER NAME

### Enable Kerberos for Cluster 1

- Getting Started
- Enter KDC Information
- 3 Manage krb5.conf**
- 4 Enter Account Credentials
- 5 Command Details
- 6 Configure Kerberos
- 7 Command Details
- 8 Summary

CDEP Deployment from 2019-Nov-14 09:20

- Parcels
- Recent Commands
- Support
- admin

### Manage krb5.conf

Specify the properties needed for generating the krb5.conf file for the cluster. You can use the Advanced Configuration Snippet to specify configuration of an advanced KDC setup, for example, with cross-realm authentication.

Manage krb5.conf through Cloudera Manager  Undo

**Kerberos Ticket Lifetime**  day(s)

**Kerberos Renewable Lifetime**  day(s)

**DNS Lookup KDC**

**Forwardable Tickets**

**KDC Timeout**  second(s)

**Advanced Configuration Snippet (Safety Valve) for [libdefaults] section of krb5.conf**

**Advanced Configuration Snippet (Safety Valve) for the Default Realm in krb5.conf**

**Advanced Configuration Snippet (Safety Valve) for remaining krb5.conf**

Cancel

- If left unchecked, you must ensure that the `krb5.conf` is deployed on all hosts in the cluster, including the Cloudera Manager Server host.

**Note:**

If you are using Red Hat IdM/FreeIPA, by default the `krb5.conf` file contains lines similar to this:

```
default_ccache_name = KEYRING:persistent:%{uid}
```

or, in the case of Kerberos Cache Manager (KCM):

```
default_ccache_name = KCM:
```

Cloudera does not support the keyring credential cache (which uses the above Linux-specific KEYRING directive) or Kerberos Cache Manager. Comment out these lines on every cluster host by adding a hash mark (#) at the beginning, and explicitly set the credentials cache to file-based, like this:

```
#default_ccache_name = KEYRING:persistent:%{uid}
default_ccache_name = FILE:/tmp/krb5cc_%{uid}
```

or, in the case of Kerberos Cache Manager:

```
# default_ccache_name = KCM:
default_ccache_name = FILE:/tmp/krb5cc_%{uid}
```

If you configure Cloudera Manager to manage the `krb5.conf` file, you do not need to do anything.

- Click Continue to proceed.

#### 4. Enter Account Credentials

Learn about how to enter account credentials.

##### About this task



**Note:** Enter the REALM portion of the principal in upper-case only to conform to Kerberos convention.

**Note:**

Many enterprises employ policies that require all passwords to be changed after a particular number of days. you can use the following steps to change the password in Cloudera Manager for the Account Manager:

1. In the Cloudera Manager Admin Console, select Administration Security .
2. Go to the Kerberos Credentials tab and click Import Kerberos Account Manager Credentials.
3. In the Import Kerberos Account Manager Credentials dialog box, enter the user name and password for the user that can create principals for Cloudera cluster in the KDC.

##### Procedure

1. Enter the user name and password for the user that can create principals for Cloudera cluster in the KDC. This is the user/principal you created in “Step 3: Create the Kerberos Principal for Cloudera Manager Server”. Cloudera Manager encrypts the user name and password into a keytab and uses it as needed to create new principals.

If you are using Red Hat IdM/FreeIPA, enter the IPA admin credentials here. These admin credentials are not stored, and are used only to create a new user and role (named `cmadin-RANDOM_ID` and `cmadminrole`,

respectively) and retrieve its keytab. Cloudera Manager stores this keytab for future Kerberos operations, such as regenerating the credentials of the Cloudera service accounts.

The screenshot shows the Cloudera Manager interface for enabling Kerberos on Cluster 1. The left sidebar contains navigation options: Parcels, Recent Commands, Support, and a user profile for 'admin'. The main content area displays a progress bar with steps: Getting Started, Enter KDC Information, Manage krb5.conf, Enter Account Credentials (current step), Command Details, Configure Kerberos, Command Details, and Summary. The 'Enter Account Credentials' step is active, showing a form with the following fields:

- Username \***: A text input field containing 'c...' followed by an '@' symbol and a domain 'AD.I...COM'.
- Password \***: A password input field with masked characters '.....'.

Below the form, there are three buttons: 'Cancel', 'Back', and 'Continue'.

2. Click Continue to proceed.

## 5. Command Details

Learn about the command details page.

### Procedure

- The Command Details page displays the outcome of the Enter Account Credentials step. Click Continue to proceed.

The screenshot shows the Cloudera Manager interface for enabling Kerberos on Cluster 1, now at the 'Command Details' step. The progress bar shows that 'Enter Account Credentials' is completed. The main content area displays the following information:

- Command Title:** Import KDC Account Manager Credentials Command
- Status:** Finished (indicated by a green checkmark)
- Timestamp:** Nov 17, 10:56:03 AM
- Duration:** 5.02s
- Message:** Successfully imported KDC Account Manager credentials.

At the bottom, there are three buttons: 'Cancel', 'Back', and 'Continue'.

## 6. Configure Kerberos

Learn about how to configure Kerberos.

## Procedure

1. If you have not already done so, run the provided commands on each cluster host to install the Kerberos client libraries.

**Enable Kerberos for Cluster 1**

**Configure Kerberos**

Install Kerberos client libraries on all hosts before proceeding.

```
# RHEL / CentOS
$ yum install krb5-workstation krb5-libs

# if Red Hat IPA is used as the KDC
$ yum install freeipa-client

# SUSE
$ zypper install krb5-client

# if Red Hat IPA is used as the KDC
$ zypper install freeipa-client

# Ubuntu
$ apt-get install krb5-user

# if Red Hat IPA is used as the KDC
$ apt-get install freeipa-client
```

Configure the privileged ports required by DataNodes in a secure HDFS service.

DataNode Transceiver Port:   
Port for DataNode's Xceiver Protocol. Combined with the DataNode's hostname to build its address.

DataNode HTTP Web UI Port:   
Port for the DataNode HTTP web UI. Combined with the DataNode's hostname to build its HTTP address.

Configure Kerberos Principals

Use Default Kerberos Principals

Cancel      < Back      Continue >

2. The wizard automatically sets the privileged ports needed by the DataNode Transceiver Protocol and the HTTP Web UI, but you can also specify alternate privileged ports.



**Note:** If SSL is enabled, the assigned port numbers will be higher than 1024; if SSL is not enabled, the assigned port numbers will be less than 1024.

3. To configure custom service principals, clear the Use Default Kerberos Principals check box, and then specify a custom principal for each service.



**Note:** Before configuring custom service principals, see “Customizing Kerberos principals” for additional information.

4. Click Continue to proceed.

## 7. Command Details

Learn about the outcome of the Enable Kerberos command.

## Procedure

- The Command Details page displays the outcome of the Enable Kerberos command. It may take a few minutes for these steps to complete.

If an error message appears, you can fix the error, then click Resume. In the following example, we select Administration Settings Kerberos , then enter an invalid file name in the Custom Kerberos Keytab Retrieval Script box.

The screenshot shows the Cloudera Manager Administration Settings page for Kerberos. The left sidebar contains navigation options: Clusters, Hosts, Diagnostics, Audits, Charts, Replication, Administration (selected), CDEP Deployments, Parcels, Recent Commands, Support, and the user 'admin'. The main content area displays various Kerberos configuration settings:

- Kerberos Ticket Lifetime: 1 day(s)
- Kerberos Renewable Lifetime: 7 day(s)
- DNS Lookup KDC:
- Forwardable Tickets:
- KDC Timeout: 3 second(s)
- Custom Kerberos Keytab Retrieval Script: /tmp/1.sh (highlighted with a red box)
- Maximum Renewable Life for Principals: 5 day(s)
- Active Directory Domain Controller Override: (empty)
- Advanced Configuration Snippet (Safety Valve) for [libdefaults] section of krb5.conf: (empty)
- Advanced Configuration Snippet (Safety Valve) for the Default Realm in krb5.conf: (empty)

This causes a credential generation error. In this case we can remove the invalid script setting, then click Resume to resume the Enable Kerberos command.

**Enable Kerberos for Cluster 1**

**Enable Kerberos Command**

Investigate the failure step and once the cause is fixed, click Resume to continue

Status **Failed** Context [Cluster 1](#) Nov 21, 10:10:42 AM 99.85s [Resume](#)

**Failed to enable Kerberos.**

**Completed 5 of 8 step(s).**

Show All Steps  Show Only Failed Steps  Show Only Running Steps

<ul style="list-style-type: none"> <li>Wait for credentials to be generated Command (Generate Missing Credentials (363)) has failed</li> </ul>	Nov 21, 10:12:08 AM	13.39s
<ul style="list-style-type: none"> <li>Execute global command Generate Missing Credentials Custom keytab retrieval script '/tmp/1.sh' is not an executable file.</li> </ul>	Nov 21, 10:12:16 AM	5.52s

[Cancel](#) [Back](#) [Continue](#)

After the command finishes running, click Continue to proceed.

**Enable Kerberos for Cluster 1**

**Enable Kerberos Command**

Status **Finished** Context [Cluster 1](#) Nov 17, 12:06:51 PM 6.5m

Successfully enabled Kerberos.

**Completed 8 of 8 step(s).**

Show All Steps  Show Only Failed Steps  Show Only Running Steps

Stop cluster	<a href="#">Cluster 1</a>	Nov 17, 12:06:52 PM	63.9s
Stop Cloudera Management Services	<a href="#">Cloudera Management Service</a>	Nov 17, 12:07:56 PM	5.94s
Deploy krb5.conf	<a href="#">Cluster 1</a>	Nov 17, 12:08:02 PM	15.27s
Configure all services to use Kerberos	<a href="#">Cluster 1</a>	Nov 17, 12:08:17 PM	29ms
Wait for credentials to be generated		Nov 17, 12:08:17 PM	36.49s
Deploy client configuration	<a href="#">Cluster 1</a>	Nov 17, 12:08:54 PM	20.98s
Start Cloudera Management Services	<a href="#">Cloudera Management Service</a>	Nov 17, 12:09:15 PM	27.63s
Start cluster	<a href="#">Cluster 1</a>	Nov 17, 12:09:46 PM	3.5m

[Cancel](#) [Back](#) [Continue](#)

## 8. Summary

Learn about the summary of the task you performed.

### About this task

The final step of the wizard lists the cluster(s) for which Kerberos has been successfully enabled. Click Finish to return to the Cloudera Manager Admin Console home page.

The screenshot shows the Cloudera Manager interface for the 'Enable Kerberos for Cluster 1' wizard. On the left is a dark sidebar with the Cloudera Manager logo and navigation options: Parcels, Recent Commands, Support, and a user profile for 'admin'. The main content area is titled 'Enable Kerberos for Cluster 1' and features a vertical progress indicator with steps: Getting Started, Enter KDC Information, Manage krb5.conf, Enter Account Credentials, Command Details, Configure Kerberos, Command Details, and Summary (the current step, marked with a circled '8'). To the right of the progress indicator is a 'Summary' section with a green message box containing a checkmark and the text: 'You have successfully enabled Kerberos on this cluster.' At the bottom of the wizard, there are three buttons: 'Cancel', 'Back', and 'Finish'.

## Results

To view details about Kerberos-enabled services, select Administration > Security, then click the applicable row in the Kerberos column.

The screenshot shows the Cloudera Manager interface for configuring Kerberos authentication. The main page is titled "Security" and has a sub-tab "Kerberos Credentials". There are buttons for "Enable Auto-TLS", "TLS Settings", and "Security Inspector". A message states: "This page allows user to enable Kerberos and HDFS Data Encryption that the wizard sets." Below this is a search box "Search by cluster name" and a table with columns "Cluster" and "Kerberos". The table shows "Cluster 1" with a warning icon and the text "17 of 18 services are enabled".

A modal window titled "Services with Kerberos Enabled" is open, listing the following services:

- KUDU-1
- ZOOKEEPER-1
- HDFS-1
- HBASE-1
- OOZIE-1
- HIVE-1
- HUE-1
- SOLR-1
- KS\_INDEXER-1
- YARN-1
- IMPALA-1
- SPARK\_ON\_YARN-1
- KAFKA-1
- HIVE\_ON\_TEZ-1
- LIVY-1
- TEZ-1
- ZEPPELIN-1

Below the list, there is a section "Services with Kerberos Disabled" containing:

- SQOOP\_CLIENT-1

At the bottom of the modal, there is a button labeled "View Kerberos Configuration".

Click View Kerberos Configuration to view and edit configuration details for each service. Click Save Changes to save any configuration updates.



### Note:

The first five steps of this wizard can also be performed before cluster creation by selecting Administration Security Kerberos Credentials Setup KDC for this Cloudera Manager . If that has already been done, the first five steps of this wizard do not appear.

## 9. Add prefix to account names in Active Directory (Optional)

Learn about the steps you need to perform to add a prefix to account names in Active Directory.

### About this task

If you are using Active Directory to enable Kerberos authentication, the account names in Active Directory show random strings created automatically by a bash script hosted in Cloudera Manager. This is expected behavior, but you can add a prefix to the account names, which helps identify the accounts used for authentication.

Follow these steps to add a prefix to the account names in Active Directory:

### Procedure

1. In the Cloudera Manager Admin Console, select Administration Settings .
2. Find Active Directory Account Prefix in the search bar.
3. Enter the desired prefix in the text field, such as *my-lab* or similar.

The screenshot shows the Cloudera Manager interface. On the left is a dark sidebar with navigation options: Clusters, Hosts, Diagnostics, Audits, Charts, Replication, Administration (highlighted), Data Services (New), Parcels, Running Commands, Support, and admin. The main content area is titled 'Settings' and shows the configuration for 'Active Directory Account Prefix'. A search bar at the top contains 'Active Directory Account Prefix'. Below it, a 'Filters' panel is open, showing a list of categories and their counts: SCOPE (Settings: 1), CATEGORY (Other: 0, Advanced: 0, Altus: 0, Custom Service Descriptors: 0, External Authentication: 0, Kerberos: 1, Monitoring: 0, Network: 0, Parcels: 0, Performance: 0, Ports and Addresses: 0, Replication: 0, Reports: 0, Security: 0, Support: 0), and STATUS (Error: 0, Warning: 0, Edited: 0, Non-Default: 1, Include Overrides: 0). The main configuration area shows 'Active Directory Account Prefix' with a value of 'my-lab' and a 'Show All Descriptions' link. A 'Save Changes (CTRL+S)' button is at the bottom right.

4. Click Save Changes.
5. On the Home Status tab, click the three dots to the right of the cluster name, and select Stop.
6. Regenerate the Kerberos credentials by selecting Administration Security Kerberos Credentials .
7. Select all credentials, then click Regenerate Selected.
8. On the Home Status tab, click the three dots to the right of the cluster name, and select Start.
9. Check in the Active Directory if the changes are reflected in the account names.

### 10. Update Kerberos configuration parameters

Learn about how to update Kerberos configuration settings on an already Kerberos-enabled cluster.

#### About this task

After Kerberos has been enabled on your cluster, you may need to update Kerberos configuration parameters. The required actions to ensure that the changes are applied correctly depend on whether Cloudera Manager manages the `krb5.conf` file through the Manage `krb5.conf` through Cloudera Manager option or if the file is managed externally.

## Procedure

The screenshot shows the Cloudera Manager Administration interface. The left sidebar is set to 'Administration' > 'Settings'. The main panel displays the 'Kerberos' category settings. The 'KDC Type' is set to 'MIT KDC'. The 'Active Directory Suffix' is 'ou=hadoop,DC=hadoop,DC=com'. The 'Active Directory Delete Accounts on Credential Regeneration' checkbox is checked. The 'Kerberos Encryption Types' is set to 'rc4-hmac'. The 'Active Directory Password Properties' field contains 'length=12,minLowerCaseLetters=2,minUpperCaseLetters=2,minDigits=2,minSpaces=0,minSpecialChars=0,speci'. The 'Active Directory Account Properties' field contains 'accountExpires=0,objectClass=top,objectClass=person,objectClass=organizationalPerson,objectClass=user'. The 'Kerberos Security Realm' is 'ROOT.COM OPS.SITE'. The 'KDC Server Host' is 'kdc' and the 'KDC Admin Server Host' is 'admin.example.com'. A status bar at the bottom indicates '1 Edited Value Reason for change: Modified KDC Timeout' and a 'Save Changes(CTRL+S)' button.

1. In Cloudera Manager, select **Administration Settings**.
2. Select **Category Kerberos** to display Kerberos-related settings.
3. Update the required Kerberos configuration parameters. Common parameters that may need updating include:
  - Kerberos Security Realm - The Kerberos realm name (in uppercase).
  - KDC Server Host - The hostname or FQDN of the KDC server.
  - KDC Admin Server Host - The hostname or FQDN of the KDC admin server.
  - Kerberos Ticket Lifetime - The duration for which Kerberos tickets are valid (for example, 10 hours instead of the default 1 day).
  - KDC Timeout - The timeout value for KDC communication (for example, 10 seconds).
  - Active Directory Suffix - The organizational unit path in Active Directory where service accounts are created.
  - Advanced Configuration Snippet (Safety Valve) for the Default Realm in `krb5.conf` - Used to configure additional KDC servers or admin servers. For detailed instructions on managing the `krb5.conf` file, see [3. Manage krb5.conf](#).
4. If you want Cloudera Manager to manage `krb5.conf` across all hosts, ensure the **Manage krb5.conf through Cloudera Manager** option is enabled.



**Important:** If you manage `krb5.conf` externally, leave the **Manage krb5.conf through Cloudera Manager** option unchecked and deploy the updated `krb5.conf` file using your standard process.

5. Click the **Save Changes(CTRL+S)** button.
6. If Cloudera Manager manages `krb5.conf`, stop the cluster by navigating to the **Home Status** tab, clicking the three dots to the right of the cluster name, and selecting **Stop**. Then deploy the updated Kerberos configuration by selecting **Actions Deploy Kerberos Client Configuration**, wait for completion, and finally select **Start** to bring the cluster back online.

This action distributes the updated `krb5.conf` file and related Kerberos configuration to all hosts in the cluster.



**Important:** If the `krb5.conf` file is managed externally, restarting the cluster is not necessary for distributing the updated `krb5.conf` file. You must restart the cluster only if your changes require regenerating principals or keytabs.

7. Verify that all services start successfully and that Kerberos authentication is working as expected.

## Results

The updated Kerberos configuration parameters have been successfully applied to all cluster hosts. The cluster is now running with the new Kerberos settings.



### Tip:

If you need to make additional Kerberos configuration changes in the future, repeat this process to ensure consistent configuration across the cluster.

## Step 4: Create the HDFS superuser

To create home directories for users, you need access to the HDFS superuser account.

### About this task

Cloudera automatically creates the HDFS superuser account on each cluster host during Cloudera installation. When you enable Kerberos for the HDFS service, you lose access to the default HDFS superuser account using `sudo -u hdfs` commands. Cloudera recommends that you use a different user account as the superuser, rather than the default `hdfs` account.

### Designating a Non-default Superuser Group

#### About this task

To designate a different group of superusers instead of using the default `hdfs` account:

#### Procedure

1. Open the Cloudera Manager Admin console and navigate to the HDFS service.
2. Click the Configuration tab.
3. Select Scope HDFS (Service-Wide) .
4. Select Category Security .
5. Locate the Superuser Group property and change the value to the appropriate group name for your environment. For example, `<SUPERUSER>`.
6. Enter a Reason for change, then click Save Changes to commit the changes.
7. Restart the HDFS service.

#### What to do next

To enable your access to the superuser account now that Kerberos is enabled, you must now create a Kerberos principal or an Active Directory user whose first component is `<SUPERUSER>`:

If you are using Active Directory

Add a new user account to Active Directory, `<superuser>@YOUR-REALM.COM`. The password for this account should be set to never expire.

If you are using MIT KDC

1. In the `kadmin.local` or `kadmin` shell, type the following command to create a Kerberos principal called `<SUPERUSER>`:

```
kadmin: addprinc <SUPERUSER>@YOUR-LOCAL-REALM.COM
```

This command prompts you to create a password for the `<SUPERUSER>` principal. You should use a strong password because having access to this principal provides superuser access to all of the files in HDFS.

2. To run commands as the HDFS superuser, you must obtain Kerberos credentials for the `<SUPERUSER>` principal. To do so, run the following command and provide the appropriate password when prompted.

```
kinit <SUPERUSER>@YOUR-LOCAL-REALM.COM
```

If you are using Red Hat IdM/FreeIPA

1. On the Identity Users page, click the Add button.
2. Specify the superuser principal name in the User login field, complete the remaining fields, then click Add.
3. On the Identity Groups page, click the Add button, then select the users that have been created.

## Step 5: Get or create a Kerberos principal for each user account

How to create a Kerberos principal for a user account.

### About this task

Now that Kerberos is configured and enabled on your cluster, you and every other Hadoop user must have a Kerberos principal or keytab to obtain Kerberos credentials to be allowed to access the cluster and use the Hadoop services. In the next step of this procedure, you will need to create your own Kerberos principals to verify that Kerberos security is working on your cluster. If you and the other Hadoop users already have a Kerberos principal or keytab, or if your Kerberos administrator can provide them, you can skip ahead to the next step.

### If you are using Active Directory

#### Procedure

- Add a new AD user account for each new user that should have access to the cluster. You do not need to make any changes to existing user accounts.

### If you are using MIT KDC

#### Procedure

1. In the `kadmin.local` or `kadmin` shell, use the following command to create user principals by replacing `YOUR-LOCAL-REALM.COM` with the name of your realm, and replacing `USERNAME` with a username:

```
kadmin: addprinc USERNAME@YOUR-LOCAL-REALM.COM
```

2. Enter and re-enter a password when prompted.

## Step 6: Prepare the cluster for each user

Before users access the cluster, there are a few tasks you must complete to prepare the hosts for each user.

#### Procedure

1. Make sure all hosts in the cluster have a Linux user account with the same name as the first component of that user's principal name. For example, the Linux account `joe` should exist on every box if the user's principal name is `joe@YOUR-REALM.COM`. You can use LDAP for this step if it is available in your organization.



**Note:** Each account must have a user ID that is greater than or equal to 1000. In the `/etc/hadoop/conf/tas-kcontroller.cfg` file, the default setting for the `banned.users` property is `mapred, hdfs, and bin` to prevent jobs from being submitted using those user accounts. The default setting for the `min.user.id` property is 1000 to prevent jobs from being submitted with a user ID less than 1000, which are conventionally Unix super users.

2. Create a subdirectory under /user on HDFS for each user account (for example, /user/joe). Change the owner and group of that directory to be the user.

```
hadoop fs -mkdir /user/joe
hadoop fs -chown joe /user/joe
```



**Note:** sudo -u hdfs is not included in the commands above. This is because it is not required if Kerberos is enabled on your cluster. You will, however, need to have Kerberos credentials for the HDFS super user to successfully run these commands. For information on gaining access to the HDFS super user account, see “Step 5: Create the HDFS superuser”.

### Related Information

[Step 4: Create the HDFS superuser](#)

## Step 7: Verify that Kerberos security is working

Verify that Kerberos security is working by running test MapReduce jobs.

### Before you begin

After you have Kerberos credentials, you can verify that Kerberos security is working on your cluster by trying to run MapReduce jobs. To confirm, try launching a sleep or a pi job from the provided Hadoop examples (/usr/lib/hadoop/hadoop-examples.jar).



**Note:**

This section assumes you have a fully-functional Cloudera cluster and you have been able to access HDFS and run MapReduce jobs before you followed these instructions to configure and enable Kerberos on your cluster. If you have not already done so, you should at a minimum use the Cloudera Manager Admin Console to generate a client configuration file to enable you to access the cluster.

### Procedure

1. Acquire Kerberos credentials for your user account.

```
kinit USERNAME@YOUR-LOCAL-REALM.COM
```

2. Enter a password when prompted.
3. Submit a sample pi calculation as a test MapReduce job. Use the following command if you use a package-based setup for Cloudera Manager:

```
$ hadoop jar /usr/lib/hadoop-0.20-mapreduce/hadoop-examples.jar pi 10 10
000
Number of Maps = 10
Samples per Map = 10000
...
Job Finished in 38.572 seconds
Estimated value of Pi is 3.14120000000000000000
```

If you have a parcel-based setup, use the following command instead:

```
$ hadoop jar /opt/cloudera/parcels/CDH/bin/hadoop jar /opt/cloudera/parcels/CDH/lib/hadoop-mapreduce/hadoop-mapreduce-examples.jar wordcount /hdfs-input-path /hdfs-output-path
Number of Maps = 10
Samples per Map = 10000
...
Job Finished in 30.958 seconds
Estimated value of Pi is 3.14120000000000000000
```

## What to do next

You have now verified that Kerberos security is working on your cluster.



### Important:

Running a MapReduce job will fail if you do not have a valid Kerberos ticket in your credentials cache. You can examine the Kerberos tickets currently in your credentials cache by running the klist command. You can obtain a ticket by running the kinit command and either specifying a keytab file containing credentials, or entering the password for your principal. If you do not have a valid ticket, you will receive an error such as:

```
11/01/04 12:08:12 WARN ipc.Client:
Exception encountered while connecting to the server :
javax.security.sasl.SaslException:GSS initiate failed
[Caused by GSSException: No valid credentials provided (Mechanism level
: Failed to find any
Kerberos tgt)]
Bad connection to FS. command aborted. exception: Call to nn-host/10
.0.0.2:8020 failed on local exception:
java.io.IOException:javax.security.sasl.SaslException: GSS initiate f
ailed
[Caused by GSSException: No valid credentials provided
(Mechanism level: Failed to find any Kerberos tgt)]
```

## Step 8: (Optional) Enable authentication for HTTP web consoles for Hadoop roles

Authentication for access to the web consoles for the HDFS and YARN roles can be enabled using a configuration option for the appropriate service.

### Before you begin

Minimum Required Role: [Configurator](#) (also provided by Cluster Administrator, Limited Cluster Administrator , and Full Administrator)

### Procedure

1. On the Clusters tab, select the service (HDFS or YARN) for which you want to enable authentication.
2. Click the Configuration tab.
3. Select Scope *SERVICE NAME* Service-Wide .
4. Type Enable Kerberos in the Search box.
5. Select Enable Kerberos Authentication for HTTP Web-Consoles.
6. elect Enable Kerberos Authentication for HTTP Web-Consoles.
7. Enter a Reason for change, then click Save Changes to commit the changes.
8. When the command finishes, restart all roles of that service.

## Enabling SPNEGO as an Authentication Backend for Cloudera Data Explorer (Hue)

Set up Cloudera Manager authentication backend and configure Kerberos keytab for Hue service.

### Procedure

1. In Cloudera Manager, set the authentication backend to SpnegoDjangoBackend.
  - a) Go to the Cloudera Manager Admin Console. From the Clusters tab, select the Hue service.
  - b) Click the Configuration tab.
  - c) Select Scope Service-Wide .
  - d) Select Category Security .
  - e) Locate the Authentication Backend property and select desktop.auth.backend.SpnegoDjangoBackend.
  - f) Click Save Changes.

2. Restart the Hue service.
3. If you are using an external load balancer, perform the following steps, otherwise skip the remaining steps. Cloudera Manager creates these configuration automatically:
  - a) Obtain or create a Kerberos keytab that includes keys for the load balancer host's HTTP service principal and for any other DNS hostnames or aliases a client might use to connect to Hue.

For example, if clients need to bypass the external load balancer and connect to Hue instances directly, the keytab must include all associated HTTP principals.

```
klist -kte custom-hue-spnego.keytab
Keytab name: FILE: custom-hue-spnego.keytab
KVNO Timestamp Principal

1 03/09/15 20:20:35 HTTP/load-balancer.example.cloudera.com@EXAMPLE.C
LOUDERA.COM (aes128-cts-hmac-sha1-96)
1 03/09/15 20:20:36 HTTP/huehost1.example.cloudera.com@EXAMPLE.CLOUDER
A.COM (aes128-cts-hmac-sha1-96)
1 03/09/15 20:20:36 HTTP/huehost2.example.cloudera.com@EXAMPLE.CLOUDERA.
COM (aes128-cts-hmac-sha1-96)
```

For principals not managed by Cloudera Manager, you must contact your organization's KDC administrator for help with keytab creation.

- b) Copy the custom-hue-spnego.keytab file to /var/lib/hue/hue.keytab and change ownership to the hue user and group.

```
cp ./custom-hue-spnego.keytab /var/lib/hue/hue.keytab
chown hue:hue /var/lib/hue/hue.keytab
```

- c) Go to the Cloudera Manager Admin Console. From the Clusters tab, select the Hue service.
- d) Click the Configuration tab.
- e) Select Scope Service-Wide .
- f) Select Category Advanced .
- g) Locate the Hue Service Environment Advanced Configuration Snippet (Safety Valve) property and add the following line:

```
KRB5_KTNAME=/var/lib/hue/hue.keytab
```

- h) Enter a Reason for change, then click Save Changes to commit the changes.
- i) Restart the Hue service.

## Kerberos authentication for non-default users

The steps described here are only applicable if you are running one or more Cloudera services with non-default users.

### Procedure

- If you have modified the default value for the System User property for any service in Cloudera Manager, you must only perform the command (as described below) corresponding to that service, in order to successfully run jobs with the non-default user.

HBase	<p>Give the hbase user ownership of the HBase root directory:</p> <pre>sudo -u hdfs hadoop fs -chown -R hbase \${hbase.rootd ir}</pre> <p>By default, hbase.rootdir is /hbase.</p>
-------	--

Hive	<p>Give the hive user ownership of the /user/hive directory.</p> <pre>sudo -u hdfs hadoop fs -chown hive /user/hive</pre>
YARN	<p>For every NodeManager host, for each path in yarn.nodemanager.local-dirs, run:</p> <pre>rm -rf \${yarn.nodemanager.local-dirs}/usercache/*</pre> <p>This removes the /usercache directory that contains intermediate data stored for previous jobs.</p>

## Customizing Kerberos Principals and System Users

How to configure custom service principals in Cloudera Manager.

Custom Kerberos Principals are a non-default cluster configuration option for customers who have specific security or identity management requirements. For example, customers may have a pre-existing identity management (LDAP/AD/IPA) configuration with identities that are either incompatible with Hadoop and/or Linux username syntax restrictions, or are otherwise undesirable to use as the identifier of an end-user within the Hadoop environment.

In this case, the Kerberos principal differs from the user understood by both the Cloudera platform and the operating system via a set of mapping rules, today implemented by the ‘auth\_to\_local’ feature of Apache Hadoop. This occurs when customers have long-standing naming conventions and policies about identity management at the corporate level which cannot be altered for their Cloudera deployment.

To accommodate this, custom Kerberos principals are often used in conjunction with custom service accounts at the local (OS) and Hadoop levels. These are known to Cloudera Manager as “System users”.



**Important:** Cloudera Manager configures Cloudera services to use the default Kerberos principal names and default system users. Cloudera recommends that you do not change the default Kerberos principal or system user names.

If your security policies require you to customize the service Kerberos Principals and System User Names, contact Cloudera Professional Services for additional help. Configuring the recommended solution requires additional steps and automation outside of Cloudera to be successful.

### Preparation of System Users/Groups

Cluster administrators will need to ensure that all the required custom system users have been created on the hosts that will be joining the cluster. Cloudera Manager only creates the default system users.



**Note:** If you are not changing the default system user names, you should skip the following steps

It is highly recommended that IT/Ops should handle the creation of system users with standard tools that help manage large number of hosts, eg. Ansible. The below procedure is a manual alternative to using such tools.

1. Ensure the CM Agent is installed on the hosts.
2. Select a host and ssh into the host.
3. Copy service\_list.csv and group\_list.csv to a directory of your choice, eg. /tmp
4. Edit your copied service\_list.csv file to include the chosen custom names for system users and/or the respective groups for each Cloudera service component.
5. For each one of the hosts managed by CM:
  - a. Copy the modified service\_list.csv and group\_list.csv to a directory on the host eg. /tmp
  - b. Log into the host as root or a sudo-capable user account.
  - c. `$ cd /opt/cloudera/cm-agent/service/inituids`
  - d. Assuming the files are in /tmp, run this command: `./set-service-uids.py -s /tmp/service_list.csv -g /tmp/group_list.csv`

## Related Information

[Hadoop Users \(user:group\) and Kerberos Principals](#)

## Enabling feature flag for Custom Kerberos Principals and System Users

Cloudera Manager does not enable the Custom Kerberos Principals and System Users feature by default. You must enable the feature flag for Custom Kerberos Principals and System Users before setting up the cluster using the Add Cluster - Configuration wizard.

### About this task

To enable the feature flag, perform the following steps:

### Procedure

1. SSH into the Cloudera Manager Server host.
2. Edit the `/etc/default/cloudera-scm-server` file and add the following line:

```
export CMF_FF_CUSTOM_KP_AND_SYSTEM_USER=true
```

3. Save the `/etc/default/cloudera-scm-server` file.
4. Restart the Cloudera Manager Server by running the following command:

```
sudo systemctl restart cloudera-scm-server
```

## Customizing Kerberos Principals and System Users (Recommended)

The Custom Kerberos Principals and System Users is an advanced feature that allows you to customize the *Kerberos Principals* and *System Users* for the Cloudera Runtime services. The following steps explain how to customize the *Kerberos Principals* and *System Users* in the Cloudera Manager.

### Before you begin



#### Important:

Ensure you complete the following tasks before you start performing the steps to customize the *Kerberos Principals* and *System Users* in the Cloudera Manager.:

1. Before you start customizing the *Kerberos Principals* and *System Users* in the Cloudera Manager, ensure you complete enabling the feature flag for Custom Kerberos Principals and System Users before setting up the cluster. See [Enabling feature flag for Custom Kerberos Principals and System Users](#).
2. On the Cloudera Manager home page, go to **Status Add** and select **Add Cluster** to add a new cluster.
3. Perform the steps listed on this page [Set Up a Cluster Using the Wizard](#) from [Select Services](#) through [Configure Kerberos](#).

### About this task

Currently, the supported combination for the new Private Cloud Base clusters is to **use an equal name for kerberos principals and system users**. Such as, in case of Kudu service, enter the name as “kudu” for both kerberos principal name and system username.

However, there are following exceptions to the above scenario and you must note them before you customize the *Kerberos Principals* and *System Users*:

- Service Monitor (role of the *Cloudera Management Service*): When Hue service is present in the cluster, the principal name for Service Monitor must be equal to the principal name of the Hue service in the cluster.
- Ozone and HDFS: You can customize the principal names for Ozone role types, but the Ozone system username must match the HDFS system username.

- Kafka Mirror Maker: The system user for this role type must match the Kafka service-level system username (default is “kafka”).
- Ranger role types (such as Ranger Admin, Ranger Tagsync, and Ranger Usersync) have a role-specific principal name, but the system user must match the Ranger service-level system username.



**Important:** Cloudera Manager configures Cloudera services to use the default Kerberos principal names and default system users. Cloudera recommends that you do not change the default Kerberos principal or system user names. For existing clusters and services, do not change the existing Kerberos principal and system users names.

If your security policies require you to customize the service Kerberos Principals and System User Names, contact Cloudera Professional Services for additional help. Configuring the recommended solution requires additional steps and automation outside of Cloudera to be successful.

Use the following steps only for new clusters or when adding a new service to a new cluster that is created by enabling with Custom Kerberos Principals and System Users.

Perform the following steps to customize the *Kerberos Principals* and *System Users* for the Cloudera Runtime services:

### Procedure

1. Navigate to Custom Kerberos Principals and System Users after the Configure Kerberos operation, for customizing the *Kerberos Principals* and *System Users*.

- Select both Customize Kerberos Principals and Customize System users check boxes as seen in the following figure.



### Important:

- If no check boxes are selected, then click Continue.
- If atleast one of the check boxes are selected, then you must click the Generate Dependent Configurations button before you proceed with the process and click Continue.

## Add Cluster - Configuration

- Select Services
- Assign Roles
- Enter Required Parameters
- Review Changes
- Configure Kerberos
- Custom Kerberos Principals and System Users**
- Command Details
- Command Details
- Summary

### Custom Kerberos Principals and System Users

**⚠** This is an advanced feature that allows you to customize the kerberos principals and the system users that the services will run as.

**Note:**  
 Default system users will be created automatically, but all non default users must be first created manually on all the hosts.  
 All the necessary files/directories will have permissions set for these users. These permissions are very difficult to change afterwards.  
 If you are unsure what to do, leave them unmodified.

**Customize Kerberos Principals**  
 **Customize System Users**

<b>Kerberos Principal</b> <small>Edit Identical Values</small> <small>🔗 kerberos Princ_name</small>	<b>Core Configuration (Service-Wide)</b> ⓘ <input type="text" value="hdfs"/> <b>HBase (Service-Wide)</b> <input type="text" value="hbase"/> <b>HDFS (Service-Wide)</b> <input type="text" value="hdfs"/> <b>Solr (Service-Wide)</b> <input type="text" value="solr"/> <b>Spark (Service-Wide)</b> <input type="text" value="spark"/> <b>Spark 3 (Service-Wide)</b> <input type="text" value="spark"/> <b>YARN (Service-Wide)</b> <input type="text" value="yarn"/> <b>ZooKeeper (Service-Wide)</b> <input type="text" value="zookeeper"/>
<b>Hue's Kerberos Principal Short Name</b> <small>hue.kerberos.principal.shortname</small> <small>🔗 hue_kerberos_principal_shortname</small>	<b>HDFS (Service-Wide)</b> ⓘ <input type="text"/>
<b>Role-Specific Kerberos Principal</b> <small>Edit Identical Values</small> <small>🔗 kerberos_role Princ_name</small>	<b>HttpFS Default Group</b> ⓘ <input type="text" value="httpfs"/> <b>JobHistory Server Default Group</b> <input type="text" value="mapred"/>

1 - 3 of 3

<b>System User</b> <small>Edit Identical Values</small> <small>🔗 process_username</small>	<b>Core Configuration (Service-Wide)</b> ⓘ <input type="text" value="hdfs"/> <b>HBase (Service-Wide)</b> <input type="text" value="hbase"/> <b>HDFS (Service-Wide)</b> <input type="text" value="hdfs"/> <b>Solr (Service-Wide)</b>
---	---

3. Update the kerberos principal and system usernames for services as follows:
  - You can change the names as required. You must use the same name for a Kerberos Principal and the corresponding System User. Such as for HDFS service you choose “hdfs-custom” as a name value and set this value for both HDFS *Kerberos Principal* and HDFS *System User*.
  - Besides service-level principals and system users, some role types have individual configurations with a dedicated principal name. These role types must also follow the same pattern as applicable, such as using a custom name and setting this name for both kerberos principal and system user.
  - You may also choose not to modify the custom principal or system user for a specific service or role type. You must ensure that the values match for a given service or role.
4. Click Generate Dependent Configurations.

**Important:**

You can verify the generated rules and manually edit the rules, if required. In the above scenario there will be `auth_to_local` rules for the [exceptions](#) listed above, but you do not need any further `auth_to_local` rules.

If you update any kerberos principal and system username after generating the rules, you must click the Generate Dependent Configurations button to auto-generate the `auth_to_local` rules again.

5. Click Continue.



**Important:** Cloudera Manager makes use of the entered kerberos principal and system username information to calculate the value for `auth_to_local` rules (this is a cluster-wide configuration and it is saved in Core Settings). For more information on `auth_to_local` rules, see [Hadoop documentation](#).

- If you need to customize kerberos principals and system users while adding a service on a cluster after enabling Custom Kerberos Principals and System Users as per above steps on a new cluster, then repeat the steps 2 through 5.

The Add Service wizard includes a step for customizing any kerberos principal and system user specific to the service (and role types) being added as seen in the following figure.

### Add Kudu Service to Cluster 1

- Select Dependencies
- Assign Roles
- Review Changes
- 4 Custom Kerberos Principals and System Users**
- 5 Command Details
- 6 Summary

#### Custom Kerberos Principals and System Users

 This is an advanced feature that allows you to customize the kerberos principals and the system users that the services will run as.

Note:  
Default system users will be created automatically, but all non default users must be first created manually on all the hosts.  
All the necessary files/directories will have permissions set for these users. These permissions are very difficult to change afterwards.  
If you are unsure what to do, leave them unmodified.

Customize Kerberos Principals  
 Customize System Users

Kerberos Principal: Kudu (Service-Wide) ⓘ  
 1 - 1 of 1

System User: Kudu (Service-Wide) ⓘ  
 1 - 1 of 1



#### Important:

Before adding a new service with custom kerberos principal and system usernames, you need to use the Ranger UI and update the appropriate policies.

## Customizing only Kerberos Principals

How to configure custom service principals in Cloudera Manager.

### Before you begin

- If you are using ShellBasedUnixGroupsMapping to obtain user-group mappings, ensure you have the UNIX accounts for the principals present on all hosts of the cluster.

### About this task



**Important:** Cloudera Manager configures Cloudera services to use the default Kerberos principal names. Cloudera recommends that you do not change the default Kerberos principal.

If your security policies require you to customize the service Kerberos Principals, contact Cloudera Professional Services for additional help. Configuring the recommended solution requires additional steps and automation outside of Cloudera to be successful.

### Configuring custom Kerberos principal for Atlas

The Kerberos principal for Atlas is configured by default to use the same service principal as the default system user. To change the default setting:

#### Procedure

1. In Cloudera Manager, go to Atlas Configuration .
2. Search for the Kerberos Principal by entering "kerberos" in the search field
3. Find the Kerberos Principal property and enter the custom Kerberos principal name.
4. Click Save Changes.
5. Click Actions Restart .

Cloudera Manager handles the mapping of the service user to the Kerberos Principal and no additional task is required. You must configure the required policies in the Ranger UI.



#### Attention:

For Atlas, if you have custom service principal, you must add the same to Kafka policies if you have not mapped auth-to-local rules in Kafka configurations. Else, you must have the Atlas service user in the Kafka policies. Note that Kafka supports auth-to-local rules with a custom property named `sasl.kerberos.principal.to.local.rules`

For more information, see [Enable Kerberos Authentication](#).

### Configuring custom Kerberos principal for Cruise Control

The Kerberos principal for Cruise Control is configured by default to use the same service principal as the default process user. To change the default setting:

#### Procedure

1. Go to your Cluster in Cloudera Manager.
2. Select Cruise Control from the list of services.
3. Go to the Configuration tab.
4. Search for the Kerberos principal by entering "kerberos" in the search field.
5. Provide a custom name to the Kerberos Principal property.
6. Click Save Changes.
7. Click on Actions > Restart next to the Cruise Control service name to restart the service.

#### What to do next

If you use Ranger for authorization, update all resource-based services and policies that use the old principal and add the new principal. For more information on updating resource-based services and policies, see *Using Ranger to Provide Authorization in Cloudera*.

### Configuring custom Kerberos principal for Apache Flink

The Kerberos principal for Flink is configured by default to use the same service principal as the default process user. To change the default setting:

#### Procedure

1. Go to your Cluster in Cloudera Manager.
2. Select Flink from the list of services.
3. Go to the Configuration tab.
4. Search for the Kerberos principal by entering kerberos in the search field.
5. Provide a custom name to the Kerberos Principal property.

6. Click Save Changes.
7. Click Actions > Restart next to the Flink service name to restart the service.

### Configuring custom Kerberos principal for HBase

The Kerberos principal for HBase is configured by default to use the same service principal as the default process user. However, you can change the default setting by providing a custom Kerberos principal in Cloudera Manager.

#### About this task

After changing the Kerberos Principal to the required value in Cloudera Manager, you have to change the owner of the HBase folders in HDFS to the new custom Kerberos principal name. Then, the ACLs for the ZNodes that are managed by HBase have to be changed in ZooKeeper.

Perform the steps given below to configure a custom Kerberos principal for HBase.

#### Procedure

1. Stop the HBase service and set the custom Kerberos principal in Cloudera Manager:
  - a) Log in to Cloudera Manager as an Administrator.
  - b) In Cloudera Manager, click Clusters > HBase.
  - c) Click Actions > Stop to stop the Hbase service.
  - d) Go to the Configuration tab.
  - e) Search for the Kerberos Principal by entering "kerberos" in the search field.
  - f) For Kerberos Principal, enter the required custom principal value.
  - g) Click Save Changes.



**Important:** Do not restart the HBase service until the remaining steps given below are performed.

2. Change the owner of the HBase HDFS directories:

To change the owner of the HBase folders in HDFS to the new custom Kerberos principal name, use the `chown` command as an HDFS superuser.

```
hdfs dfs -chown -R newhbaseprincipal:newhbaseprincipal /hbase
```

If Ranger is used, use the `chown` command as an HDFS superuser to change the owner of the Ranger HBase log directory in HDFS.

```
hdfs dfs -chown -R newhbaseprincipal:newhbaseprincipal /ranger/audit/hbase
```

3. Change the HBase principals configured in Ranger.

If Ranger is used, log in to the Ranger web UI and perform the following steps:

- a) In the Service Manager page, click the Edit icon of the HBase service to open the Edit Service page, and replace the original principal with the custom principal in all the fields in which the original principal is used.
- b) In the Service Manager page, under HBASE, click the `cm_hbase` link to navigate to the configuration page for `cm_hbase` policies, and replace the original HBase principal in each policy with the custom principal.

#### 4. Change the ACLs in ZooKeeper for the /hbase node.

To change the ACLs in ZooKeeper, use either one of the following two options:

Option 1 - Changing the ACLs:

- a) Log in to the ZooKeeper CLI as the old HBase Kerberos principal that is currently owning the HBase ZNodes. See *Configure ZooKeeper client shell for Kerberos authentication* for information on configuring authentication for zkClient.sh.
- b) The ZNodes that are managed by HBase are under the /hbase ZNode. For each ZNode (including the root ZNode, for example, "/hbase"), list the ACLs by using the `getAcl` command and then change the ACLs by using the `setAcl` command to use the new principal.

Configuration example of ZNodes that can be accessed only by HBase:

```
getAcl /hbase/tokenauth/keys
'sasl,'hbase
: cdrwa

setAcl /hbase/tokenauth/keys sasl:newhbaseprincipal:cdrwa
```

Configuration example of ZNodes that can be read by any user but can be changed only by HBase:

```
getAcl /hbase
'sasl,'hbase
: cdrwa
'world,'anyone
: r

setAcl /hbase sasl:newhbaseprincipal:cdrwa,world:anyone:r
```



**Note:** Ensure that you start changing the ACLs from the leaf nodes, and then work towards the root, because you cannot access the nodes with the original principal after the `setAcl` command is used.

Option 2 - Deleting and recreating all HBase ZNodes:



**Important:** Use this option only for freshly installed HBase clusters. Using this option for HBase clusters that are not freshly installed could lead to loss of some HBase configuration files that are stored in ZooKeeper, such as replication-related configuration files.

- a) Stop the HBase service.
- b) Log in to the ZooKeeper CLI as a super user or as the old HBase Kerberos principal that is currently owning the HBase ZNodes.
- c) Delete all HBase ZNodes, including the root ZNode for HBase (/hbase, by default) by using the `deleteall /hbase` command.

#### 5. Restart the HBase service, and any stale services.

After performing the steps given above, click **Actions > Start** to restart the HBase service from Cloudera Manager, restart any stale services, and redeploy any stale configurations.

### Configuring custom Kerberos principal for HDFS

The Kerberos principal for HDFS is configured by default to use the same service principal as the default process user. However, you can change the default setting by providing a custom principal in Cloudera Manager.

#### Procedure

1. Log in to Cloudera Manager as an Administrator.
2. Go to **Clusters > HDFS service > Configuration** and search for the Kerberos Principal by entering "kerberos" in the search field.

3. Enter the custom Kerberos principal in the Kerberos Principal field.

This Kerberos principal short name is used by all the roles of HDFS.

4. Click Save Changes and restart the HDFS service.

### Configuring custom Kerberos principal for Hive and Hive-on-Tez

Use the steps given here to configure a custom Kerberos principal for Hive and Hive-on-Tez.

#### Procedure

1. In Cloudera Manager, go to Clusters > HIVE and click Actions > Stop to stop the Hive services.
2. In Cloudera Manager, go to Clusters > HIVE > Configuration and search for “Kerberos”.
3. Enter the custom Kerberos principal, hivefoo, in the Kerberos Principal field.
4. The /hiveserver2 node is created when the HiveServer2 is launched for the first time. All instance nodes are created under /hiveserver2. When the kerberos principal name is changed, the parent node must be deleted so that a new parent node can be automatically recreated with the new ACL.

```
kinit <zookeeper_principal>
zookeeper-client
delete /hiveserver2
```

5. Use the following commands to set up the HDFS user home directory:

```
kinit hdfs
hadoop fs -mkdir /user/hivefoo
hadoop fs -chown hivefoo:hive /user/hivefoo
```

6. In Cloudera Manager, go to Clusters > HIVE and click Actions > Start to start Hive services.

### Configuring custom Kerberos principal for HttpFS

To use custom Kerberos principal for HttpFS:

#### Procedure

1. Log in to Cloudera Manager as an Administrator.
2. Go to Clusters > HDFS service > Configuration and search for *Kerberos Principal*.
3. Enter the custom Kerberos principal in the Role-Specific Kerberos Principal field (for the HttpFs Default Group).
4. Click Save Changes and restart the HDFS service.

### Configuring custom Kerberos principal for Cloudera Data Explorer (Hue)

The Kerberos principal for Hue is configured by default to use the same service principal as the default process user. However, you can change the default setting by providing a custom principal in Cloudera Manager.

#### About this task

Currently the Service Monitor role relies on using the same principal name as the Hue service to carry out some health checks on clusters: When changing the Hue principal, you should also update the Service Monitor configuration to use the same principal name. In addition, when Ozone is present, some Ranger policies need to be updated in the Ranger UI: S3\_VOLUME\_POLICY\_FOR\_OZONE\_CANARY, S3\_BUCKET\_POLICY\_FOR\_OZONE\_CANARY, S3\_KEY\_POLICY\_FOR\_OZONE\_CANARY.

#### Procedure

1. Log in to Cloudera Manager as an Administrator.
2. Go to Clusters Hue service Configuration and search for "Kerberos".
3. Enter the custom Kerberos principal in the Kerberos Principal field.

This Kerberos principal short name is used by all roles associated with this service.

4. Click Save Changes and restart the Hue service.

## Configuring Kerberos Authentication for Impala

### Requirements for Using Impala with Kerberos



#### Important:

- If you plan to use Impala in your cluster, you must configure your KDC to allow tickets to be renewed, and you must configure `krb5.conf` to request renewable tickets. Typically, you can do this by adding the `max_renewable_life` setting to your realm in `kdc.conf`, and by adding the `renew_lifetime` parameter to the `libdefaults` section of `krb5.conf`.

Impala supports the Cloudera ODBC driver and the Kerberos interface provided. To use Kerberos through the ODBC driver, the host type must be set depending on the level of the ODBC driver:

- `SecImpala` for the ODBC 1.0 driver.
- `SecBeeswax` for the ODBC 1.2 driver.
- `Blank` for the ODBC 2.0 driver or higher, when connecting to a secure cluster.
- `HS2NoSasl` for the ODBC 2.0 driver or higher, when connecting to a non-secure cluster.

### Enabling Kerberos in Impala-shell

To enable Kerberos in the Impala shell, start the `impala-shell` command using the `-k` flag.

### Enabling Access to Internal Impala APIs for Kerberos Users

For applications that need direct access to Impala APIs, without going through the HiveServer2 or Beeswax interfaces, you can specify a list of Kerberos users who are allowed to call those APIs. By default, the `impala` and `hdfs` users are the only ones authorized for this kind of access. Any users not explicitly authorized through the internal `_principals_whitelist` configuration setting are blocked from accessing the APIs. This setting applies to all the Impala-related daemons, although currently it is primarily used for HDFS to control the behavior of the catalog server.

### Customizing Kerberos Principals for Impala

1. In Cloudera Manager, click Clusters Impala Configuration Scope Impala (Service-Wide)
2. In the Kerberos Principal field, add the custom Kerberos principal name to be used by all roles of this service.
3. Click Save Changes.
4. After setting the new kerberos principal name, restart stale services.

### Mapping Kerberos Principals to Short Names for Impala

Impala can support the additional mapping rules that will be inserted before rules generated from the list of trusted realms and before the default rule. The support is disabled by default in Impala.

To enable mapping Kerberos principals to short names:

1. In Cloudera Manager, select the Impala service.
2. In the Configuration tab, select Impala (Service-Wide) in Scope and Advanced in Category.
3. Select the Use HDFS Rules to Map Kerberos Principals to Short Names field.
4. Click Save Changes, and restart the Impala service.

### Configuring custom Kerberos principal for Kafka

In a Kerberos-enabled cluster, the Kafka service uses the `kafka` principal by default. Changing the default principal and using custom principals is supported. Principals can be configured on a service-wide level in Cloudera Manager with the Kerberos Principal property.

### About this task

If you are using a custom process user, ensure that the custom Kerberos principal is set to the default Kafka service principal.

### Before you begin

Access to Kafka znodes is restricted by default. Configuring the principal is only possible if access to the Kafka znodes in Zookeeper is unlocked. As a result, you must ensure that access to znodes is unlocked. For more information, see [Unlocking access to Kafka metadata in Zookeeper](#).

### Procedure

1. In Cloudera Manager select the Kafka service.
2. Go to Configuration.
3. Find the Kerberos Principal property and enter your principal.
4. Click Save Changes.
5. Restart the Kafka service.

### Results

The custom principal is configured for Kafka. Kafka uses the configured principal.

### What to do next

- Restrict znode access. For more information, see *Restricting access to Kafka metadata in Zookeeper*.
- If you use Ranger for authorization, update the principal in all resource-based services and policies that use the old principal.

The exact services and policies you need to update depend on your environment and cluster setup. At minimum you need to update the principal in the Kafka and Solr resource-based services. For more information on updating resource-based services and policies, see *Using Ranger to Provide Authorization in Cloudera*

- Update all Kafka clients to use the new principal.

### Related Information

[Restricting access to Kafka metadata in Zookeeper](#)

[Using Ranger to Provide Authorization in CDP](#)

### Configuring custom Kerberos principal for Knox

Use the steps given here to configure a custom Kerberos principal for Knox.

### About this task

To configure custom Kerberos principal for Knox:

### Procedure

1. In Cloudera Manager, go to Knox > Configuration .
2. Search for the Kerberos Principal by entering "kerberos" in the search field
3. Find the Kerberos Principal property and enter the custom Kerberos principal name.
4. Click Save Changes.
5. Click Actions > Restart .

### Configuring custom Kerberos principal for Kudu

You can configure a custom Kerberos principal for Kudu using Cloudera Manager.

### Procedure

1. In Cloudera Manager, navigate to **Kudu Configuration**.
2. Search for **kerberos**.
3. Find the Kerberos principal property and set it to the required name.
4. Click **Save changes**.  
Custom Kerberos principal for Kudu is applied for not just the Kudu server but also for the Hive and Impala clients.
5. For components that are not controlled by Cloudera Manager, configure the SASL protocol name.  
You must add the SASL protocol name configuration wherever the Kudu client properties, such as master addresses, are configured.

For example, if the principal name is `kudu/_HOST` set the protocol to `kudu`.

### Configuring custom Kerberos principal for Livy

The Kerberos principal for Apache Livy is configured by default to use the same service principal as the default process user. However, you can change the default setting by providing a custom principal in Cloudera Manager.

### Procedure

1. Go to your Cluster in Cloudera Manager.
2. Select Livy from the list of services.
3. Go to the Configuration tab.
4. Search for the Kerberos principal by entering "kerberos" in the search field.
5. Provide a custom name to the Kerberos Principal property.
6. Click **Save Changes**.
7. Click **Actions > Restart** next to the Livy service name to restart the service.

### Configuring custom Kerberos principal for NiFi and NiFi Registry

The Kerberos principal for NiFi and NiFi Registry is configured by default to use the same service principal as the default process user. However, you can change the default setting by providing a custom principal in Cloudera Manager.

### Procedure

1. Go to your Cluster in Cloudera Manager.
2. Select NiFi or NiFi Registry from the list of services.
3. Select Configuration tab.
4. Search for the *Kerberos principal* by entering *kerberos* in the search field.
5. Provide a custom name to the Kerberos Principal property.
6. Click **Save Changes**.
7. Click on **Actions > Restart** next to the NiFi or NiFi Registry service name to restart the service.

### Configuring custom Kerberos principal for Omid

Use the steps given here to configure a custom Kerberos principal for Omid.

### Procedure

1. Start the HBase shell as the HBase superuser. See *Use the HBase shell* for information on starting the HBase shell.
2. Grant `rw` (read, write, execute) permissions to the new custom principal linked to the Omid tables:

```
grant 'NEW_OMID_PRINCIPAL', 'RWX', 'OMID_COMMIT_TABLE';
grant 'NEW_OMID_PRINCIPAL', 'RWX', 'OMID_TIMESTAMP_TABLE';
```

3. Log in to Cloudera Manager as an Administrator.
4. In Cloudera Manager, click Clusters > Omid.
5. Go to the Configuration tab.
6. Search for the Kerberos Principal by entering "kerberos" in the search field.
7. For Kerberos Principal, enter the required custom principal value.
8. Click Save Changes.
9. Click Actions and select Restart to restart the service.

### Configuring custom Kerberos principal for Oozie

The Kerberos principal for Ozone is configured by default to use the same service principal as the default process user. However, you can change the default setting by providing a custom principal in Cloudera Manager.

#### Procedure

1. In Cloudera Manager, click Clusters > Oozie .
2. Go to the Configuration tab
3. Search for the Kerberos Principal by entering "kerberos" in the search field.
4. For Kerberos Principal, enter your custom principal value.
5. Click Save Changes.
6. Click Actions and select Restart to restart the service.

### Configuring custom Kerberos principal for Ozone

The Kerberos principal for Ozone is configured by default to use the same service principal as the default process user. However, you can change the default setting by providing a custom principal in Cloudera Manager.

#### About this task



**Note:** When you change the principal name of Ozone Manager and the Ranger plugin is enabled, you must ensure that you update the required safety valve in Ranger as well to notify the Ranger plugin about the Ozone Manager principal change. Otherwise, Ozone Manager cannot communicate with the Ranger plugin and all authorization requests fail.

#### Procedure

1. Go to the Cloudera Manager *OZONE SERVICE* Configuration tab.
2. Search for *Kerberos principal*.
3. Enter the custom Kerberos principals for the various Ozone roles.
4. Click Save Changes.
5. Restart the Ozone service.
6. Login to the Cloudera Manager Ranger service Ranger Web UI page using administrator credentials.
7. Edit `cm_ozone` to add or update the following key-value configuration parameters:

- a. `tag.download.auth.users = [***CUSTOM_OZONE_MANAGER_ROLE_PRINCIPAL***]`
- b. `policy.download.auth.users = [***CUSTOM_OZONE_MANAGER_ROLE_PRINCIPAL***]`



**Tip:** Cloudera recommends you to configure the `conf/ranger-admin-site.xml_role_safety_valve` property with `ranger.plugins.ozone.serviceuser=[***CUSTOM_OZONE_MANAGER_ROLE_PRINCIPAL***]` when you set up a cluster using a template.

For example, if the kerberos principal name of Ozone Manager is updated to `ozone-om`, then configure the `conf/ranger-admin-site.xml_role_safety_valve` property in Ranger to `ranger.plugins.ozone.serviceuser=ozone-om`.

### Configuring custom Kerberos principal for Phoenix

Use the steps given here to configure a custom Kerberos principal for Phoenix.

#### About this task

To configure a custom Kerberos principal for Phoenix:

#### Procedure

1. Log in to Cloudera Manager as an Administrator.
2. In Cloudera Manager, go to Clusters > Phoenix.
3. Go to the Configuration tab.
4. Search for the Kerberos Principal by entering "kerberos" in the search field.
5. For Kerberos Principal, enter the required custom principal value.
6. Click Save Changes.
7. Restart all stale services.

### Configuring custom Kerberos principal for Ranger

Use the steps given here to configure a custom Kerberos principal for Ranger.

## Procedure

- Ranger

Ranger creates all plugin services and related policies with default service user names. If you customize the principal names using Cloudera Manager for any service, you must manually update all the policies and plugin service configs to use the customized principal names.



**Note:** If using Ranger KMS service in a custom principal environment, you must update the Hadoop KMS Blacklist Decrypt EEK property to have custom hdfs principal value in Ranger KMS service.

If your Ranger RMS service uses a custom principal name (for example - rangermsfoo0), you must configure HMS to use rangermsfoo0 as a super user. To do so,

Add the following property using the HMS configuration page in Cloudera Manager Hive Service Advanced Configuration Snippet (Safety Valve) for core-site.xml :

```
hadoop.proxyuser.rangermsfoo0.hosts=*
```

Update the existing Hive Metastore Access Control and Ranger RMS Proxy User Hosts property (which is meant for default principal name - rangerms) from \* to no\_host\_.

After updating all the properties above, use Cloudera Manager to Restart Stale Services.



**Note:** If you manage the auth-to-local rules, use auth-to-local rule mapping to map custom principals to default service user names.



**Important:** Default audit filter is configured in serviceDef with default service user. Audit filter is created at the time of service creation with default service user. Audit filter contains service user across components and not just restricted to a service for which it is been created. Hence you must update custom service user while using the Custom Kerberos Principal cluster.

You can add auth-to-local rules, using Cloudera Manager HDFS Configuration Additional Rules to Map Kerberos Principals to Short Names.



**Note:** You must configure Ranger Admin to add Audit Filters:

If you set up custom service principals for a cluster, you must

- Update the ranger.accesslogs.exclude.users.list property to use the custom principal names and then restart Ranger Admin.
- Manually update the required users in the audit-filters in each plugin service config.

in order to ensure accurate audit logging.

- Configuring Ranger Admin role with custom principals for a template-based install.

If you use a template to set up a cluster with customized principals, you must configure the Ranger Admin role, by adding properties and values in roleConfigGroups.

## Configuring Custom Kerberos Principal for Ranger KMS

The Kerberos principal for Ranger KMS is configured by default to use the same service principal as the default process user. To change the default setting:

## Procedure

1. Go to your Cluster in Cloudera Manager.
2. Select Ranger KMS from the list of services.
3. Go to the Configuration tab.
4. Search for the Kerberos principal by entering "kerberos" in the search field.
5. Provide a custom name to the Kerberos Principal property.
6. Click Save Changes.

- Click on Actions > Restart next to the Ranger KMS service name to restart the service.

### Configuring custom Kerberos principal for Schema Registry

The Kerberos principal for Schema Registry is configured by default to use the same service principal as the default process user. However, you can change the default setting by providing a custom principal in Cloudera Manager.

#### Procedure

- Go to your cluster in Cloudera Manager.
- Select Schema Registry from the list of services.
- Go to the **Configuration** tab.
- Search for the Kerberos Principal by entering kerberos in the search field.
- Enter a custom name in the Kerberos Principal field.
- Click Save changes.
- Click Action Restart next to the Schema Registry service name to restart the service.

### Configuring custom Kerberos principals for Solr

In a Kerberos enabled cluster, the Solr service uses the solr principal by default. Changing the default principal and using custom principals is supported. Principals can be configured on a service-wide level in Cloudera Manager with the Kerberos Principal property.

#### Before you begin

- Ensure that you have the following privileges:
  - SSH access to the cluster where you want to enable the custom principal
  - administrative privileges in Cloudera Manager
  - HDFS super user access
- If the SunJCE cryptographic provider is removed to run the zkcli.sh utility, you must set the JDK\_JAVA\_OPTIONS environment variable. For example,

```
export FIPS_JAVA_ARGS
=
"-Dcom.safelogic.cryptocomply.fips.approved_only=true --add-modules=com
.safelogic.cryptocomply.fips.core --add-modules=bctls --add-exports=ja
va.base/sun.security.provider=com.safelogic.cryptocomply.fips.core --add-
exports=java.base/sun.security.provider=bctls --module-path=/cdep/extra_j
ars -Djdk.tls.trustNameService=true -Dsun.security.krb5.disableReferra
ls=true -Djdk.tls.ephemeralDHKeySize=2048 -Dcom.sun.management.jmxremo
te.ssl.enabled.protocols=TLSv1.2,TLSv1.3 --add-opens=java.base/java.lang
=ALL-UNNAMED --add-opens=java.base/java.util=ALL-UNNAMED --add-opens=jav
a.base/java.util.zip=ALL-UNNAMED --add-opens=java.base/java.io=ALL-UNNAMED
--add-opens=java.base/java.lang.reflect=ALL-UNNAMED --add-opens=java.base
/java.net=ALL-UNNAMED --add-exports=java.base/sun.net.www.protocol.jar=A
LL-UNNAMED --add-opens=java.base/sun.net.www.protocol.jar=ALL-UNNAMED --
add-opens=java.base/sun.net.www.protocol.file=ALL-UNNAMED --add-exports=
java.base/sun.net.www=ALL-UNNAMED --add-opens=java.base/sun.net.www=ALL-
UNNAMED"

export JDK_JAVA_OPTIONS
=
"${JDK_JAVA_OPTIONS} ${FIPS_JAVA_ARGS}"
```

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## Procedure

1. Stop the Solr service.
2. Disable ZooKeeper ACL checking temporarily.
  - a) In Cloudera Manager, navigate to ZooKeeper Configuration .
  - b) Find the Java Configuration Options for ZooKeeper Server property.
  - c) Add the following value:
 

```
-Dzookeeper.skipACL=yes
```
  - d) Click Save Changes.
  - e) Restart the ZooKeeper service.
3. In Cloudera Manager, navigate to Clusters Solr service Configuration and find the Kerberos Principal property.
4. Provide the custom Kerberos principal.
5. Click Save Changes.
6. Create a jaas.conf file containing the following:

```
Client {
    com.sun.security.auth.module.Krb5LoginModule required
    useKeyTab=false
    useTicketCache=true
    principal
    = " [***CUSTOM_SOLR_KERBEROS_PRINCIPAL@KERBEROS_REALM_NAME***] " ;
};
```

Replace `[***CUSTOM_SOLR_KERBEROS_PRINCIPAL@KERBEROS_REALM_NAME***]` with your Kerberos principal and realm name.

7. Set the `LOG4J_PROPS` environment variable to a `log4j.properties` file:

```
export LOG4J_PROPS=/etc/zookeeper/conf/log4j.properties
```

8. Set the `ZKCLI_JVM_FLAGS` environment variable:

```
export ZKCLI_JVM_FLAGS="-Djava.security.auth.login.config=/path/to/jaas.conf \
-DzkACLProvider=org.apache.solr.common.cloud.SaslZkACLProvider \
-Droot.logger=INFO,console \
-Dsolr.authorization.superuser=[***CUSTOM_SOLR_KERBEROS_PRINCIPAL***]"
```

9. Authenticate as the `[***CUSTOM_SOLR_KERBEROS_PRINCIPAL***]`:

```
kinit [***CUSTOM_SOLR_KERBEROS_PRINCIPAL@KERBEROS_REALM_NAME***]
```

Replace `[***CUSTOM_SOLR_KERBEROS_PRINCIPAL@KERBEROS_REALM_NAME***]` with your Kerberos principal and realm name.

10. Run the `zkcli.sh` script as follows:

```
/opt/cloudera/parcels/CDH/lib/solr/bin/zkcli.sh -zkhost [***ZOOKEEPER_SERVER_HOSTNAME***]:[***ZOOKEEPER_SERVER_PORT***] -cmd updateacls /solr
```

Replace `[***ZOOKEEPER_SERVER_HOSTNAME***]` and `[***ZOOKEEPER_SERVER_PORT***]` with the hostname and port of a ZooKeeper server.

For example:

```
/opt/cloudera/parcels/CDH/lib/solr/bin/zkcli.sh -zkhost zk01.example.com:2181 -cmd updateacls /solr
```

11. Check ACLs in Zookeeper:

```
zookeeper-client -server ${HOSTNAME}:2181 getAcl /solr
```

12. Change ownership of Solr's HDFS Data Directory. Check the value in Cloudera Manager under Solr Configuration HDFS Data Directory .

13. Execute the following command as the HDFS superuser:

```
hdfs dfs -chown -R [***CUSTOM_SOLR_KERBEROS_PRINCIPAL***] [***HDFS_DATA_DIRECTORY***]
```

14. Re-enable ZooKeeper ACL check.

- In Cloudera Manager, navigate to ZooKeeper Configuration .
- Find the Java Configuration Options for ZooKeeper Server property.
- Remove the following value:

```
-Dzookeeper.skipACL=yes
```

- Click Save Changes.
- Restart the ZooKeeper service.

### Configuring custom Kerberos principal for Spark

The Kerberos principal for Apache Spark is configured by default to use the same service principal as the default process user. However, you can change the default setting by providing a custom principal in Cloudera Manager.

#### Procedure

- Go to your Cluster in Cloudera Manager.
- Select Spark from the list of services.
- Go to the Configuration tab.
- Search for the Kerberos principal by entering "kerberos" in the search field.
- Provide a custom name to the Kerberos Principal property.
- Click Save Changes.
- Click Actions > Restart next to the Spark service name to restart the service.

### Configuring custom Kerberos principal for Streams Messaging Manager

In a Kerberos-enabled cluster, Streams Messaging Manager uses the `streamsmgmtmgr` Kerberos principal to connect to Kafka and Schema Registry. The principal can be customized in Cloudera Manager with the Kerberos Principal property.

#### Procedure

- In Cloudera Manager, go to Streams Messaging Manager > Configuration .

2. Find the Kerberos Principal property and enter your principal.
3. Click Save Changes.
4. Restart the service.

### What to do next

If you use Ranger for authorization, update all resource-based services and policies that use the old principal and add the new principal. For more information on updating resource-based services and policies, see *Using Ranger to Provide Authorization in Cloudera*.

### Configuring custom Kerberos principal for Cloudera SQL Stream Builder

The Kerberos principal for Cloudera SQL Stream Builder is configured by default to use the same service principal as the default process user. However, you can change the default setting by providing a custom principal in Cloudera Manager.

#### Procedure

1. Go to your Cluster in Cloudera Manager.
2. Select Cloudera SQL Stream Builder from the list of services.
3. Go to the Configuration tab.
4. Search for the Kerberos principal by entering kerberos in the search field.
5. Provide a custom name to the Kerberos Principal property.
6. Click Save Changes.
7. Click Actions > Restart next to the Cloudera SQL Stream Builder service name to restart the service

### Configuring custom Kerberos principal for Streams Replication Manager

In a Kerberos-enabled cluster, the Streams Replication Manager service uses the streamsrepmgr principal by default. The principal can be configured in Cloudera Manager with the Kerberos Principal property.

#### About this task

The principal specified in the Kerberos Principal property is used by the Streams Replication Manager service (Driver and Service roles) when it establishes a connection with its co-located Kafka cluster. Additionally, this principal is also used for Kerberos-enabled clusters defined with a Kafka credential, but only if there is no specific JAAS configuration set for that cluster.

For example, if you have a Kerberos-enabled external Kafka cluster that you defined with a Kafka credential, but did not specify a JAAS configuration, Streams Replication Manager falls back to using the default JAAS configuration which contains the principal defined in the Kerberos Principal property.



**Important:** The principal set in the Kerberos Principal property is only used by the Streams Replication Manager service. Configuring the property does not affect the principal used by the srm-control tool. For more information on how to configure the srm-control tool, see *Configuring srm-control*.

#### Procedure

1. In Cloudera Manager select the Streams Replication Manager service.
2. Go to Configuration.
3. Find the Kerberos Principal property and enter the custom Kerberos principal.
4. Click Save Changes.
5. Restart the Streams Replication Manager service.

#### Results

The custom principal used by Streams Replication Manager is configured.

### What to do next

If you use Ranger for authorization, update all resource-based services and policies that use the old principal and add the new principal. For more information on updating resource-based services and policies, see *Using Ranger to Provide Authorization in Cloudera*.

### Related Information

[Using Ranger to Provide Authorization in CDP](#)

[Configuring srm-control](#)

### Enabling custom Kerberos principal support in YARN

By default Cloudera Manager sets the Kerberos principal in YARN to yarn. This value can be easily changed using Cloudera Manager.

### Procedure

1. Disable the ZooKeeper ACL check temporarily.
  - a) In Cloudera Manager, navigate to ZooKeeper Configuration .
  - b) Find the Java Configuration Options for ZooKeeper Server property.
  - c) Add the following value:

```
-Dzookeeper.skipACL=yes
```

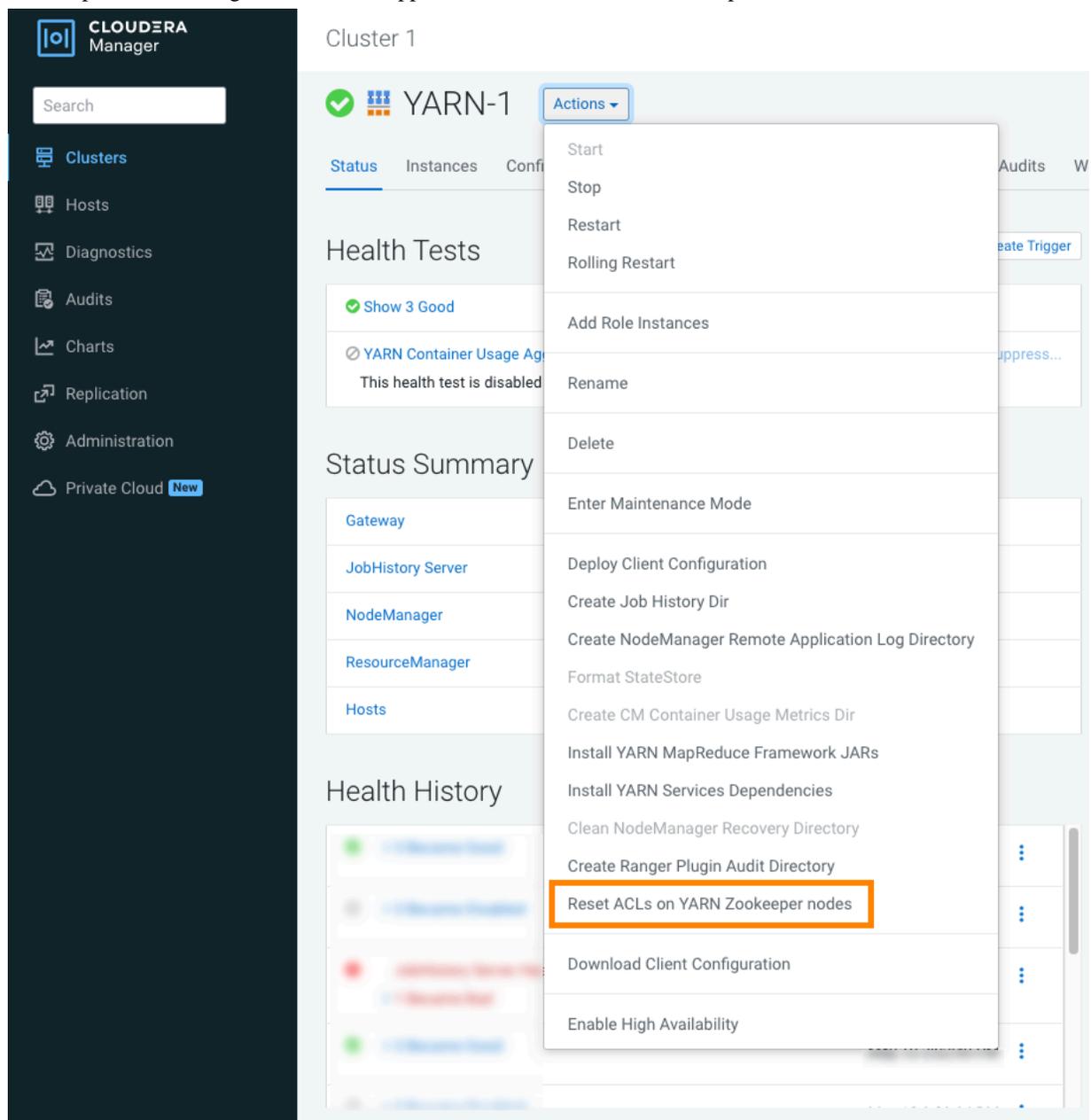
- d) Click Save Changes.
  - e) Restart the ZooKeeper service.
2. In Cloudera Manager, navigate to YARN Configuration .
  3. Find the Kerberos principal property and set it to the required name.
  4. Click Save Changes.
  5. Find the Admin ACL property and ensure that it contains either the `${yarn_user}` placeholder or the updated principal name value.
  6. Ensure that YARN HDFS folders have the correct access rights and owners.

For example, if you use the Capacity Scheduler Node labels feature, the `yarn.node-labels.fs-store.root-dir` folder could be inaccessible by YARN with the new Kerberos principal name. To resolve this issue, make it accessible or use the `hdfs chown` command. The following is the minimum list of folder paths for which ownership needs to be changed if Capacity Scheduler Node labels are enabled:

    - `/yarn/node-labels`
    - `/user/yarn/mapreduce/mr-framework`
    - `/user/yarn/services/service-framework/*`
    - `/tmp/logs`
  7. Restart all services with stale configuration.
    - a) Click Stale configuration: Restart needed.
    - b) Ensure that Deploy client configuration is selected.
    - c) Click Restart.
  8. Select the YARN service.

9. Click Actions Reset ACLs on ZooKeeper nodes .

This step can take a long time if a lot of application data is stored in ZooKeeper.



10. Enable the ZooKeeper ACL check.

- a) Navigate to ZooKeeper Configuration .
- b) Find Java Configuration Options for ZooKeeper Server.
- c) Remove the `-Dzookeeper.skipACL=yes` value.
- d) Click Save Changes.
- e) Restart the ZooKeeper service.

### Enabling custom Kerberos principal support in a Queue Manager cluster

In a secure Queue Manager cluster you can enable custom Kerberos principal using Cloudera Manager.

#### Before you begin

Ensure your Queue Manager cluster is secure. For that check if it runs on port 7183.

### Procedure

1. In Cloudera Manager, navigate to **YARN Configuration**.
2. Search for `admin acl`.
3. Find the `Admin ACL (yarn_admin_acls)` property.
4. Add the user you want to use for the Kerberos principal to the list of Admin ACL property.
5. Click **Save Changes**.
6. Restart the YARN service.
7. Navigate to **Queue Manager Configuration**.
8. Search for `kerberos principal`.
9. Find the `Kerberos Principal (kerberos_princ_name)` property.
10. Add the same user you added to the Admin ACL property.
11. Click **Save Changes**.
12. Restart the YARN Queue Manager service to avoid staleness.

If you get the Exception: Only admins can carry out this operation error message while doing Queue Manager operations, ensure that the principal name is added to the YARN Admin ACL



Failed to add queue. [More](#)

```
Validation failed for Add q
standalone="yes"?><Remo
<message>java.lang.Excep
<javaClassName>org.apac
</RemoteException>
```

list.

### Configuring custom Kerberos principal for Zeppelin

The Kerberos principal for Apache Zeppelin is configured by default to use the same service principal as the default process user. However, you can change the default setting by providing a custom principal in Cloudera Manager.

### Procedure

1. Go to your Cluster in Cloudera Manager.
2. Select Zeppelin from the list of services.
3. Go to the Configuration tab.
4. Search for the Kerberos principal by entering "kerberos" in the search field.
5. Provide a custom name to the Kerberos Principal property.
6. Click Save Changes.
7. Click Actions > Restart next to the Zeppelin service name to restart the service.

### Configuring custom Kerberos principal for ZooKeeper

Use the steps given here to configure a custom Kerberos principal for ZooKeeper.

### Procedure

1. Log in to Cloudera Manager as an Administrator.
2. In Cloudera Manager, click Clusters > ZooKeeper.
3. Go to the Configuration tab.
4. Search for the Kerberos Principal by entering "kerberos" in the search field.
5. For Kerberos Principal, enter the required custom principal value.
6. Click Save Changes.
7. Click Actions and select Restart to restart the service.

## Managing Kerberos credentials using Cloudera Manager

How to regenerate Kerberos principals in Cloudera Manager.

### Related Information

[Configuring a dedicated MIT KDC for cross-realm trust](#)

[Step 2: Create the Kerberos Principal for Cloudera Manager Server](#)

Using CM to manage Kerberos credentials.

### About this task

Minimum Required Role: [Full Administrator](#). This feature is not available when using Cloudera Manager to manage Data Hub clusters.

When Kerberos authentication is enabled for HDFS service instances, Cloudera Manager starts creating Kerberos principals for each role instance on the cluster at the end of the configuration process. Depending on the number of hosts and the number of HDFS role instances in the cluster, the process may take anywhere from a few seconds to several minutes.

After the process completes, view the list of Kerberos principals created for the cluster by using the Cloudera Manager Admin Console. Every host with HDFS role instances should have Kerberos principals.

If no principals have been created after 10 minutes, there may be an issue with the process.



#### Important:

- Do not regenerate the principals for your cluster unless you have made a global configuration change, such as changing the encryption type.
- Regenerate principals using the Cloudera Manager Admin Console only. Do not use kadmin shell.
- For an MIT KDC, see “Configuring a dedicated MIT KDC for cross-realm trust” to avoid invalidating existing host keytabs.

## Updating Kerberos credentials in Cloudera Manager

Using CM to update Kerberos credentials.

### About this task

If you change the user name or the password (or both) in the Active Directory KDC for the account used by Cloudera Manager for Kerberos authentication, you must also change it in Cloudera Manager. These credentials were stored during the Kerberos integration process (see “Step 3: Create the Kerberos Principal for Cloudera Manager Server”).

### Procedure

1. Log in to Cloudera Manager Admin Console.
2. Select Administration Security .
3. Click the Kerberos Credentials tab.
4. Click Setup KDC for this Cloudera Manager.
5. Enter the new user and password for the principal added to the Kerberos KDC in “Step 4: Enter Account Credentials”.

If you are using Red Hat IdM/FreeIPA, enter the IPA admin credentials here. These admin credentials are not stored, and are used only to create a new user and role (named `cmadin-<RANDOM_ID>` and `cmadminrole`, respectively) and retrieve its keytab. Cloudera Manager stores this keytab for future Kerberos operations, such as regenerating the credentials of the Cloudera service accounts.

## Managing Active Directory account properties

Using CM to manage AD account properties.

### About this task

If you are using an Active Directory KDC, Cloudera Manager lets you configure Active Directory accounts and customize the credential regeneration process using the Cloudera Manager Admin Console. You can also use Cloudera Manager to configure the encryption types to be used by your Active Directory account. Once you modify any Active Directory account properties, you must regenerate Kerberos credentials to reflect those changes. The credential regeneration process requires you to delete existing accounts before new ones are created.

By default, Cloudera Manager does not delete accounts in Active Directory, which means that to regenerate Kerberos principals contained in Active Directory, you need to manually delete the existing Active Directory accounts. You can either delete and regenerate all existing Active Directory accounts, or only delete those with the `userPrincipalName` (or login name) that you will later manually select for regeneration. If the accounts haven't already been deleted manually, the regeneration process will throw an error message saying that deletion of accounts is required before you proceed.

### Modifying Active Directory account properties using Cloudera Manager

Using CM to modify AD account properties.

### About this task

If you are using an Active Directory KDC, you can configure the Active Directory account properties, `objectClass` and `accountExpires` directly from the Cloudera Manager Admin Console. Any changes to these properties will be reflected in the regenerated Kerberos credentials.

### Procedure

1. Go to the Cloudera Manager Admin Console and click the Administration tab.
2. Select Administration Settings .
3. Click the Kerberos category.

4. Locate the Active Directory Account Properties and edit as required. By default, the property will be set to:

```
accountExpires=0,objectClass=top,objectClass=person,objectClass=organizationalPerson,objectClass=user
```

5. Locate the Active Directory Password Properties and edit the field as needed. By default, the property will be set to:

```
length=12,minLowerCaseLetters=2,minUpperCaseLetters=2,minDigits=2,minSpaces=0,minSpecialChars=0,specialChars=?.!$%^*()-_+=~
```

6. Click Save Changes.
7. Regenerate new credentials with the new properties.

### Enabling credential regeneration for Active Directory accounts using Cloudera Manager

Using CM to enable credential regeneration for AD accounts.

#### About this task

To avoid having to delete accounts manually, enable the Active Directory Delete Accounts on Credential Regeneration property. By default, this property is disabled. After enabling this feature, Cloudera Manager will delete existing Active Directory accounts automatically when new ones are created during regeneration.

#### Procedure

1. On the Cloudera Manager Admin Console, click the Administration tab.
2. Select Administration Settings .
3. Click the Kerberos category.
4. Locate the Active Directory Delete Accounts on Credential Regeneration and check the property to activate this capability.
5. Click Save Changes.

### Configuring encryption types for Active Directory KDC using Cloudera Manager

Using CM to configure encryption types for AD KDC,

#### About this task

Cloudera Manager allows you to configure the encryption types (or enctype) used by an Active Directory KDC to protect its data. Cloudera supports the following encryption types:

- aes128-cts
- aes256-cts
- des-cbc-crc
- des-cbc-md5

To configure encryption types for an Active Directory KDC:

#### Procedure

1. Go to the Cloudera Manager Admin Console and click the Administration tab.
2. Select Administration Settings .
3. Click the Kerberos category.
4. Locate the Kerberos Encryption Types and click **+** to add the encryption types you want Active Directory to use (see the list above for supported encryption types encetypes).
5. Check the checkbox for the Active Directory Set Encryption Types property. This will automatically set the Cloudera Manager AD account to use the encryption types configured in the previous step.

6. Click Save Changes.

### Moving Kerberos principals to another OU within Active Directory

How to move Kerberos principals within AD.

#### About this task

If you have a Kerberized cluster configured with an Active Directory KDC, you can use the following steps to move the Kerberos principals from one AD Organizational Unit (OU) to another.

#### Procedure

1. Create the new OU on the Active Directory Server.
2. Use AD's Delegate Control wizard to set the permissions on the new OU such that the configured Cloudera Manager admin account has the ability to Create, Delete and Manage User Accounts within this OU.
3. Stop the cluster.
4. Stop the Cloudera Management Service.
5. In Active Directory, move all the Cloudera Manager and Cloudera components' user accounts to the new OU.
6. In Cloudera Manager, select Administration Security .
7. On the Kerberos Credentials tab, click Configuration.
8. Select Scope Settings .
9. Select Category Kerberos .
10. Locate the Active Directory Suffix property and edit the value to reflect the new OU name.
11. Click Save Changes.

### Viewing or regenerating Kerberos credentials using Cloudera Manager

Using CM to view or regenerate Kerberos credentials.

#### About this task

To view Kerberos principals for the cluster from Cloudera Manager for either MIT Kerberos or Active Directory:

#### Procedure

1. Log in to Cloudera Manager Admin Console.
2. Select Administration Security .
3. Click the Kerberos Credentials tab. The currently configured Kerberos principals for services running on the cluster display, such as:
  - For HDFS, principals hdfs/hostname and host/hostname
4. To regenerate any principals (if necessary):
  - Select the principal from the list.
  - Click Regenerate.

### Running the Security Inspector

How to run Security Inspector.

#### About this task

The Security Inspector uses the Host Inspector to run a security-related set of commands on the hosts in your cluster. It reports on matters such as how Java is configured for encryption and on the default realms configured on each host:

#### Procedure

1. Select Administration Security .

2. Click Security Inspector. Cloudera Manager begins several tasks to inspect the managed hosts.
3. After the inspection completes, click Download Result Data or Show Inspector Results to review the results.

## Using a custom Kerberos keytab retrieval script

How to manually create principals and keytabs using a custom retrieval script.

### About this task

The Cloudera Manager Kerberos setup procedure requires you to create an administrator account for the Cloudera Manager user. Cloudera Manager will then connect to your KDC and use this admin account to generate principals and keytabs for the remaining Cloudera services. If for some reason, you cannot create a Cloudera Manager administrator account on your KDC with the privileges to create other principals and keytabs for Cloudera services, then these will need to be created manually.

Cloudera Manager gives you the option to use a custom script to retrieve keytabs from the local filesystem. To use a custom Kerberos keytab retrieval script:

### Procedure

1. The KDC administrators should create the required principals and keytabs, and store them securely on the Cloudera Manager Server host.
2. Create the keytab retrieval script. Your script should take two arguments: a full principal name for which it should retrieve a keytab, and a destination to which it can write the keytab. The script must be executable by the Cloudera Manager admin user, `cloudera-scm`. Depending on the principal name input by Cloudera Manager, the script should locate the corresponding keytab on the Cloudera Manager Server host (stored in step 1), and copy it into a location accessible to the `cloudera-scm` user. Here is a simple example:

```
#!/bin/bash
# Cloudera Manager will input a destination path
DEST="$1"

# Cloudera Manager will input the principal name in the format: <service>/
<fqdn>@REALM
PRINC="$2"
# Assuming the '<service>_<fqdn>@REALM.keytab' naming convention for ke
ytab files
IN=$(echo $PRINC | sed -e 's/\//_/')
SRC="/keytabs/${IN}.keytab"
# Copy the keytab to the destination input by Cloudera Manager
cp -v $SRC $DEST
```

Note that the script will change according to the keytab naming convention followed by your organization.

There are special requirements when providing your own keytabs and using this sample script:

- Do not use the Keytab File Owner:Group values listed in “Hadoop Users (user:group) and Kerberos Principals”; instead ensure that the Cloudera Manager user (`cloudera-scm`) has read access to the keytabs that you are creating.
- Create keytabs for the individual principals (e.g., `"hive/host.example.com@EXAMPLE.COM"`)
- Name the keytab files for these individual principals matching the paradigm `"<service>_<fqdn>@REALM.keytab"`. For example, `Filename (*.keytab) = "hive_host.example.com@realm.keytab"`.

3. Configure the location for the script in Cloudera Manager:
  - a) Go to the Cloudera Manager Admin console.
  - b) Select Administration Settings .
  - c) Select Category Kerberos .
  - d) Locate the Custom Kerberos Keytab Retrieval Script and set it to point to the script created in step 2.
  - e) Click Save Changes.
4. Once the Custom Kerberos Keytab Retrieval Script property is set, whenever Cloudera Manager needs a keytab, it will ignore all other Kerberos configuration and run the keytab retrieval script to copy the required keytab to the desired destination.
5. Cloudera Manager can now distribute the keytab to the services that need access to it.

### Related Information

[Hadoop Users \(user:group\) and Kerberos Principals](#)

## Adding trusted realms to the cluster

How to specify trusted realms in Cloudera Manager.

### Before you begin

The Kerberos instance associated with a given cluster has its *REALM-NAME* specified as the `default_realm` in the Kerberos configuration file (`krb5.conf`) on the cluster's NameNode. Rules defined in the `hadoop.security.auth_to_local` property translate the Kerberos principals to local account names at the host level. The default rules simply remove the `@REALM` portion of the Kerberos principal and leave the short name.

To allow principals from other realms to use the cluster, the trusted realms must be specified in Cloudera Manager. For example, the Kerberos realm used by your cluster may have a trust relationship to a central Active Directory or MIT Kerberos realm. Add the central realm to the cluster as detailed in the following steps so that Cloudera Manager can apply the appropriate mapping rules to the principals from the trusted realm to access the cluster's services.

To specify trusted realms using Cloudera Manager:

### Procedure

1. Log in to the Cloudera Manager Admin Console.
2. Select ClustersCORE\_SETTINGS.
3. Click the Configuration tab.
4. Select CORE\_SETTINGS (Service-Wide) for the Scope filter.
5. Select Security for the Category filter.
6. In the Search field, type Kerberos Realms to find the Trusted Kerberos Realms setting.
7. Add other Kerberos realms that the cluster's realm can trust. Use all upper-case letters to specify the REALM name for MIT Kerberos or Active Directory realms:

```
ANOTHER-REALM.EXAMPLE.COM
```

To add multiple realms, click the plus (+) button.

8. Click Save Changes.

### What to do next

For each trusted realm identified in Trusted Kerberos Realms, default mapping rules automatically strip the REALM name. To customize the mapping rules, specify additional rules in the Additional Rules to Map Kerberos Principals to Short Names setting, one rule per line. Cloudera Manager will wrap each rule in the appropriate XML tags and add

to the generated `core-site.xml` file. To create custom rules and translate mixed-case Kerberos principals to lower-case Hadoop usernames.

If you specify custom mapping rules for a Kerberos realm using the Additional Rules to Map Kerberos Principals to Short Names setting, ensure that the same realm is not specified in the Trusted Kerberos Realms setting. If it is, the auto-generated rule (which only strips the realm from the principal and does no additional transformations) takes precedent, and the custom rule is ignored.

For these changes to take effect, you must restart the cluster and redeploy the client configuration, as follows:

1. On the Cloudera Manager Admin Console, Clusters Cluster-*N* to choose cluster-wide actions.
2. From the Actions drop-down button, select Deploy Client Configuration.
3. From the Actions drop-down button, select Restart and wait for the restart process to finish.

## Using auth-to-local rules to isolate cluster users

How to use auth-to-local rules to restrict user access to specific clusters.

### About this task

By default, the Hadoop auth-to-local rules map a principal of the form `<username>/<hostname>@<REALM>` to `<username>`. This means if there are multiple clusters in the same realm, then principals associated with hosts of one cluster would map to the same user in all other clusters.

For example, if you have two clusters, `cluster1-host-[1..4].example.com` and `cluster2-host-[1..4].example.com`, that are part of the same Kerberos realm, `EXAMPLE.COM`, then the `cluster2` principal, `hdfs/cluster2-host1.example.com@EXAMPLE.COM`, will map to the `hdfs` user even on `cluster1` hosts.

To prevent this, use auth-to-local rules as follows to ensure only principals containing hostnames of `cluster1` are mapped to legitimate users.

### Procedure

1. Go to the Core Settings Configuration tab.
2. Select Category Security .
3. In the Search field, type Additional Rules to find the Additional Rules to Map Kerberos Principals to Short Names settings.
4. Additional mapping rules can be added to the Additional Rules to Map Kerberos Principals to Short Names property. These rules will be inserted before the rules generated from the list of trusted realms (configured above) and before the default rule.

```
RULE:[ 2:$1/$2@$0](hdfs/cluster1-host1.example.com@EXAMPLE.COM)s/(.*)@EXAMPLE.COM/hdfs/
RULE:[ 2:$1/$2@$0](hdfs/cluster1-host2.example.com@EXAMPLE.COM)s/(.*)@EXAMPLE.COM/hdfs/
RULE:[ 2:$1/$2@$0](hdfs/cluster1-host3.example.com@EXAMPLE.COM)s/(.*)@EXAMPLE.COM/hdfs/
RULE:[ 2:$1/$2@$0](hdfs/cluster1-host4.example.com@EXAMPLE.COM)s/(.*)@EXAMPLE.COM/hdfs/
```

```
RULE: [ 2:$1/$2@$0](hdfs.*@EXAMPLE.COM)s/(.*)@EXAMPLE.COM/nobody/
```

In the example, the principal `hdfs/<hostname>@REALM` is mapped to the `hdfs` user if `<hostname>` is one of the cluster hosts. Otherwise it gets mapped to `nobody`, thus ensuring that principals from other clusters do not have access to `cluster1`.

If the cluster hosts can be represented with a regular expression, that expression can be used to make the configuration easier and more conducive to scaling. For example:

```
RULE: [ 2:$1/$2@$0](hdfs/cluster1-host[1-4].example.com@EXAMPLE.COM)s/(.*)@EXAMPLE.COM/hdfs/
RULE: [ 2:$1/$2@$0](hdfs.*@EXAMPLE.COM)s/(.*)@EXAMPLE.COM/nobody/
```



**Note:**

It is not possible to use alternatives in capturing or non-capturing groups within the matching portion of the rule, because the use of round brackets in the expression is not currently supported. For example, the following rule would result in an error:

```
RULE: [ 2:$1/$2@$0](hdfs/cluster1-(hosta|hostb|hostc).example.com@EXAMPLE.COM)s/(.*)@EXAMPLE.COM/hdfs/
```



**Important:** If you use Kafka, ensure that your `auth_to_local` rules do not include commas (for example, regex quantifiers like `{2,3}`). The system might interpret commas as rule separators when propagated to the `Kafka sasl.kerberos.principal.to.local.rules` property, which can break Kafka broker startup.



**Note:**

In CM 7.3.1, added `auth_to_local` rules that map the first component of the principal name to the lowercase system user name.

New behavior for CM 7.4.4 and later: `auth_to_local` rules that map the first component of the principal name to the lowercase system user name are added only when you select the `Set Rules to Map Kerberos Principals to Lower Case Short Names` check box and you enable Kerberos.

5. Click Save Changes.
6. Restart the Core Settings service and any dependent services.

## Configuring a dedicated MIT KDC for cross-realm trust

How to configure a cluster-dedicated KDC and default realm in Cloudera Manager.

### Related Information

[Hadoop Users \(user:group\) and Kerberos Principals](#)

### About this task

Using Cloudera Manager to configure Kerberos authentication for the cluster creates several principals and keytabs automatically. Cloudera Manager also deploys the keytab files to every host in the cluster. See “Hadoop Users (user:group) and Kerberos Principals” for complete listing.



**Note:** The example below is specific for creating and deploying principals and keytab files for MIT Kerberos. See the appropriate documentation for other Kerberos implementations, such as Microsoft Active Directory, as needed.

## Local and Remote Kerberos Admin Tools

### About this task

Kerberos administrator commands can be run directly on the KDC server host or remotely, as shown in the table:

kadmin.local	Requires root access or Kerberos admin account. Use to log on directly to the KDC host.
kadmin	Use the logon to the KDC host system from another remote host over the network.

- To run Kerberos administration commands locally on the KRB host system:

```
sudo kadmin.local
```

Enter your Linux system password (for the sudo).

- To run Kerberos administration commands from any host:

```
kadmin
```

Enter your Kerberos administrator password.



**Note:** Commands shown for the kadmin shell can also be run at the kadmin.local shell.

## Setting up a Cluster-Dedicated KDC and Default Realm for the Hadoop Cluster

### About this task

Cloudera has tested the following configuration approaches to Kerberos security for clusters managed by Cloudera Manager. For administration teams that are just getting started with Kerberos security, we recommend starting with these approaches to the configuration of KDC services for a number of reasons.

The number of Service Principal Names (SPNs) that are created and managed by the Cloudera Manager server for a Cloudera cluster can be significant, so it is important to realize the potential impact on cluster uptime and overall operations if you choose to manage keytabs manually instead. The Cloudera Manager server manages the creation of service keytabs on the proper hosts based on the current configuration of the database. Manual keytab management can be error prone and introduce delays when deploying or moving services within the cluster, especially under time-sensitive conditions.

Cloudera Manager creates SPNs within a KDC that it can access with the kadmin command based on configuration of the `/etc/krb5.conf` file on the Cloudera Manager host. SPNs are created with the format `service-name/host.fqdn.name@EXAMPLE.COM` where `service-name` is the relevant Cloudera service name such as `hue` or `hbase` or `hdfs`.

If your site already has a working KDC, and any existing principals share the same name as any of the principals that Cloudera Manager creates, the Cloudera Manager Server generates a new randomized key for those principals, and consequently causes existing keytabs to become invalid.

This is why Cloudera recommends using a dedicated local MIT Kerberos KDC and realm for the Hadoop cluster. You can set up a one-way cross-realm trust from the cluster-dedicated KDC and realm to your existing central MIT Kerberos KDC, or to an existing Active Directory realm. Using this method, there is no need to create Hadoop service principals in the central MIT Kerberos KDC or in Active Directory, but principals (users) in the central MIT KDC or in Active Directory can be authenticated to Hadoop. The steps to implement this approach are as follows:

## Procedure

1. Install and configure a cluster-dedicated MIT Kerberos KDC that will be managed by Cloudera Manager for creating and storing principals for the services supported by the cluster.
  -  **Note:** The `krb5-server` package includes a `logrotate` policy file to rotate log files monthly. To take advantage of this, install the `logrotate` package. No additional configuration is necessary.
2. See the example `kdc.conf` and `krb5.conf` files in [Sample Kerberos Configuration Files](#) for configuration considerations for the KDC and Kerberos clients.
3. Configure a default Kerberos realm for the cluster you want Cloudera Manager to manage and set up one-way cross-realm trust between the cluster-dedicated KDC and either your central KDC or Active Directory, using the appropriate steps:
  - Using a Cluster-Dedicated KDC with a Central MIT KDC
  - Using a Cluster-Dedicated MIT KDC with Active Directory

Cloudera strongly recommends the method above because:

- It requires minimal configuration in Active Directory.
- It is comparatively easy to script the creation of many principals and keytabs. A principal and keytab must be created for every daemon in the cluster, and in a large cluster this can be extremely onerous to do directly in Active Directory.
- There is no need to involve central Active Directory administrators to get service principals created.
- It allows for incremental configuration. The Hadoop administrator can completely configure and verify the functionality the cluster independently of integrating with Active Directory.

## Using a Cluster-Dedicated KDC with a Central MIT KDC

### About this task



**Important:** If you plan to use Oozie or the Hue Kerberos Ticket Renewer in your cluster, you must configure your KDC to allow tickets to be renewed, and you must configure `krb5.conf` to request renewable tickets. Typically, you can do this by adding the `max_renewable_life` setting to your realm in `kdc.conf`, and by adding the `renew_lifetime` parameter to the `libdefaults` section of `krb5.conf`.

### Procedure

1. In the `/var/kerberos/krb5kdc/kdc.conf` file on the local dedicated KDC server host, configure the default realm for the Hadoop cluster by substituting your Kerberos realm in the following `realms` property:

```
[realms]
HADOOP.EXAMPLE.COM = {
```

2. In the `/etc/krb5.conf` file on all cluster hosts and all Hadoop client user hosts, configure the default realm for the Hadoop cluster by substituting your Kerberos realm in the following `realms` property. Also specify the local dedicated KDC server hostname in the `/etc/krb5.conf` file (for example, `kdc01.example.com`).

```
[libdefaults]
  default_realm = HADOOP.EXAMPLE.COM
[realms]
  HADOOP.EXAMPLE.COM = {
    kdc = kdc01.hadoop.example.com:88
    admin_server = kdc01.hadoop.example.com:749
    default_domain = hadoop.example.com
  }
  EXAMPLE.COM = {
    kdc = kdc01.example.com:88
    admin_server = kdc01.example.com:749
    default_domain = example.com
```

```

}
[domain_realm]
.hadoop.example.com = HADOOP.EXAMPLE.COM
hadoop.example.com = HADOOP.EXAMPLE.COM
.example.com = EXAMPLE.COM
example.com = EXAMPLE.COM

```

3. To set up the cross-realm trust in the cluster-dedicated KDC, type the following command in the `kadmin.local` or `kadmin` shell on the cluster-dedicated KDC host to create a `krbtgt` principal. Substitute your cluster-dedicated KDC realm for `HADOOP.EXAMPLE.COM`, and substitute your central KDC realm for `EXAMPLE.COM`. Enter a trust password when prompted. Note the password because you will need to enter the exact same password in the central KDC in the next step.

```
kadmin: addprinc krbtgt/HADOOP.EXAMPLE.COM@EXAMPLE.COM
```

4. To set up the cross-realm trust in the central KDC, type the same command in the `kadmin.local` or `kadmin` shell on the central KDC host to create the exact same `krbtgt` principal and password.

```
kadmin: addprinc krbtgt/HADOOP.EXAMPLE.COM@EXAMPLE.COM
```



**Important:** For a cross-realm trust to operate properly, both KDCs must have the same `krbtgt` principal and password, and both KDCs must be configured to use the same encryption type.

5. To properly translate principal names from the central KDC realm into the cluster-dedicated KDC realm for the Hadoop cluster, configure the Trusted Kerberos Realms property of the Core Settings service.
  - a) Open the Cloudera Manager Admin Console.
  - b) Go to the Core Settings service.
  - c) Click the Configuration tab.
  - d) Type Kerberos in the Search box.
  - e) Edit the Trusted Kerberos Realms property to add the name of your central KDC realm. If you need to use more advanced mappings which do more than just allow principals from another domain, you may enter them in the Additional Rules to Map Kerberos Principals to Short Names property.
6. Each of your Hadoop client users must also place this information in their local `core-site.xml` file. The easiest way to do so is by using the Cloudera Manager Admin Console to generate a client configuration file.
7. Later in this procedure, you will restart the services to have the configuration changes in `core-site.xml` take effect.

## Using a Cluster-Dedicated MIT KDC with Active Directory

### About this task

For Cloudera Manager clusters, the `openldap-clients` package must be installed on the Cloudera Manager Server host before configuring the cluster to use Kerberos for authentication.

## On the Active Directory Server

### Procedure

1. On the Active Directory server host, type the following command to add the local realm trust to Active Directory:

```
netdom trust HADOOP.EXAMPLE.COM /Domain:EXAMPLE.COM /add /realm /password:TRUSTPASSWORD
```

- On the Active Directory server host, type the following command to set the proper encryption type:

Windows 2003 RC2

Windows 2003 server installations do not support AES encryption for Kerberos.

```
ktpass /MITRealmName HADOOP.EXAMPLE.COM /TrustEncryp RC4
```

Windows 2008

```
ksetup /SetEncTypeAttr HADOOP.EXAMPLE.COM <enc_type>
```

Where the <enc\_type> parameter can be replaced with parameter strings for AES, DES, or RC4 encryption modes. For example, for AES encryption, replace <enc\_type> with AES256-CTS-HMAC-SHA1-96 or AES128-CTS-HMAC-SHA1-96 and for RC4 encryption, replace with RC4-HMAC-MD5.



**Important:** Make sure that the encryption type you specify is supported on both your version of Windows Active Directory and your version of MIT Kerberos.

## On the MIT KDC Server

### Procedure

- In the /var/kerberos/krb5kdc/kdc.conf file on the local dedicated KDC server host, configure the default realm for the Hadoop cluster by substituting your Kerberos realm in the following realms property:

```
[realms]
HADOOP.EXAMPLE.COM = {
```

- Each of your Hadoop client users must also place this information in their local core-site.xml file. The easiest way to do so is by using the Cloudera Manager Admin Console to generate a client configuration file.
- On the local MIT KDC server host, type the following command in the kadmin.local or kadmin shell to add the cross-realm krbtgt principal:

```
kadmin: addprinc -e "<keysalt_list>" krbtgt/HADOOP.EXAMPLE.COM@EXAMPLE.COM
```

where the <keysalt\_list> parameter specifies the types of keys and their salt to be used for encryption of the password for this cross-realm krbtgt principal. It can be set to AES, or RC4 keytypes with a salt value of :normal. Note that DES is deprecated and should no longer be used. You can specify multiple keysalt types using the parameter in the command above. Make sure that at least one of the encryption types corresponds to the encryption types found in the tickets granted by the KDC in the remote realm. For an example of the values to use, see the examples based on the Active Directory functional domain level, below.

Examples by Active Directory Domain or Forest "Functional level"

Active Directory will, based on the Domain or Forest functional level, use encryption types supported by that release of the Windows Server operating system. It is not possible to use AES encryption types with an AD 2003 functional level. If you notice that DES encryption types are being used when authenticating or requesting service tickets to Active Directory then it might be necessary to enable weak encryption types in the /etc/krb5.conf.

- Windows 2003

```
kadmin: addprinc -e "rc4-hmac:normal" krbtgt/HADOOP.EXAMPLE.COM@EXAMPLE.COM
```

- Windows 2008

```
kadmin: addprinc -e "aes256-cts:normal aes128-cts:normal rc4-hmac:normal" krbtgt/HADOOP.EXAMPLE.COM@EXAMPLE.COM
```



**Note:** The cross-realm krbtgt principal that you add in this step must have at least one entry that uses the same encryption type as the tickets that are issued by the remote KDC. If there are no matching encryption types, principals in the local realm can successfully access the Hadoop cluster, but principals in the remote realm are unable to.

## On All Cluster Hosts

### Procedure

1. In the `/etc/krb5.conf` file on all cluster hosts and all Hadoop client user hosts, configure both Kerberos realms. Note that `default_realm` should be configured as the local MIT Kerberos realm for the cluster. Your `krb5.conf` may contain more configuration properties than those demonstrated below. This example is provided to clarify configuration parameters.

```
[libdefaults]
  default_realm = HADOOP.EXAMPLE.COM
[realms]
  EXAMPLE.COM = {
    kdc = dc01.example.com:88
    admin_server = dc01.example.com:749
  }
  HADOOP.EXAMPLE.COM = {
    kdc = kdc01.hadoop.example.com:88
    admin_server = kdc01.hadoop.example.com:749
  }
[domain_realm]
  .hadoop.example.com = HADOOP.EXAMPLE.COM
  hadoop.example.com = HADOOP.EXAMPLE.COM
  .example.com = EXAMPLE.COM
  example.com = EXAMPLE.COM
```

2. Use one of the following methods to properly translate principal names from the Active Directory realm into the cluster-dedicated KDC realm for the Hadoop cluster.
  - Using Cloudera Manager: Configure the Trusted Kerberos realms property of the Core Settings service:
    - a. Open the Cloudera Manager Admin Console.
    - b. Go to the Core Settings service.
    - c. Click the Configuration tab.
    - d. Type Kerberos in the Search box.
    - e. Edit the Trusted Kerberos Realms property to add the name of your central KDC realm. If you need to use more advanced mappings which do more than just allow principals from another domain, you may enter them in the Additional Rules to Map Kerberos Principals to Short Names property.
  - Using the Command Line: Configure the `hadoop.security.auth_to_local` setting in the `core-site.xml` file on all of the cluster hosts. The following example translates all principal names with the realm `EXAMPLE.COM` into the first component of the principal name only. It also preserves the standard translation for the default realm (the cluster realm).

```
<property>
  <name>hadoop.security.auth_to_local</name>
  <value>
    RULE: [1:$1@$0](^.*@EXAMPLE\.COM$)s/^(.*)@EXAMPLE\.COM$/$1/g
    RULE: [2:$1@$0](^.*@EXAMPLE\.COM$)s/^(.*)@EXAMPLE\.COM$/$1/g
    DEFAULT
```

```
</value>  
</property>
```

## Integrating MIT Kerberos and Active Directory

How to integrate MIT Kerberos and Active Directory in a Cloudera Manager cluster.

### About this task

Several different subsystems are involved in servicing authentication requests, including the Key Distribution Center (KDC), Authentication Service (AS), and Ticket Granting Service (TGS). The more nodes in the cluster and the more services provided, the heavier the traffic between these services and the services running on the cluster.

As a general guideline, Cloudera recommends using a dedicated Active Directory instance (Microsoft Server Domain Services) for every 100-200 nodes in the cluster. However, this is just a loose guideline. Monitor utilization and deploy additional instances as needed to meet the demand.

By default, Kerberos uses UDP for client/server communication which is typically faster at delivering packets than TCP, but does not guarantee delivery. Additionally, using UDP packets that get too large are frequently dropped, as is the case when a user is a member of a large number of groups. To avoid this problem, force Kerberos to use TCP by modifying the Kerberos configuration file (krb5.conf) as follows:

```
[libdefaults]  
udp_preference_limit = 1  
...
```

This is especially useful if the domain controllers are not on the same subnet as the cluster or are separated by firewalls.

In general, Cloudera recommends setting up the Active Directory domain controller (Microsoft Server Domain Services) on the same subnet as the cluster and never over a WAN connection which results in considerable latency and affects cluster performance.

Troubleshooting cluster operations when Active Directory is being used for Kerberos authentication requires administrative access to the Microsoft Server Domain Services instance. Administrators may need to enable Kerberos event logging on the Microsoft Server KDC to resolve issues.

Deleting Cloudera Manager roles or nodes requires manually deleting the associate Active Directory accounts. Cloudera Manager cannot delete entries from Active Directory.

### Related Information

[Mapping Kerberos Principals to Short Names](#)

## Integrating MIT Kerberos and Active Directory

### About this task

Prior to release 5.1, clusters managed by Cloudera Manager could not integrate directly with a Microsoft Active Directory KDC. Rather, integrating the Cloudera Manager cluster with an Active Directory KDC required the additional setup of a local MIT KDC (local, meaning in the same subnet as the cluster).

The steps below can be used for Cloudera Manager clusters prior to release 5.1, or if the Active Directory KDC cannot be accessed directly for whatever reason. The setup process assumes that:

- An MIT Kerberos KDC is running in the same subnet as the cluster and that a Kerberos REALM is local to the cluster

- A Microsoft Server Active Directory instance (Microsoft Server Domain Services) is running elsewhere on the network, in its own Kerberos realm.

Given these two systems, you can then:

1. Create principals for all services running on the cluster in the MIT Kerberos realm local to the cluster.
2. Set up one-way cross-realm trust from the MIT Kerberos realm to the Active Directory realm, as detailed in “Configuring a Local MIT Kerberos Realm to Trust Active Directory” below.

The result of this setup is that Active Directory principals (users) can authenticate to the cluster without needing service principals.

## Configuring a Local MIT Kerberos Realm to Trust Active Directory

### On the Active Directory Server

#### Procedure

1. Add the local realm trust to Active Directory with this command:

```
netdom trust YOUR-LOCAL-REALM.COMPANY.COM /Domain:AD-REALM.COMPANY.COM /
add /realm /passwordt:<TrustPassword>
```

2. Set the proper encryption type with this command:

On Microsoft Windows 2008, 2012, or 2016:

```
ksetup /SetEncTypeAttr YOUR-LOCAL-REALM.COMPANY.COM <enc_type>
```

The <enc\_type> parameter specifies AES, DES, or RC4 encryption. Refer to the documentation for your version of Windows Active Directory to find the <enc\_type> parameter string to use.

3. Get and verify the list of encryption types set with this command:

On Microsoft Windows 2008, 2012, or 2016:

```
ksetup /GetEncTypeAttr YOUR-LOCAL-REALM.COMPANY.COM
```



**Important:** Make sure the encryption type you specify is supported on both your version of Windows Active Directory and your version of MIT Kerberos.

### On the MIT KDC Server

#### Procedure

- Type the following command in the kadmin.local or kadmin shell to add the cross-realm krbtgt principal. Use the same password you used in the netdom command on the Active Directory Server.

```
kadmin: addprinc -e "ENC_TYPE_LIST" krbtgt/YOUR-LOCAL-REALM.COMPANY.CO
M@AD-REALM.COMPANY.COM
```

where the *ENC\_TYPE\_LIST* parameter specifies the types of encryption this cross-realm krbtgt principal can support—AES, DES, or RC4. You can specify multiple encryption types using the parameter in the command

above, what's important is that at least one of the encryption types corresponds to the encryption type found in the tickets granted by the KDC in the remote realm. For example:

```
kadmin: addprinc -e "rc4-hmac:normal des3-hmac-sha1:normal" krbtgt/YOUR-LOCAL-REALM.COMPANY.COM@AD-REALM.COMPANY.COM
```



**Note:** The cross-realm krbtgt principal that you add in this step must have at least one entry that uses the same encryption type as the tickets that are issued by the remote KDC. If no entries have the same encryption type, then the problem you will see is that authenticating as a principal in the local realm will allow you to successfully run Hadoop commands, but authenticating as a principal in the remote realm will not allow you to run Hadoop commands.

### On All of the Cluster Hosts

#### Procedure

1. Verify that both Kerberos realms are configured on all of the cluster hosts. Note that the default realm and the domain realm should remain set as the MIT Kerberos realm which is local to the cluster.

```
[realms]
AD-REALM.CORP.FOO.COM = {
  kdc = ad.corp.foo.com:88
  admin_server = ad.corp.foo.com:749
  default_domain = foo.com
}
CLUSTER-REALM.CORP.FOO.COM = {
  kdc = cluster01.corp.foo.com:88
  admin_server = cluster01.corp.foo.com:749
  default_domain = foo.com
}
```

2. To properly translate principal names from the Active Directory realm into local names within Hadoop, you must configure the `hadoop.security.auth_to_local` setting in the `core-site.xml` file on all of the cluster machines. The following example translates all principal names with the realm `AD-REALM.CORP.FOO.COM` into the first component of the principal name only. It also preserves the standard translation for the default realm (the cluster realm).

a.

```
<property>
  <name>hadoop.security.auth_to_local</name>
  <value>
    RULE: [ 1:$1@$0 ] ( ^.*@AD-REALM\.CORP\.FOO\.COM$ ) s/^ ( .* )@AD-REALM\.CORP
    \.FOO\.COM$/ $1/g
    RULE: [ 2:$1@$0 ] ( ^.*@AD-REALM\.CORP\.FOO\.COM$ ) s/^ ( .* )@AD-REALM\.CORP
    \.FOO\.COM$/ $1/g
    DEFAULT
  </value>
</property>
```

For more information about name mapping rules, see “Mapping Kerberos Principals to Short Names”.

## Hadoop Users (user:group) and Kerberos Principals

During the Cloudera Manager installation process, several Linux user accounts and groups are created by default. These are listed in the table below. For details of these local Linux user accounts, see the [Overview](#) page of this section. Integrating the cluster to use Kerberos for authentication requires creating Kerberos principals and keytabs for these user accounts.

**Table 2: Users and Groups**

Component (Version)	Unix User ID	Groups	Functionality
Apache Atlas	atlas	atlas, hadoop	Apache Atlas by default has atlas as user and group. It is configurable
Apache Flink	flink	flink	The Flink Dashboard runs as this user.
Apache HBase	hbase	hbase	The Master and the RegionServer processes run as this user.
Apache HBase Indexer	hbase	hbase	The indexer servers are run as this user.
Apache HDFS	hdfs	hdfs, hadoop	The NameNode and DataNodes run as this user, and the HDFS root directory as well as the directories used for edit logs should be owned by it.
Apache Hive Hive on Tez	hive	hive	The HiveServer2 process and the Hive Metastore processes run as this user. A user must be defined for Hive access to its Metastore DB (for example, MySQL or Postgres) but it can be any identifier and does not correspond to a Unix uid. This is <code>javax.jdo.option.ConnectionUserName</code> in <code>hive-site.xml</code> .
Apache Impala	impala	impala, hive	Impala services run as this user.
Apache Kafka	kafka	kafka	Kafka brokers, mirrorMaker, and Connect workers run as this user.
Apache Knox	knox	knox	Apache Knox Gateway Server runs as this user
Apache Kudu	kudu	kudu	Kudu services run as this user.
Apache Livy	livy	livy	The Livy Server process runs as this user
Apache NiFi	nifi	nifi	Runs as the nifi user
Apache NiFi Registry	nifiregistry	nifiregistry	Runs as the nifiregistry user
Apache Oozie	oozie	oozie	The Oozie service runs as this user.
Apache Ozone	hdfs	hdfs, hadoop	Ozone Manager, Storage Container Manager (SCM), Recon and Ozone Datanodes run as this user.
Apache Parquet	~	~	No special users.
Apache Phoenix	phoenix	phoenix	The Phoenix Query Server runs as this user
Apache Ranger	ranger	ranger, hadoop	Ranger Admin, Usersync and Tagsync services by default have ranger as user and ranger, hadoop as groups. It is configurable.
Apache Ranger KMS	kms	kms	Ranger KMS runs with kms user and group. It is configurable.
Apache Ranger Raz	rangerraz	ranger	Ranger Raz runs with rangerraz user and is part of the ranger group.

Component (Version)	Unix User ID	Groups	Functionality
Apache Ranger RMS	rangerrms	ranger	Ranger RMS runs with rangerrms user and is part of the ranger group.
Apache Solr	solr	solr	The Solr processes run as this user.
Apache Spark	spark	spark	The Spark History Server process runs as this user.
Apache Sqoop	sqoop	sqoop	This user is only for the Sqoop1 Metastore, a configuration option that is not recommended.
Apache YARN	yarn	yarn, hadoop	Without Kerberos, all YARN services and applications run as this user. The LinuxContainerExecutor binary is owned by this user for Kerberos.
Apache Zeppelin	zeppelin	zeppelin	The Zeppelin Server process runs as this user
Apache ZooKeeper	zookeeper	zookeeper	The ZooKeeper processes run as this user. It is not configurable.
Cloudera Manager (all versions)	cloudera-scm	cloudera-scm	Clusters managed by Cloudera Manager run Cloudera Manager Server, monitoring roles, and other Cloudera Server processes as cloudera-scm. Requires keytab file named cmf.keytab because name is hard-coded in Cloudera Manager.
Cruise Control	cruisecontrol	hadoop	The Cruise Control process runs as this user.
HttpFS	httpfs	httpfs	The HttpFS service runs as this user. See “HttpFS authentication” for instructions on how to generate the merged httpfs-http.keytab file.
Hue	hue	hue	Hue services run as this user.
Hue Load Balancer	apache	apache	The Hue Load balancer has a dependency on the apache2 package that uses the apache user name. Cloudera Manager does not run processes using this user ID.
Schema Registry	schemaregistry	hadoop	The Schema Registry process runs as this user.
Streams Messaging Manager	streamsmgmgr	streamsmgmgr	The Streams Messaging Manager processes run as this user.
Streams Replication Manager	streamsrepmgr	streamsrepmgr	The Streams Replication Manager processes run as this user.

### Keytabs and Keytab File Permissions

Linux user accounts, such as hdfs, are mapped to the username portion of the Kerberos principal names, as follows:

```
username/host.example.com@EXAMPLE.COM
```

For example, the Kerberos principal for Apache Hive would be:

```
hive/host.example.com@EXAMPLE.COM
```

Keytabs that contain multiple principals are merged automatically from individual keytabs by Cloudera Manager. If you override a service configuration to not use the CM-provided keytab, then you must ensure that all the principals required for the given role instance on a specific host are merged together in the keytab file you deploy manually on that host.

For example, for Filename (\*.keytab), the Atlas keytab filename would be atlas.keytab, HBase would be hbase.keytab, and Cloudera Manager would be cmf.keytab and scm.keytab.

Keytab File Owner:Group matters when Cloudera Manager starts a role. For example, Cloudera Manager starts the role "DataNode". Cloudera Manager launches the DataNode process as a user (here, "hdfs"). Because that process needs to access the HDFS keytab, Cloudera Manager puts the HDFS keytab in the DataNode's process directory, and the keytab is given the owner:group that is listed in the table. Thus, the DataNode process properly owns the keytab file.

The tables below lists the usernames to use for Kerberos principal names, for clusters managed by Cloudera Manager.

### Apache Atlas

**Role:** atlas-ATLAS\_SERVER

**Kerberos Principals**

atlas

**Filename (\*.keytab)**

atlas

**Keytab File Owner:Group**

atlas:atlas

**File Permission (octal)**

600

### Apache Flink

**Role:** flink

**Kerberos Principals**

flink

**Filename (\*.keytab)**

flink

**Keytab File Owner:Group**

flink:flink

**File Permission (octal)**

600

### Apache HBase

**Role:** hbase-HBASETHRIFTSERVER

**Kerberos Principals**

hbase, HTTP

**Filename (\*.keytab)**

hbase, HTTP

**Keytab File Owner:Group**

hbase:hbase

**File Permission (octal)**

600

**Role: hbase-REGIONSERVER****Kerberos Principals**

hbase, HTTP

**Filename (\*.keytab)**

hbase, HTTP

**Keytab File Owner:Group**

hbase:hbase

**File Permission (octal)**

600

**Role: hbase-HBASERESTSERVER****Kerberos Principals**

hbase, HTTP

**Filename (\*.keytab)**

hbase, HTTP

**Keytab File Owner:Group**

hbase:hbase

**File Permission (octal)**

600

**Role: hbase-MASTER****Kerberos Principals**

hbase, HTTP

**Filename (\*.keytab)**

hbase, HTTP

**Keytab File Owner:Group**

hbase:hbase

**File Permission (octal)**

600

**Apache HBase indexer****Role: ks\_indexer-HBASE\_INDEXER****Kerberos Principals**

hbase, HTTP

**Filename (\*.keytab)**

hbase

**Keytab File Owner:Group**

hbase:hbase

**File Permission (octal)**

600

**Apache HDFS****Role: hdfs-NAMENODE****Kerberos Principals**

hdfs, HTTP

**Filename (\*.keytab)**

hdfs

**Keytab File Owner:Group**

hdfs:hdfs

**File Permission (octal)**

600

**Role: hdfs-DATANODE****Kerberos Principals**

hdfs, HTTP

**Filename (\*.keytab)**

hdfs

**Keytab File Owner:Group**

hdfs:hdfs

**File Permission (octal)**

600

**Role: hdfs-SECONDARYNAMENODE****Kerberos Principals**

hdfs, HTTP

**Filename (\*.keytab)**

hdfs

**Keytab File Owner:Group**

hdfs:hdfs

**File Permission (octal)**

600

**Apache Hive, Hive on Tez****Role: hive-HIVESERVER2****Kerberos Principals**

hive

**Filename (\*.keytab)**

hive

**Keytab File Owner:Group**

hive:hive

**File Permission (octal)**

600

**Role: hive-HIVEMETASTORE****Kerberos Principals**

hive

**Filename (\*.keytab)**

hive

**Keytab File Owner:Group**

cloudera-scm:cloudera-scm

**File Permission (octal)**

600

**Apache Impala****Role: impala-STATESTORE****Kerberos Principals**

impala, HTTP

**Filename (\*.keytab)**

impala

**Keytab File Owner:Group**

impala:impala

**File Permission (octal)**

600

**Role: impala-CATALOGSERVER****Kerberos Principals**

impala, HTTP

**Filename (\*.keytab)**

impala

**Keytab File Owner:Group**

impala:impala

**File Permission (octal)**

600

**Role: impala-IMPALAD****Kerberos Principals**

impala, HTTP

**Filename (\*.keytab)**

impala

**Keytab File Owner:Group**

impala:impala

**File Permission (octal)**

600

**Apache Kafka****Role: kafka-KAFKA\_BROKER****Kerberos Principals**

kafka

**Filename (\*.keytab)**

kafka

**Keytab File Owner:Group**

kafka:kafka

**File Permission (octal)**

600

**Role: kafka-KAFKA\_MIRROR\_MAKER****Kerberos Principals**

kafka\_mirror\_maker

**Filename (\*.keytab)**

kafka

**Keytab File Owner:Group**

kafka:kafka

**File Permission (octal)**

600

**Role: kafka-KAFKA\_CONNECT****Kerberos Principals**

kafka

**Filename (\*.keytab)**

kafka

**Keytab File Owner:Group**

kafka:kafka

**File Permission (octal)**

600

**Apache Knox****Role: knox-KNOX\_GATEWAY****Kerberos Principals**

knox, HTTP

**Filename (\*.keytab)**

knox

**Keytab File Owner:Group**

knox:knox

**File Permission (octal)**

600

**Apache Kudu****Role: kudu-KUDU\_MASTER****Kerberos Principals**

kudu

**Filename (\*.keytab)**

kudu

**Keytab File Owner:Group**

kudu:kudu

**File Permission (octal)**

600

**Role: kudu-KUDU\_TSERVER****Kerberos Principals**

kudu

**Filename (\*.keytab)**

kudu

**Keytab File Owner:Group**

kudu:kudu

**File Permission (octal)**

600

**Apache Livy****Role:** livy-LIVY\_SERVER**Kerberos Principals**

livy

**Filename (\*.keytab)**

livy

**Keytab File Owner:Group**

livy:livy

**File Permission (octal)**

600

**Apache NiFi****Role:** nifi**Kerberos Principals**

nifi, HTTP

**Filename (\*.keytab)**

nifi

**Keytab File Owner:Group**

nifi:nifi

**File Permission (octal)**

600

**Apache NiFi Registry****Role:** nifiregistry**Kerberos Principals**

nifiregistry, HTTP

**Filename (\*.keytab)**

nifiregistry

**Keytab File Owner:Group**

nifiregistry:nifiregistry

**File Permission (octal)**

600

**Apache Oozie****Role:** oozie-OOZIE\_SERVER**Kerberos Principals**

oozie, HTTP

**Filename (\*.keytab)**

oozie

**Keytab File Owner:Group**

oozie:oozie

**File Permission (octal)**

600

**Apache Ozone****Role:** ozone-OZONE\_MANAGER

**Kerberos Principals**

om, HTTP

**Filename (\*.keytab)**

ozone

**Keytab File Owner:Group**

hdfs:hdfs

**File Permission (octal)**

600

**Role: ozone-STORAGE\_CONTAINER\_MANAGER****Kerberos Principals**

scm, HTTP

**Filename (\*.keytab)**

ozone

**Keytab File Owner:Group**

hdfs:hdfs

**File Permission (octal)**

600

**Role: ozone-OZONE\_DATANODE****Kerberos Principals**

dn, HTTP

**Filename (\*.keytab)**

ozone

**Keytab File Owner:Group**

hdfs:hdfs

**File Permission (octal)**

600

**Role: ozone-OZONE\_RECON****Kerberos Principals**

recon, HTTP

**Filename (\*.keytab)**

ozone

**Keytab File Owner:Group**

hdfs:hdfs

**File Permission (octal)**

600

**Role: ozone-S3\_GATEWAY****Kerberos Principals**

HTTP

**Filename (\*.keytab)**

ozone

**Keytab File Owner:Group**

hdfs:hdfs

**File Permission (octal)**

---

600

### Apache Phoenix

**Role:** phoenix-PHOENIX\_QUERY\_SERVER

**Kerberos Principals**

phoenix, HTTP

**Filename (\*.keytab)**

phoenix

**Keytab File Owner:Group**

phoenix:phoenix

**File Permission (octal)**

600

### Apache Ranger

**Role:** ranger-RANGER\_ADMIN

**Kerberos Principals**

rangeradmin, rangerlookup, HTTP

**Filename (\*.keytab)**

ranger

**Keytab File Owner:Group**

ranger:ranger

**File Permission (octal)**

600

**Role:** ranger-RANGER\_USERSYNC

**Kerberos Principals**

rangerusersync

**Filename (\*.keytab)**

ranger

**Keytab File Owner:Group**

ranger:ranger

**File Permission (octal)**

600

**Role:** ranger-RANGER\_TAGSYNC

**Kerberos Principals**

rangertagsync

**Filename (\*.keytab)**

ranger

**Keytab File Owner:Group**

ranger:ranger

**File Permission (octal)**

600

### Apache Ranger KMS

**Role:** ranger-RANGER\_TAGSYNC

**Kerberos Principals**

rangerkms, HTTP

**Filename (\*.keytab)**

ranger\_kms

**Keytab File Owner:Group**

kms:kms

**File Permission (octal)**

600

**Apache Ranger Raz**

**Role: ranger-RANGER\_RAZ**

**Kerberos Principals**

rangerraz, HTTP

**Filename (\*.keytab)**

rangerraz

**Keytab File Owner:Group**

ranger:rangerraz

**File Permission (octal)**

600

**Apache Ranger RMS**

**Role: ranger-RANGER\_RMS**

**Kerberos Principals**

rangerrms

**Filename (\*.keytab)**

rangerrms

**Keytab File Owner:Group**

ranger:rangerrms

**File Permission (octal)**

600

**Apache Solr**

**Role: solr-SOLR\_SERVER**

**Kerberos Principals**

solr, HTTP

**Filename (\*.keytab)**

solr

**Keytab File Owner:Group**

solr:solr

**File Permission (octal)**

600

**Apache Spark**

**Role: spark\_on\_yarn-SPARK\_YARN\_HISTORY\_SERVER**

**Kerberos Principals**

spark

**Filename (\*.keytab)**

spark

**Keytab File Owner:Group**

spark:spark

**File Permission (octal)**

600

**Apache YARN**

**Role: yarn-NODEMANAGER**

**Kerberos Principals**

yarn, HTTP

**Filename (\*.keytab)**

yarn

**Keytab File Owner:Group**

yarn:hadoop

**File Permission (octal)**

644

**Role: yarn-RESOURCEMANAGER**

**Kerberos Principals**

yarn, HTTP

**Filename (\*.keytab)**

yarn

**Keytab File Owner:Group**

yarn:hadoop

**File Permission (octal)**

600

**Role: yarn-JOBHISTORY**

**Kerberos Principals**

mapred

**Filename (\*.keytab)**

mapred

**Keytab File Owner:Group**

yarn:hadoop

**File Permission (octal)**

600

**Apache Zeppelin**

**Role: zeppelin-ZEPPELIN\_SERVER**

**Kerberos Principals**

zeppelin, HTTP

**Filename (\*.keytab)**

zeppelin

**Keytab File Owner:Group**

zeppelin:zeppelin

**File Permission (octal)**

---

600

### Apache ZooKeeper

**Role:** zookeeper-server

**Kerberos Principals**

zookeeper

**Filename (\*.keytab)**

zookeeper

**Keytab File Owner:Group**

zookeeper:zookeeper

**File Permission (octal)**

600

### Cloudera Management

**Role:** cloudera-mgmt-REPORTSMANAGER

**Kerberos Principals**

hdfs

**Filename (\*.keytab)**

headlamp

**Keytab File Owner:Group**

cloudera-scm:cloudera-scm

**File Permission (octal)**

600

**Role:** cloudera-mgmt-SERVICEMONITOR

**Kerberos Principals**

hue

**Filename (\*.keytab)**

cmon

**Keytab File Owner:Group**

cloudera-scm:cloudera-scm

**File Permission (octal)**

600

**Role:** cloudera-mgmt-ACTIVITYMONITOR

**Kerberos Principals**

hue

**Filename (\*.keytab)**

cmon

**Keytab File Owner:Group**

cloudera-scm:cloudera-scm

**File Permission (octal)**

600

### Cloudera Manager

**Kerberos Principals**

cloudera-scm, HTTP

**Filename (\*.keytab)**

cmf, scm

**Keytab File Owner:Group**

cloudera-scm:cloudera-scm

**File Permission (octal)**

600

**CruiseControl****Role: cruise\_control-CRUISE\_CONTROL\_SERVER****Kerberos Principals**

cruisecontrol, kafka, HTTP

**Filename (\*.keytab)**

cruise\_control

**Keytab File Owner:Group**

cruisecontrol:hadoop

**File Permission (octal)**

600

**HttpFS****Role: hdfs-HTTPFS****Kerberos Principals**

httpfs, HTTP

**Filename (\*.keytab)**

httpfs

**Keytab File Owner:Group**

httpfs:httpfs

**File Permission (octal)**

600

**Hue****Role: hue-KT\_RENEWER****Kerberos Principals**

hue

**Filename (\*.keytab)**

hue

**Keytab File Owner:Group**

hue:hue

**File Permission (octal)**

600

**Schema Registry****Role: schemaregistry-SCHEMA\_REGISTRY\_SERVER****Kerberos Principals**

schemaregistry, HTTP

**Filename (\*.keytab)**

schemaregistry

**Keytab File Owner:Group**

schemaregistry:hadoop

**File Permission (octal)**

600

**Streams Messaging Manager****Role: streams\_messaging\_manager-STREAMS\_MESSAGING\_MANAGER\_SERVER****Kerberos Principals**

streamsmgmr, HTTP

**Filename (\*.keytab)**

streams\_messaging\_manager

**Keytab File Owner:Group**

streamsmgmr:streamsmgmr

**File Permission (octal)**

600

**Streams Replication Manager****Role: streams\_replication\_manager-STREAMS\_REPLICATION\_MANAGER\_DRIVER****Kerberos Principals**

streamsrepmgr

**Filename (\*.keytab)**

streams\_replication\_manager

**Keytab File Owner:Group**

streamsrepmgr:streamsrepmgr

**File Permission (octal)**

600

**Role: streams\_replication\_manager-STREAMS\_REPLICATION\_MANAGER\_SERVICE****Kerberos Principals**

streamsrepmgr

**Filename (\*.keytab)**

streams\_replication\_manager

**Keytab File Owner:Group**

streamsrepmgr:streamsrepmgr

**File Permission (octal)**

600

**Create Service Principals and Keytab Files for HDP**

This section is optional. During the HDP 3.1.5 to HDP intermediate bits upgrade, Ambari can generate the principals and keytabs. However, before upgrading, you can manually generate the principals and keytabs. First, create the principal using mandatory naming conventions and then create the keytab file with the principal's information. Lastly, copy the keytab file to the keytab directory on the appropriate service host.

To create a service principal, use the kadmin utility. The kadmin utility is a command-line driven utility where you can run Kerberos commands to manipulate the central database. To start kadmin, run the following commands:

1. 'kadmin \$USER/admin@REALM'

2. `kadmin: addprinc -randkey $principal_name/$service-host-FQDN@$hadoop.realm`



**Note:**

- a. You must have a principal with administrative permissions to run the above commands.
- b. The `randkey` is used to generate the password.
- c. The `$principal_name` part of the name must match the values in the table below.

In the example mentioned in step 2, each service principal's name is appended with a fully qualified domain name of the host on which the principal is running. This is to provide a unique principal name for services that run on multiple hosts, like DataNodes and TaskTrackers. The addition of the hostname serves to distinguish, for example, a request from DataNode A from a request from DataNode B. This is important for two reasons:

- If the Kerberos credentials for one DataNode are compromised, it does not automatically compromise all other DataNodes.
- If multiple DataNodes have the same principal and are simultaneously connecting to the NameNode, and if the Kerberos authenticator sent has the same timestamp, then the authentication is rejected as a replay request.



**Note:** The NameNode, Secondary NameNode, and Oozie require two principals each.

If you are configuring High Availability (HA) for a Quorum-based NameNode, you must also generate a principle (`jn/$FQDN`) and keytab (`jn.service.keytab`) for each JournalNode. JournalNode also requires the keytab for its HTTP service. If the JournalNode is deployed on the same host as a NameNode, the same keytab file (`spnego.service.keytab`) can be used for both. In addition, HA requires two NameNodes. Both the active and standby NameNodes require their own principal and keytab files. The service principles of the two NameNodes can share the same name, specified with the `dfs.namenode.kerberos.principal` property in `hdfs-site.xml`, but the NameNodes still have different fully qualified domain names.

Service	Component/Role	Principal Name	Mandatory Keytab Filename
HDFS	NameNode	<code>nn/\$FQDN</code>	<code>nn.service.keytab</code>
	SecondaryNameNode	<code>nn/\$FQDN</code>	<code>nn.service.keytab</code>
	DataNode	<code>dn/\$FQDN</code>	<code>dn.service.keytab</code>
	Journal Server*	<code>jn/\$FQDN</code>	<code>jn.service.keytab</code>
	NameNode HTTP	<code>HTTP/\$FQDN</code>	<code>spnego.service.keytab</code>
	SecondaryNameNode HTTP	<code>HTTP/\$FQDN</code>	<code>spnego.service.keytab</code>
MapReduce	MR2 History Server	<code>jhs/\$FQDN</code>	<code>nm.service.keytab</code>
	MR2 History Server HTTP	<code>HTTP/\$FQDN</code>	<code>spnego.service.keytab</code>
YARN	Node Manager	<code>nm/\$FQDN</code>	<code>nm.service.keytab</code>
	Resource Manager	<code>rm/\$FQDN</code>	<code>rm.service.keytab</code>
	YARN Timeline Server	<code>yarn-ats/\$FQDN</code>	<code>yarn-ats.service.keytab</code>
	HTTP	<code>HTTP/\$FQDN</code>	<code>spnego.service.keytab</code>
Oozie	Oozie Server	<code>oozie/\$FQDN</code>	<code>oozie..service.keytab</code>
	Oozie HTTP	<code>HTTP/\$FQDN</code>	<code>spnego.service.keytab</code>
Hive	HiveServer2, HMS	<code>hive/\$FQDN</code>	<code>hive.service.keytab</code>
	Hive HTTP	<code>HTTP/\$FQDN</code>	<code>spnego.service.keytab</code>
HBase	HBase Master Server	<code>hbase/\$FQDN</code>	<code>hbase.service.keytab</code>
	HBase RegionServer	<code>hbase/\$FQDN</code>	<code>hbase.service.keytab</code>
Kafka	Kafka Broker	<code>kafka/\$FQDN</code>	<code>kafka.service.keytab</code>
Zeppelin	Zeppelin Server	<code>zeppelin/\$FQDN</code>	<code>zeppelin.service.keytab</code>

Service	Component/Role	Principal Name	Mandatory Keytab Filename
Zookeeper		zookeeper/\$FQDN	zk.service.keytab
Knox		knox/\$FQDN	knox.service.keytab
Ranger	Admin Server	rangeradmin/\$FQDN	rangeradmin.service.keytab
	Lookup Server	rangerlookup/\$FQDN	rangerlookup.service.keytab
	KMS	rangerkms/\$FQDN	rangerkms.service.keytab
	UserSync	rangerusersync/\$FQDN	rangerusersync.service.keytab
	TagSync	rangertagsync/\$FQDN	rangertagsync.service.keytab
AMS		amshbase/\$FQDN	ams-hbase.master.keytab
		amsmon/\$FQDN	ams.collector.keytab
		amszk/\$FQDN	ams-zk.service.keytab
Spark2		spark/\$FQDN	spark.service.keytab
Druid		druid/\$FQDN	druid.service.keytab
Infra-Solr		infra-solr/\$FQDN	ambari-infra-solr.service.keytab
Atlas		atlas/\$FQDN	atlas.service.keytab
Livy		livy/\$FQDN	livy.service.keytab

\* Only required if you are setting up NameNode HA. For example, to create the principal for a DataNode service, run the command `kadmin: addprinc -randkey dn/$datanode-host@$hadoop.realm`

3. Extract the related keytab file and place it in the keytab directory of the respective components. The default directory is `/etc/krb5.keytab`.

- `kadmin: xst -k $keytab_file_name $principal_name/fully.qualified.domain.name`

You must use the mandatory names for the `$keytab_file_name` variable shown in the table above. For example, to create the keytab files for the NameNode, run the command `kadmin: xst -k nn.service.keytab nn/$namenode-host`  
`kadmin: xst -k spnego.service.keytab HTTP/$namenode-host`

After creating the keytab files, copy the keytab files to the keytab directory of the respective service hosts.

4. On each service in your cluster, verify that the correct keytab files and principals are associated with the correct service using the `klist` command. For example, on the NameNode, run the command `klist -k -t /etc/security/nn.service.keytab`

### Related Information

[Using a custom Kerberos keytab retrieval script](#)

[Customizing Kerberos Principals and System Users](#)

## Mapping Kerberos Principals to Short Names

You configure the mapping from Kerberos principals to short names in the `hadoop.security.auth_to_local` property setting in the `core-site.xml` file. Kerberos has this support natively, and Hadoop's implementation uses Kerberos's configuration language to specify the mapping.

A mapping consists of a set of rules that are evaluated in the order listed in the `hadoop.security.auth_to_local` property. The first rule that matches a principal name is used to map that principal name to a short name. Any later rules in the list that match the same principal name are ignored.

You specify the mapping rules on separate lines in the `hadoop.security.auth_to_local` property as follows:

```
<property>
```

```

<name>hadoop.security.auth_to_local</name>
<value>
  RULE:[<principal translation>](<acceptance filter>)<short name substituti
ion>
  RULE:[<principal translation>](<acceptance filter>)<short name substituti
on>
  DEFAULT
</value>
</property>

```



**Note:** You can also set `auth_to_local` rules in `krb5.conf` using MIT Kerberos. If you do, be aware that the format is different, and the rules described below will fail if used in this context.

## Mapping Rule Syntax

To specify a mapping rule, use the prefix string `RULE:` followed by three sections—principal translation, acceptance filter, and short name substitution—described in more detail below. The syntax of a mapping rule is:

```
RULE:[<principal translation>](<acceptance filter>)<short name substitution>
```

## Principal Translation

The first section of a rule, `<principal translation>`, performs the matching of the principal name to the rule. If there is a match, the principal translation also does the initial translation of the principal name to a short name. In the `<principal translation>` section, you specify the number of components in the principal name and the pattern you want to use to translate those principal component(s) and realm into a short name. In Kerberos terminology, a principal name is a set of components separated by slash ("/") characters.

The principal translation is composed of two parts that are both specified within "[ ]" using the following syntax:

```
[<number of components in principal name>:<initial specification of short name>]
```

where:

`<number of components in principal name>` – This first part specifies the number of components in the principal name (not including the realm) and must be 1 or 2. A value of 1 specifies principal names that have a single component (for example, `hdfs`), and 2 specifies principal names that have two components (for example, `hdfs/fully.qualified.domain.name`). A principal name that has only one component will only match single-component rules, and a principal name that has two components will only match two-component rules.

`<initial specification of short name>` – This second part specifies a pattern for translating the principal component(s) and the realm into a short name. The variable `$0` translates the realm, `$1` translates the first component, and `$2` translates the second component.

Here are some examples of principal translation sections. These examples use `atm@YOUR-REALM.COM` and `atm/fully.qualified.domain.name@YOUR-REALM.COM` as principal name inputs:

This Principal Translation	Translates <code>atm@YOUR-REALM.COM</code> into this short name	Translates <code>atm/fully.qualified.domain.name@YOUR-REALM.COM</code> into this short name
<code>[1:\$1@\$0]</code>	<code>atm@YOUR-REALM.COM</code>	Rule does not match1
<code>[1:\$1]</code>	<code>atm</code>	Rule does not match1
<code>[1:\$1.foo]</code>	<code>atm.foo</code>	Rule does not match1
<code>[2:\$1/\$2@\$0]</code>	Rule does not match2	<code>atm/fully.qualified.domain.name@YOUR-REALM.COM</code>
<code>[2:\$1/\$2]</code>	Rule does not match2	<code>atm/fully.qualified.domain.name</code>
<code>[2:\$1@\$0]</code>	Rule does not match2	<code>atm@YOUR-REALM.COM</code>

This Principal Translation	Translates atm@YOUR-REALM.COM into this short name	Translates atm/fully.qualified.domain.name@YOUR-REALM.COM into this short name
[2:\$1]	Rule does not match2	atm

Footnotes:

1Rule does not match because there are two components in principal name atm/fully.qualified.domain.name@YOUR-REALM.COM

2Rule does not match because there is one component in principal name atm@YOUR-REALM.COM

## Acceptance Filter

The second section of a rule, (<acceptance filter>), matches the translated short name from the principal translation (that is, the output from the first section). The acceptance filter is specified in "(" characters and is a standard regular expression. A rule matches only if the specified regular expression matches the entire translated short name from the principal translation. That is, there's an implied ^ at the beginning of the pattern and an implied \$ at the end.

## Short Name Substitution

The third and final section of a rule is the (<short name substitution>). If there is a match in the second section, the acceptance filter, the (<short name substitution>) section does a final translation of the short name from the first section. This translation is a sed replacement expression (s/.../.../g) that translates the short name from the first section into the final short name string. The short name substitution section is optional. In many cases, it is sufficient to use the first two sections only.

## Converting Principal Names to Lowercase

In some organizations, naming conventions result in mixed-case usernames (for example, John.Doe) or even uppercase usernames (for example, JDOE) in Active Directory or LDAP. This can cause a conflict when the Linux username and HDFS home directory are lowercase.

To convert principal names to lowercase, append /L to the rule.

## Example Rules

Suppose all of your service principals are either of the form App.service-name/fully.qualified.domain.name@YOUR-REALM.COM or App.service-name@YOUR-REALM.COM, and you want to map these to the short name string service-name. To do this, your rule set would be:

```
<property>
  <name>hadoop.security.auth_to_local</name>
  <value>
    RULE:[1:$1](App\..*)s/App\.(.*)/$1/g
    RULE:[2:$1](App\..*)s/App\.(.*)/$1/g
    DEFAULT
  </value>
</property>
```

The first \$1 in each rule is a reference to the first component of the full principal name, and the second \$1 is a regular expression back-reference to text that is matched by (.\*)

In the following example, suppose your company's naming scheme for user accounts in Active Directory is FirstnameLastname (for example, JohnDoe), but user home directories in HDFS are /user/firstname.lastname. The following rule set converts user accounts in the CORP.EXAMPLE.COM domain to lowercase.

```
<property>
  <name>hadoop.security.auth_to_local</name>
  <value>
    RULE:[2:$1@$0](HTTP@QCORP.EXAMPLE.COM\E$)s/@QCORP.EXAMPLE.COM\E$//
```

```

RULE: [ 1: $1@$0 ] ( . *@\QCORP . EXAMPLE . COM\E$ ) s /@\QCORP . EXAMPLE . COM\E$ // /L
RULE: [ 2: $1@$0 ] ( . *@\QCORP . EXAMPLE . COM\E$ ) s /@\QCORP . EXAMPLE . COM\E$ // /L
DEFAULT
</value>
</property>

```

In this example, the JohnDoe@CORP.EXAMPLE.COM principal becomes the johndoe HDFS user.

## Default Rule

You can specify an optional default rule called DEFAULT (see example above). The default rule reduces a principal name down to its first component only. For example, the default rule reduces the principal names atm@YOUR-REALM.COM or atm/fully.qualified.domain.name@YOUR-REALM.COM down to atm, assuming that the default domain is YOUR-REALM.COM.

The default rule applies only if the principal is in the default realm.

If a principal name does not match any of the specified rules, the mapping for that principal name will fail.

## Testing Mapping Rules

You can test mapping rules for a long principal name by running:

```
hadoop org.apache.hadoop.security.HadoopKerberosName name1 name2 name3
```

# Using a custom Kerberos configuration path

How to use a custom Kerberos configuration path ( a path other than the default file path, /etc/krb5.conf) for an existing cluster.

### About this task

From Cloudera Data Platform 7.1.9 ( Cloudera Manager 7.11.3 ) onwards, you are able to set a custom path for the Kerberos Configuration file, *KRB5.CONF*. The valid paths are limited to */ETC/HADOOP/\** or */ETC/KRB5.CONF* when Manage krb5.conf through Cloudera Manager setting is enabled in Cloudera Manager; otherwise, any path is acceptable.

The steps below show how to change the default kerberos path(*/ETC/KRB5.CONF*) to a custom path(e.g. */ETC/HADOOP/[\*\*\*CUSTOM\_PATH\*\*]/KRB5.CONF*)

### Before you begin

Begin with a running cluster with Kerberos path set to */ETC/KRB5.CONF*. Then, make sure the original krb5.conf under */ETC/KRB5.CONF* has been removed from all the hosts on the cluster before following the steps.

## Procedure

1. Define the Kerberos file path by following Option1 - if you want Cloudera Manager to manage the krb configuration, or else Option 2.

Option 1: Configure Manage krb5.conf by Cloudera Manager and set the new location of krb5.conf to */ETC/HADOOP/[\*\*\*CUSTOM\_PATH\*\*\*/KRB5.CONF*.

- a) Go to Cloudera Manager Administration Settings .
- b) Enter */ETC/HADOOP/[\*\*\*CUSTOM\_PATH\*\*\*/KRB5.CONF* for krb5.conf file path.



### Note:

- Ensure all the required Kerberos fields are populated before enabling Manage krb5.conf by Cloudera Manager.
- Ensure Active Directory Set Encryption Types is selected if Kerberos Encryption Type is set to a stronger encryption type like *AES128-CTS* or *AES256-CTS*.

- c) Select the Manage krb5.conf by Cloudera Manager checkbox.
- d) Click on Save Changes.

The screenshot shows two configuration items in Cloudera Manager:

- krb5.conf file path:** The value is `/etc/hadoop/test1/krb5.conf`. It includes a warning icon (triangle) and the text "Requires Server Restart". Below the input field is a blue "Undo" button.
- Manage krb5.conf through Cloudera Manager:** The checkbox is checked. It also includes a warning icon and the text "Requires Server Restart". Below the checkbox is a blue "Undo" button.

- e) Restart Cloudera Manager Server.
- f) Stop the cluster.
- g) Stop Cloudera Management services.
- h) Run the Kerberos Staleness Wizard to ensure the new krb5.conf file is deployed on all hosts. Go to Home Configuration Configuration Issues. Click on Cluster has stale Kerberos client configuration and complete the wizard for Deploy Kerberos Client Configuration.

Option 2: Where Manage krb5.conf by Cloudera Manager is unselected before changing the krb5 file path.

- a) Go to Cloudera Manager Administration Settings .
  - b) Enter */ETC/HADOOP/[\*\*\*CUSTOM\_PATH\*\*\*/KRB5.CONF* for krb5.conf file path.
  - c) Click on Save Changes.
  - d) Restart Cloudera Manager Server.
  - e) Stop the cluster.
  - f) Stop Cloudera Management services.
2. If using MIT KDC, fix the KDC services to point to the new file location. Skip this step if using AD.

```
# vim /etc/sysconfig/krb5kdc
# cat /etc/sysconfig/krb5kdc
KRB5KDC_ARGS=
KRB5_CONFIG=/etc/hadoop/[***custom_path***/krb5.conf
```

```
# vim /etc/sysconfig/kadmin
# cat /etc/sysconfig/kadmin
KADMIND_ARGS=
```

```
KRB5_CONFIG=/etc/hadoop/[***custom_path***]/krb5.conf
```

```
# service krb5kdc restart && service kadmind restart
Redirecting to /bin/systemctl restart krb5kdc.service

Redirecting to /bin/systemctl restart kadmind.service
```

3. Add the following to */ETC/DEFAULT/CLUSTER/CLUSTER-SERVER*.

```
CMF_JAVA_OPTS="{CMF_JAVA_OPTS} -Djava.security.krb5.conf=/etc/hadoop/[*  
**custom_path***]/krb5.conf"
```

4. Restart the Cloudera Manager Server by running the following command on the Cloudera Manager Server host:

```
sudo systemctl restart cloudera-scm-server
```

5. Once the Cloudera Manager server has started, go to Cloudera Manager Administration Security Kerberos Credentials, and click Setup KDC for this Cloudera Manager wizard to re-add the KDC.
6. Go to Cloudera Manager Security Kerberos Credentials, and click on Regenerate selected to regenerate credentials for all the roles.

If Regenerate credentials fails, then “sleep 30” should be added between the account deletion (ldapdelete) and account modification with AES encryption (ldapmodify).

The AD Kerberos server is sometimes unable to absorb the ldapdelete and quickly reflect the changes when ldap modify is called. Hence, adding a sleep gets the AD Kerberos server some time to sync within itself.

SSH into the Cloudera Manager server host and execute the below commands to edit the required script.

```
# vim /opt/cloudera/cm/bin/gen_credentials_ad.sh
# grep -A 5 -B 5 "sleep 30" /opt/cloudera/cm/bin/gen_credentials_ad.sh
    if [ $? -ne 0 ]; then
        echo "Deletion of the Active Directory account $PRINC failed."
        exit 1
    fi
done <<< "$LOCAL_CNS" # read LOCAL_CNS and split at newlines
sleep 30
fi

# Add account in AD
# servicePrincipalName is obtained from $PRINC by removing "@REALM" from
the end.
# password needs to be specified in unicode using "iconv"
```

**Note:**

Cloudera does not support a scenario where an Active Directory creates account principals as non-leaf objects. This might cause Kerberos credentials regeneration to stop deleting the objects recursively.

As a workaround, add `-r` argument to the `ldapdelete` call in the `/opt/cloudera/cm/bin/gen_credentials_ad.sh` script. This does a recursive delete. But if the datanode specified is not a leaf, its children and all their children are deleted down the tree without any verification. So, use the `-r` argument with your own discretion.

**Note:**

If Regenerate credentials fails with a KVNO mismatch error after upgrading to Cloudera Manager 7.13.1 or later, you may need to disable KVNO validation. The error message will appear as `com.cloudera.cmf.service.config.ConfigGenException: KVNO in keytab did not match with KVNO in KDC`.

To disable KVNO validation, perform the following steps:

- a. SSH into the Cloudera Manager server host.
- b. Edit the `/etc/default/cloudera-scm-server` file and add the following line:

```
export CMF_FF_KERBEROS_KVNO_VALIDATION="false"
```

- c. Save the `/etc/default/cloudera-scm-server` file.
- d. Restart the Cloudera Manager Server by running the following command:

```
sudo systemctl restart cloudera-scm-server
```

7. To enable the HTTPFS role in HDFS, go to Cloudera Manager HDFS Configuration HttpFS Environment Advanced Configuration Snippet (Safety Valve). Click on 'Add', and specify Key as `HADOOP_OPTS`, and Value as `-DJAVA.SECURITY.KRB5.CONF=/ETC/HADOOP/[***CUSTOM_PATH**]/KRB5.CONF`
8. Click on Save Changes.
9. Click the Stale Configuration icon to launch the Stale Configuration wizard and restart the necessary services.
10. Restart Cloudera Management Services. On the Home Status tab, click the options menu to the right of Cloudera Management Service and select Start.
11. Start the cluster. On the HomeStatus tab, click  to the right of the cluster name and select Start.
12. Configure custom KRB5\_CONFIG for Impala:

Before using `impala-shell` to connect to the Impala server with a valid Kerberos ticket for the first time, ensure the custom `KRB5_CONFIG` is accessible to `impala-shell`. To achieve this, export the custom `KRB5_CONFIG` to a file like `.bashrc`:

```
# .bashrc
```

```
# User specific aliases and functions
alias rm='rm -i'
alias cp='cp -i'
alias mv='mv -i'
```

```
# Source global definitions
if [ -f /etc/bashrc ]; then
. /etc/bashrc
```

```
fi
```

```
export KRB5_CONFIG=/etc/hadoop/[***custom_path**]/krb5.conf
```

```
# cd /run/cloudera-scm-agent/process/
# ls -lrt | grep -i impala
ImpalaGracefulShutdownCmdWork      drwxr-x--x  7 impala impala 620 Oct 25 07:18 133-
impala-IMPALAD                      drwxr-x--x  7 impala impala 640 Oct 25 07:18 118-
impala-IMPALAD                      drwxr-x--x  7 impala impala 640 Oct 25 18:17 263-
impala-IMPALAD                      drwxr-x--x  7 impala impala 620 Oct 25 18:17 394-
# cd 394-impala-IMPALAD/
# kinit -kt impala.keytab impala/quasar-gvpuyw-1.quasar-gvpuyw.root.hwx
.site@QE-INFRA-AD.CLOUDERA.COM
# impala-shell -i quasar-gvpuyw-5.quasar-gvpuyw.root.hwx.site:25003 -d de
fault -k --ssl --ca_cert=/var/lib/cloudera-scm-agent/agent-cert/cm-auto-
global_cacerts.pem
Starting Impala Shell using Kerberos authenticati
on
Using service name 'impala'
SSL is enabled
No handlers could be found for logger "thrift.trans
port.sslcompat"
Opened TCP connection to quasar-gvpuyw-5.quasar-
gvpuyw.root.hwx.site:25003
Connected to quasar-gvpuyw-5.quasar-gvpuyw.root.
hwx.site:25003
Server version: impalad version 3.4.0-SNAPSHOT RE
LEASE (build bc0299cf11ff42368fcb39ddaf04f4fe32c1c445)
Query: use `default`
*****
Welcome to the Impala shell.
(Impala Shell v3.4.0-SNAPSHOT (bc0299c) built on
Sat Jan 28 00:17:17 UTC 2023)
Press TAB twice to see a list of available comm
ands.
*****
Query: use `default`
[quasar-gvpuyw-5.quasar-gvpuyw.root.hwx.site:2500
3] default> select 1;
Query: select 1
Query submitted at: 2023-10-25 18:25:10 (Coordinat
or: https://quasar-gvpuyw-2.quasar-gvpuyw.root.hwx.site:25000)
Query progress can be monitored at: https://quasa
r-gvpuyw-2.quasar-gvpuyw.root.hwx.site:25000/query_plan?query_id=d44a181
c32b9ble9:0208a9f700000000
+---+
| 1 |
+---+
| 1 |
+---+
Fetched 1 row(s) in 0.29s
```

```
default> Goodbye root
```



**Note:** Failing to do this may lead to an error message such as "Cannot find KDC for realm 'ROOT.HWX.SITE'." This is because the Kerberos plugin within impala-shell also relies on the custom KRB5\_CONFIG location.