

Hortonworks Data Platform

Command Line Installation

(April 3, 2017)

Hortonworks Data Platform: Command Line Installation

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Table of Contents

1. Preparing to Manually Install HDP	1
1.1. Meeting Minimum System Requirements	1
1.1.1. Hardware Recommendations	1
1.1.2. Operating System Requirements	1
1.1.3. Software Requirements	1
1.1.4. JDK Requirements	2
1.1.5. Metastore Database Requirements	5
1.2. Virtualization and Cloud Platforms	16
1.3. Configuring Remote Repositories	16
1.4. Deciding on a Deployment Type	17
1.5. Collect Information	17
1.6. Prepare the Environment	17
1.6.1. Enable NTP on Your Cluster	17
1.6.2. Disable SELinux	19
1.6.3. Disable IPTables	19
1.7. Download Companion Files	20
1.8. Define Environment Parameters	20
1.9. Creating System Users and Groups	27
1.10. Determining HDP Memory Configuration Settings	27
1.10.1. Running the YARN Utility Script	27
1.10.2. Calculating YARN and MapReduce Memory Requirements	28
1.11. Configuring NameNode Heap Size	32
1.12. Allocating Adequate Log Space for HDP	33
1.13. Downloading the HDP Maven Artifacts	33
2. Installing Apache ZooKeeper	34
2.1. Install the ZooKeeper Package	34
2.2. Securing ZooKeeper with Kerberos (optional)	34
2.3. Securing ZooKeeper Access	35
2.3.1. ZooKeeper Configuration	35
2.3.2. YARN Configuration	36
2.3.3. HDFS Configuration	37
2.4. Set Directories and Permissions	37
2.5. Set Up the Configuration Files	38
2.6. Start ZooKeeper	39
3. Installing HDFS, YARN, and MapReduce	40
3.1. Set Default File and Directory Permissions	40
3.2. Install the Hadoop Packages	40
3.3. Install Compression Libraries	41
3.3.1. Install Snappy	41
3.3.2. Install LZO	41
3.4. Create Directories	41
3.4.1. Create the NameNode Directories	42
3.4.2. Create the SecondaryNameNode Directories	42
3.4.3. Create DataNode and YARN NodeManager Local Directories	42
3.4.4. Create the Log and PID Directories	43
3.4.5. Symlink Directories with hdp-select	45
4. Setting Up the Hadoop Configuration	47
5. Validating the Core Hadoop Installation	53

5.1. Format and Start HDFS	53
5.2. Smoke Test HDFS	53
5.3. Configure YARN and MapReduce	54
5.4. Start YARN	56
5.5. Start MapReduce JobHistory Server	56
5.6. Smoke Test MapReduce	57
6. Installing Apache HBase	58
6.1. Install the HBase Package	58
6.2. Set Directories and Permissions	59
6.3. Set Up the Configuration Files	59
6.4. Add Configuration Parameters for Bulk Load Support	63
6.5. Validate the Installation	63
6.6. Starting the HBase Thrift and REST Servers	63
7. Installing Apache Phoenix	65
7.1. Installing the Phoenix Package	65
7.2. Configuring HBase for Phoenix	65
7.3. Configuring Phoenix to Run in a Secure Cluster	66
7.4. Validating the Phoenix Installation	67
7.5. Troubleshooting Phoenix	69
8. Installing and Configuring Apache Tez	70
8.1. Prerequisites	70
8.2. Installing the Tez Package	70
8.3. Configuring Tez	71
8.4. Setting Up Tez for the Tez UI	77
8.4.1. Setting Up Tez for the Tez UI	77
8.4.2. Deploying the Tez UI	78
8.4.3. Additional Steps for the Application Timeline Server	79
8.5. Creating a New Tez View Instance	79
8.6. Validating the Tez Installation	80
8.7. Troubleshooting	80
9. Installing Apache Hive and Apache HCatalog	81
9.1. Installing the Hive-HCatalog Package	81
9.2. Setting Up the Hive/HCatalog Configuration Files	83
9.2.1. HDP-Utility script	85
9.2.2. Configure Hive and HiveServer2 for Tez	85
9.3. Setting Up the Database for the Hive Metastore	87
9.4. Setting up RDBMS for use with Hive Metastore	89
9.5. Enabling Tez for Hive Queries	90
9.6. Disabling Tez for Hive Queries	90
9.7. Configuring Tez with the Capacity Scheduler	90
9.8. Validating Hive-on-Tez Installation	91
9.9. Installing Apache Hive LLAP	92
9.10. LLAP Prerequisites	92
9.11. Preparing to Install LLAP	92
9.12. Installing LLAP on an Unsecured Cluster	93
9.13. Installing LLAP on a Secured Cluster	95
9.13.1. Prerequisites	95
9.13.2. Installing LLAP on a Secured Cluster	95
9.13.3. Validating the Installation on a Secured Cluster	101
9.14. Stopping the LLAP Service	102
9.15. Tuning LLAP for Performance	102

10. Installing Apache Pig	103
10.1. Install the Pig Package	103
10.2. Validate the Installation	103
11. Installing Apache WebHCat	104
11.1. Install the WebHCat Package	104
11.2. Upload the Pig, Hive and Sqoop tarballs to HDFS	104
11.3. Set Directories and Permissions	105
11.4. Modify WebHCat Configuration Files	106
11.5. Set Up HDFS User and Prepare WebHCat Directories	107
11.6. Validate the Installation	108
12. Installing Apache Oozie	109
12.1. Install the Oozie Package	109
12.2. Set Directories and Permissions	112
12.3. Set Up the Oozie Configuration Files	113
12.3.1. For Derby	114
12.3.2. For MySQL	115
12.3.3. For PostgreSQL	116
12.3.4. For Oracle	117
12.4. Configure Your Database for Oozie	119
12.5. Set up the Sharelib	120
12.6. Validate the Installation	120
12.7. Stop and Start Oozie	121
13. Installing Apache Ranger	122
13.1. Installation Prerequisites	122
13.2. Installing Policy Manager	122
13.2.1. Install the Ranger Policy Manager	123
13.2.2. Install the Ranger Policy Administration Service	126
13.2.3. Start the Ranger Policy Administration Service	126
13.2.4. Configuring the Ranger Policy Administration Authentication Mode	126
13.2.5. Configuring Ranger Policy Administration High Availability	128
13.3. Installing UserSync	128
13.3.1. Using the LDAP Connection Check Tool	128
13.3.2. Install UserSync and Start the Service	134
13.4. Installing Ranger Plug-ins	137
13.4.1. Installing the Ranger HDFS Plug-in	138
13.4.2. Installing the Ranger YARN Plug-in	141
13.4.3. Installing the Ranger Kafka Plug-in	144
13.4.4. Installing the Ranger HBase Plug-in	147
13.4.5. Installing the Ranger Hive Plug-in	150
13.4.6. Installing the Ranger Knox Plug-in	153
13.4.7. Installing the Ranger Storm Plug-in	158
13.5. Installing Ranger in a Kerberized Environment	161
13.5.1. Creating Keytab and Principals	161
13.5.2. Installing Ranger Services	163
13.5.3. Manually Installing and Enabling the Ranger Plug-ins	167
13.6. Verifying the Installation	174
14. Installing Hue	175
14.1. Before You Begin	175
14.2. Configure HDP to Support Hue	176
14.3. Install the Hue Packages	186

14.4. Configure Hue to Communicate with the Hadoop Components	187
14.4.1. Configure the Web Server	187
14.4.2. Configure Hadoop	188
14.5. Configure Hue for Databases	190
14.5.1. Using Hue with Oracle	190
14.5.2. Using Hue with MySQL	191
14.5.3. Using Hue with PostgreSQL	192
14.6. Start, Stop, and Restart Hue	193
14.7. Validate the Hue Installation	193
15. Installing Apache Sqoop	194
15.1. Install the Sqoop Package	194
15.2. Set Up the Sqoop Configuration	195
15.3. Validate the Sqoop Installation	195
16. Installing Apache Mahout	196
16.1. Install Mahout	196
16.2. Validate Mahout	196
17. Installing and Configuring Apache Flume	198
17.1. Installing Flume	198
17.2. Configuring Flume	200
17.3. Starting Flume	202
18. Installing and Configuring Apache Storm	203
18.1. Install the Storm Package	203
18.2. Configure Storm	204
18.3. Configure a Process Controller	204
18.4. (Optional) Configure Kerberos Authentication for Storm	206
18.5. (Optional) Configuring Authorization for Storm	209
18.6. Validate the Installation	211
19. Installing and Configuring Apache Spark	214
19.1. Spark Prerequisites	214
19.2. Installing Spark	214
19.3. Configuring Spark	215
19.4. (Optional) Starting the Spark Thrift Server	218
19.5. (Optional) Configuring Dynamic Resource Allocation	219
19.6. (Optional) Installing and Configuring Livy	219
19.6.1. Installing Livy	219
19.6.2. Configuring Livy	220
19.6.3. Starting, Stopping, and Restarting Livy	222
19.6.4. Granting Livy the Ability to Impersonate	223
19.6.5. (Optional) Configuring Zeppelin to Interact with Livy	223
19.7. Validating Spark	224
20. Installing and Configuring Apache Spark 2	225
20.1. Spark 2 Prerequisites	225
20.2. Installing Spark 2	225
20.3. Configuring Spark 2	226
20.4. (Optional) Starting the Spark 2 Thrift Server	229
20.5. (Optional) Configuring Dynamic Resource Allocation	230
20.6. (Optional) Installing and Configuring Livy	230
20.6.1. Installing Livy	230
20.6.2. Configuring Livy	231
20.6.3. Starting, Stopping, and Restarting Livy	233
20.6.4. Granting Livy the Ability to Impersonate	234

20.6.5. (Optional) Configuring Zeppelin to Interact with Livy	234
20.7. Validating Spark 2	234
21. Installing and Configuring Apache Kafka	236
21.1. Install Kafka	236
21.2. Configure Kafka	237
21.3. Validate Kafka	238
22. Installing and Configuring Zeppelin	239
22.1. Installation Prerequisites	239
22.2. Installing the Zeppelin Package	239
22.3. Configuring Zeppelin	240
22.4. Starting, Stopping, and Restarting Zeppelin	241
22.5. Validating Zeppelin	241
22.6. Accessing the Zeppelin UI	241
23. Installing Apache Accumulo	243
23.1. Installing the Accumulo Package	243
23.2. Configuring Accumulo	244
23.3. Configuring the "Hosts" Files	246
23.4. Validating Accumulo	246
23.5. Smoke Testing Accumulo	246
24. Installing Apache Falcon	248
24.1. Installing the Falcon Package	248
24.2. Setting Directories and Permissions	249
24.3. Configuring Proxy Settings	250
24.4. Configuring Falcon Entities	250
24.5. Configuring Oozie for Falcon	250
24.6. Configuring Hive for Falcon	255
24.7. Configuring for Secure Clusters	255
24.8. Validate Falcon	257
25. Installing Apache Knox	258
25.1. Install the Knox Package on the Knox Server	258
25.2. Set up and Validate the Knox Gateway Installation	258
25.3. Configuring Knox Single Sign-on (SSO)	260
26. Installing Apache Slider	264
27. Setting Up Kerberos Security for Manual Installs	267
28. Uninstalling HDP	268

List of Tables

1.1. Directories Needed to Install Core Hadoop	21
1.2. Directories Needed to Install Ecosystem Components	22
1.3. Define Users and Groups for Systems	26
1.4. Typical System Users and Groups	27
1.5. yarn-utils.py Options	28
1.6. Reserved Memory Recommendations	29
1.7. Recommended Container Size Values	30
1.8. YARN and MapReduce Configuration Values	30
1.9. Example Value Calculations Without HBase	31
1.10. Example Value Calculations with HBase	31
1.11. Recommended NameNode Heap Size Settings	32
8.1. Tez Configuration Parameters	71
9.1. Hive Configuration Parameters	85
9.2.	92
9.3.	93
9.4. LLAP Properties to Set in hive-site.xml	94
9.5. HiveServer2 Properties to Set in hive-site.xml to Enable Concurrent Queries with LLAP	94
9.6. Properties to Set in hive-site.xml for Secured Clusters	98
9.7. Properties to Set in ssl-server.xml for LLAP on Secured Clusters	99
9.8. LLAP Package Parameters	100
11.1. Hadoop core-site.xml File Properties	105
13.1. install.properties Entries	123
13.2. Properties to Update in the install.properties File	135
13.3. Properties to Edit in the install.properties File	139
13.4. Properties to Edit in the install.properties File	141
13.5. Properties to Edit in the install.properties File	144
13.6. HBase Properties to Edit in the install.properties file	147
13.7. Hive-Related Properties to Edit in the install.properties File	151
13.8. Knox-Related Properties to Edit in the install.properties File	154
13.9. Storm-Related Properties to Edit in the install.properties file	158
13.10. install.properties Property Values	164
13.11. install.properties Property Values	165
13.12. install.properties Property Values	166
13.13. install.properties Property Values	166
13.14. install.properties Property Values	167
13.15. install.properties Property Values	168
13.16. install.properties Property Values	169
13.17. install.properties Property Values	170
13.18. install.properties Property Values	171
13.19. install.properties Property Values	172
13.20. install.properties Property Values	173
17.1. Flume 1.5.2 Dependencies	200
18.1. Required jaas.conf Sections for Cluster Nodes	207
18.2. Supported Authorizers	209
18.3. storm.yaml Configuration File Properties	210
18.4. worker-launcher.cfg File Configuration Properties	211
18.5. multitenant-scheduler.yaml Configuration File Properties	211

19.1. Prerequisites for running Spark 1.6	214
20.1. Prerequisites for running Spark 2	225
21.1. Kafka Configuration Properties	237
22.1. Installation Prerequisites	239

1. Preparing to Manually Install HDP

This chapter describes how to prepare to install Hortonworks Data Platform (HDP) manually. You must complete the following tasks before you deploy Hadoop cluster using HDP:

1. [Meeting Minimum System Requirements \[1\]](#)
2. [Configuring Remote Repositories \[16\]](#)
3. [Deciding on a Deployment Type \[17\]](#)
4. [Collect Information \[17\]](#)
5. [Prepare the Environment \[17\]](#)
6. [Download Companion Files \[20\]](#)
7. [Define Environment Parameters \[20\]](#)
8. [\[Optional\] Create System Users and Groups](#)
9. [Determining HDP Memory Configuration Settings \[27\]](#)
10. [Allocating Adequate Log Space for HDP \[33\]](#)



Important

See the [HDP Release Notes](#) for the HDP 2.6.0.0 repo information.

1.1. Meeting Minimum System Requirements

To run Hortonworks Data Platform, your system must meet minimum requirements.

1.1.1. Hardware Recommendations

Although there is no single hardware requirement for installing HDP, there are some basic guidelines. A complete installation of HDP 2.6.0 consumes about 6.5 GB of disk space. For more information about HDP hardware recommendations, see the *HDP Cluster Planning Guide*.

1.1.2. Operating System Requirements

Refer to the [HDP Operating System Requirements](#) for information regarding supported operating systems.

1.1.3. Software Requirements

You must install the following software on each of your hosts:

- `apt-get` (for Ubuntu and Debian)

- `chkconfig` (Ubuntu and Debian)
- `curl`
- `php_curl` (for SLES)
- `reposync` (might not be installed by default on all SLES hosts)
- `rpm` (for RHEL, CentOS, or SLES)
- `scp`
- `tar`
- `unzip`
- `wget`
- `yum` (for RHEL or CentOS)
- `zypper` (for SLES)

In addition, if you are creating local mirror repositories as part of the installation process and you are using RHEL, CentOS, or SLES, you need the following utilities on the mirror repo server:

- `createrepo`
- `reposync`
- `yum-utils`

See [Deploying HDP in Production Data Centers with Firewalls](#).

1.1.4. JDK Requirements

Your system must have the correct Java Development Kit (JDK) installed on all cluster nodes.

Refer to the [HDP JDK Requirements](#) for information regarding supported JDKs.



Important

Before enabling Kerberos in the cluster, you must deploy the Java Cryptography Extension (JCE) security policy files on all hosts in the cluster. See [Installing the JCE](#) for more information.

The following sections describe how to install and configure the JDK.

1.1.4.1. Manually Installing Oracle JDK 1.7 or 1.8

Use the following instructions to manually install JDK 1.7 or JDK 1.8:

1. If you do not have a `/usr/java` directory, create one:

```
mkdir /usr/java
```

2. Download the Oracle 64-bit JDK (`jdk-7u67-linux-x64.tar.gz` or `jdk-8u51-linux-x64.tar.gz`) from the Oracle download site.
3. Open a web browser and navigate to <http://www.oracle.com/technetwork/java/javase/downloads/java-archive-downloads-javase7-521261.html> or <http://www.oracle.com/technetwork/java/javase/downloads/jdk8-downloads-2133151.html>.
4. Copy the downloaded `jdk.tar.gz` file to the `/usr/java` directory.
5. Navigate to the `/usr/java` directory and extract the `jdk.tar.gz` file:

```
cd /usr/java && tar zxvf jdk-7u67-linux-x64.tar.gz
or
cd /usr/java tar zxvf jdk-8u51-linux-x64.tar.gz
```

The JDK files are extracted into a `/usr/java/jdk1.7.0_67` directory or a `/usr/java/jdk1.8.0_51` directory.

6. Create a symbolic link (symlink) to the JDK:

```
ln -s /usr/java/jdk1.7.0_67 /usr/java/default
```

or

```
ln -s /usr/java/jdk1.8.0_51 /usr/java/default
```

7. Set the `JAVA_HOME` and `PATH` environment variables:

```
export JAVA_HOME=/usr/java/default
export PATH=$JAVA_HOME/bin:$PATH
```

8. Verify that Java is installed in your environment:

```
java -version
```

You should see output similar to the following:

```
java version "1.7.0_67"
Java(TM) SE Runtime Environment (build 1.7.0_67-b01)
Java HotSpot(TM) 64-Bit Server VM (build 24.67-b01, mixed mode)
```

1.1.4.2. Manually Installing OpenJDK 1.7

OpenJDK7 on HDP 2.6.0 does not work if you are using SLES as your OS. Use the following instructions to manually install OpenJDK 1.7 on a Linux OS other than SLES:

1. Check your currently installed version from a terminal window:

```
java -version
```

2. If the JDK version is earlier than 7, uninstall it, as in the following example using Centos:

```
rpm -qa | grep java
yum remove {java-1.*}
```

3. If you followed Step 2, verify that Java is uninstalled:

```
which java
```

4. (Optional) Download OpenJDK 1.7 RPMs from the appropriate command line:

RedHat, CentOS, or Oracle Linux:

```
yum install java-1.7.0-openjdk java-1.7.0-openjdk-devel
```

Ubuntu or Debian:

```
apt-get install openjdk-7-jdk
```

5. (Optional) Create symbolic links (symlinks) to the JDK:

```
mkdir /usr/java
```

```
ln -s /usr/hdp/current/jvm/java-1.7.0-openjdk-1.7.0.51.x86_64 /usr/java/default
```

```
ln -s /usr/java/default/bin/java /usr/bin/java
```

6. (Optional) Set your environment to define JAVA_HOME to put the Java Virtual Machine and the Java compiler on your path:

```
export JAVA_HOME=/usr/java/default
export PATH=$JAVA_HOME/bin:$PATH
```

7. (Optional) Verify that Java is installed in your environment by running the following command from the command-line console:

```
java -version
```

You should see output similar to the following:

```
openjdk version "1.7.0"
OpenJDK Runtime Environment (build 1.7.0)
OpenJDK Client VM (build 20.6-b01, mixed mode)
```

1.1.4.3. Manually Installing the JCE

Unless you are using OpenJDK with unlimited-strength JCE, you must manually install the Java Cryptography Extension (JCE) security policy files on all hosts in the cluster:

1. Obtain the JCE policy file appropriate for the JDK version in your cluster:

- Oracle JDK 1.8

<http://www.oracle.com/technetwork/java/javase/downloads/jce8-download-2133166.html>

- Oracle JDK 1.7

<http://www.oracle.com/technetwork/java/javase/downloads/jce-7-download-432124.html>

2. Save the policy file archive in a temporary location.
3. On each host in the cluster, add the unlimited security policy JCE jars to `$JAVA_HOME/jre/lib/security/`.

For example, run the following command to extract the policy jars into the JDK installed on your host:

```
unzip -o -j -q jce_policy-8.zip -d /usr/jdk64/jdk1.8.0_60/jre/lib/security/
```

1.1.5. Metastore Database Requirements

If you are installing Apache projects Hive and HCatalog, Oozie, Hue, or Ranger, you must install a database to store metadata information in the metastore. You can either use an existing database instance or install a new instance manually.

Refer to the [HDP Database Requirements](#) for information regarding supported metastore databases.

The following sections describe how to install and configure the metastore database.

1.1.5.1. Metastore Database Prerequisites

The database administrator must create the following users and specify the following values:

- For Apache Hive: `hive_dbname`, `hive_dbuser`, and `hive_dbpasswd`.
- For Apache Oozie: `oozie_dbname`, `oozie_dbuser`, and `oozie_dbpasswd`.



Note

By default, Hive uses the Derby database for the metastore. However, Derby is not supported for production systems.

- For Hue: Hue user name and Hue user password
- For Apache Ranger: `RANGER_ADMIN_DB_NAME`

1.1.5.2. Installing and Configuring PostgreSQL

The following instructions explain how to install PostgreSQL as the metastore database. See your third-party documentation for instructions on how to install other supported databases.

1.1.5.2.1. Installing PostgreSQL on RHEL, CentOS, and Oracle Linux

Use the following instructions to install a new instance of PostgreSQL:

1. Using a terminal window, connect to the host machine where you plan to deploy a PostgreSQL instance:

```
yum install postgresql-server
```

2. Start the instance:

```
/etc/init.d/postgresql start
```

For some newer versions of PostgreSQL, you might need to execute the command `/etc/init.d/postgresql initdb`.

3. Reconfigure PostgreSQL server:

- Edit the `/var/lib/pgsql/data/postgresql.conf` file.

Change the value of `#listen_addresses = 'localhost'` to `listen_addresses = '*'`.

- Edit the `/var/lib/pgsql/data/postgresql.conf` file.

Remove comments from the "port =" line and specify the port number (default 5432).

- Edit the `/var/lib/pgsql/data/pg_hba.conf` file by adding

the following:

```
host all all 0.0.0.0/0 trust
```

- If you are using PostgreSQL v9.1 or later, add the following to the `/var/lib/pgsql/data/postgresql.conf` file:

```
standard_conforming_strings = off
```

4. Create users for PostgreSQL server by logging

in as the root user and entering the following syntax:

```
echo "CREATE DATABASE $dbname;" | sudo -u $postgres psql -U postgres
echo "CREATE USER $user WITH PASSWORD '$passwd';" | sudo -u $postgres psql -U postgres
echo "GRANT ALL PRIVILEGES ON DATABASE $dbname TO $user;" | sudo -u $postgres psql -U postgres
```

The previous syntax should have the following values:

- `$postgres` is the postgres user.
- `$user` is the user you want to create.
- `$dbname` is the name of your PostgreSQL database.



Note

For access to the Hive metastore, you must create `hive_dbuser` after Hive has been installed, and for access to the Oozie metastore, you must create `oozie_dbuser` after Oozie has been installed.

5. On the Hive metastore host, install the connector:

```
yum install postgresql-jdbc*
```

6. Confirm that the `.jar` file is in the Java share directory:

```
ls -l /usr/share/java/postgresql-jdbc.jar
```

1.1.5.2.2. Installing PostgreSQL on SUSE Linux Enterprise Server (SLES)

To install a new instance of PostgreSQL:

1. Connect to the host machine where you plan to deploy the PostgreSQL instance.

At a terminal window, enter:

```
zypper install postgresql-server
```

2. Start the instance.

```
/etc/init.d/postgresql start
```



Note

For some newer versions of PostgreSQL, you might need to execute the command:

```
/etc/init.d/postgresql initdb
```

3. Reconfigure the PostgreSQL server:

- Edit the `/var/lib/pgsql/data/postgresql.conf` file.

Change the value of `#listen_addresses = 'localhost'` to `listen_addresses = '*'`

- Edit the `/var/lib/pgsql/data/postgresql.conf` file.

Change the port setting `#port = 5432` to `port = 5432`

- Edit the `/var/lib/pgsql/data/pg_hba.conf` file.

Add the following:

```
host all all 0.0.0.0/0 trust
```

- **Optional:** If you are using PostgreSQL v9.1 or later, add the following to the `/var/lib/pgsql/data/postgresql.conf` file:

```
standard_conforming_strings = off
```

4. Create users for PostgreSQL server.

Log in as the root and enter:

```
echo "CREATE DATABASE $dbname;" | sudo -u $postgres psql -U postgres
echo "CREATE USER $user WITH PASSWORD '$passwd';" | sudo -u $postgres psql -U postgres
echo "GRANT ALL PRIVILEGES ON DATABASE $dbname TO $user;" | sudo -u $postgres psql -U postgres
```


Where:

- \$postgres is the postgres user
- \$user is the user you want to create
- \$dbname is the name of your PostgreSQL database



Note

For access to the Hive metastore, create hive_dbuser after Hive has been installed, and for access to the Oozie metastore, create oozie_dbuser after Oozie has been installed.

5. On the Hive Metastore host, install the connector.

```
zypper install -y postgresql-jdbc
```

6. Copy the connector .jar file to the Java share directory.

```
cp /usr/share/pgsql/postgresql-*.jdbc3.jar /usr/share/java/postgresql-jdbc.jar
```

7. Confirm that the .jar is in the Java share directory.

```
ls /usr/share/java/postgresql-jdbc.jar
```

8. Change the access mode of the .jar file to 644.

```
chmod 644 /usr/share/java/postgresql-jdbc.jar
```

1.1.5.2.3. Installing PostgreSQL on Ubuntu and Debian

To install a new instance of PostgreSQL:

1. Connect to the host machine where you plan to deploy PostgreSQL instance.

At a terminal window, enter:

```
apt-get install postgresql-server
```

2. Start the instance.



Note

For some newer versions of PostgreSQL, you might need to execute the command:

```
/etc/init.d/postgresql initdb
```

3. Reconfigure PostgreSQL server:

- Edit the /var/lib/pgsql/data/postgresql.conf file.

```
Change the value of #listen_addresses = 'localhost' to  
listen_addresses = '*'
```

- Edit the `/var/lib/pgsql/data/postgresql.conf` file.

```
Change the port setting from #port = 5432 to port = 5432
```

- Edit the `/var/lib/pgsql/data/pg_hba.conf`

Add the following:

```
host all all 0.0.0.0/0 trust
```

- **Optional:** If you are using PostgreSQL v9.1 or later, add the following to the `/var/lib/pgsql/data/postgresql.conf` file:

```
standard_conforming_strings = off
```

4. Create users for PostgreSQL server.

Log in as the root and enter:

```
echo "CREATE DATABASE $dbname;" | sudo -u $postgres psql -U postgres  
echo "CREATE USER $user WITH PASSWORD '$passwd';" | sudo -u $postgres psql -  
U postgres  
echo "GRANT ALL PRIVILEGES ON DATABASE $dbname TO $user;" | sudo -u  
$postgres psql -U postgres
```

Where:

`$postgres` is the postgres user, `$user` is the user you want to create, and `$dbname` is the name of your PostgreSQL database.



Note

For access to the Hive metastore, create `hive_dbuser` after Hive has been installed, and for access to the Oozie metastore, create `oozie_dbuser` after Oozie has been installed.

5. On the Hive Metastore host, install the connector.

```
apt-get install -y libpostgresql-jdbc-java
```

6. Copy the connector .jar file to the Java share directory.

```
cp /usr/share/java/postgresql-*jdbc3.jar /usr/share/java/  
postgresql-jdbc.jar
```

7. Confirm that the .jar is in the Java share directory.

```
ls /usr/share/java/postgresql-jdbc.jar
```

8. Change the access mode of the .jar file to 644.

```
chmod 644 /usr/share/java/postgresql-jdbc.jar
```

1.1.5.3. Installing and Configuring MariaDB

This section describes how to install MariaDB as the metastore database. For instructions on how to install other supported databases, see your third-party documentation.

For additional information regarding MariaDB, see [MariaDB](#).

1.1.5.3.1. Installing MariaDB on RHEL and CentOS



Important

If you are installing on CentOS or RHEL, it is highly recommended that you install from a repository using **yum**.

Follow these steps to install a new instance of MariaDB on RHEL and CentOS:

1. There are YUM repositories for several YUM-based Linux distributions. Use the Maria DB Downloads page to generate the YUM repository.
2. Move the MariaDB repo file to the directory `/etc/yum.repos.d/`.

It is suggested that you name your file `MariaDB.repo`.

The following is an example `MariaDB.repo` file for CentOS 7:

```
[mariadb]
name=MariaDB
baseurl=http://yum.mariadb.org/10.1/centos7-amd64
gpgkey=https://yum.mariadb.org/RPM-GPG-KEY-MariaDB
gpgcheck=1
```

In this example the `gpgkey` line automatically fetches the GPG key that is used to sign the repositories. `gpgkey` enables **yum** and **rpm** to verify the integrity of the packages that it downloads. The id of MariaDB's signing key is `0xcbc082a1bb943db`. The short form of the id is `0x1BB943DB` and the full key fingerprint is: `1993 69E5 404B D5FC 7D2F E43B CBCB 082A 1BB9 43DB`.

If you want to fix the version to an older version, follow the instructions on [Adding the MariaDB YUM Repository](#).

3. If you do not have the MariaDB GPG signing key installed, YUM prompts you to install it after downloading the packages. If you are prompted to do so, install the MariaDB GPG signing key.
4. Use the following command to install MariaDB:

```
sudo yum install MariaDB-server MariaDB-client
```

5. If you already have the `MariaDB-Galera-server` package installed, you might need to remove it prior to installing `MariaDB-server`. If you need to remove `MariaDB-Galera-server`, use the following command:

```
sudo yum remove MariaDB-Galera-server
```

No databases are removed when the `MariaDB-Galera-server` rpm package is removed, though with any upgrade, it is best to have backups.

6. Install TokuDB with YUM by following the directions at [Enabling TokuDB](#).

7. Use one of the following commands to start MariaDB:

- If your system is using `systemctl`:

```
sudo systemctl start mariadb
```

- If your system is not using `systemctl`:

```
sudo /etc/init.d/mysql start
```

1.1.5.4. Installing and Configuring MySQL

This section describes how to install MySQL as the metastore database. For instructions on how to install other supported databases, see your third-party documentation.



Important

When you use MySQL as your Hive metastore, you must use `mysql-connector-java-5.1.35.zip` or later JDBC driver.

1.1.5.4.1. Installing MySQL on RHEL and CentOS

To install a new instance of MySQL:

1. Connect to the host machine you plan to use for Hive and HCatalog.

2. Install MySQL server.

From a terminal window, enter:

```
yum install mysql-server (for CentOS6)
```

```
yum install mysql-community-release
```

For CentOS7, install MySQL server from the HDP-Utils repository.

3. Start the instance.

```
/etc/init.d/mysqld start
```

4. Set the root user password using the following command format:

```
mysqladmin -u root password $mysqlpassword
```

For example, use the following command to set the password to "root":

```
mysqladmin -u root password root
```

5. Remove unnecessary information from log and STDOUT:

```
mysqladmin -u root 2>&1 >/dev/null
```

6. Log in to MySQL as the root user:

```
mysql -u root -proot
```

In this syntax, "root" is the root user password.

7. Log in as the root user, create the "dbuser," and grant dbuser adequate privileges:

```
[root@c6402 /]# mysql -u root -proot

Welcome to the MySQL monitor. Commands end with ; or \g.
Your MySQL connection id is 11
Server version: 5.1.73 Source distribution

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affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input
statement.

mysql> CREATE USER 'dbuser'@'localhost' IDENTIFIED BY 'dbuser';
Query OK, 0 rows affected (0.00 sec)

mysql> GRANT ALL PRIVILEGES ON *.* TO 'dbuser'@'localhost';
Query OK, 0 rows affected (0.00 sec)

mysql> CREATE USER 'dbuser'@ '%' IDENTIFIED BY 'dbuser';
Query OK, 0 rows affected (0.00 sec)

mysql> GRANT ALL PRIVILEGES ON *.* TO 'dbuser'@ '%';
Query OK, 0 rows affected (0.00 sec)

mysql> FLUSH PRIVILEGES;
Query OK, 0 rows affected (0.00 sec)

mysql> GRANT ALL PRIVILEGES ON *.* TO 'dbuser'@'localhost' WITH GRANT
OPTION;
Query OK, 0 rows affected (0.00 sec)

mysql> GRANT ALL PRIVILEGES ON *.* TO 'dbuser'@ '%' WITH GRANT OPTION;
Query OK, 0 rows affected (0.00 sec)

mysql>
```

8. Use the **exit** command to exit MySQL.

9. You should now be able to reconnect to the database as "dbuser" by using the following command:

```
mysql -u dbuser -pdbuser
```

After testing the dbuser login, use the **exit** command to exit MySQL.

10. Install the MySQL connector . jar file:

```
yum install mysql-connector-java*
```

1.1.5.4.2. SUSE Linux Enterprise Server (SLES)

To install a new instance of MySQL:

1. Connect to the host machine you plan to use for Hive and HCatalog.
2. Install MySQL server.

From a terminal window, enter:

```
zypper install mysql-server
```

3. Start the instance:

```
/etc/init.d/mysqld start
```

4. Set the root user password by using the following command format:

```
mysqladmin -u root password $mysqlpassword
```

For example, to set the password to "root", use the following command:

```
mysqladmin -u root password root
```

5. Remove unnecessary information from log and STDOUT:

```
mysqladmin -u root 2>&1 >/dev/null
```

6. Log in to MySQL as the root user:

```
mysql -u root -proot
```

7. Log in as the root user, create dbuser, and grant dbuser adequate privileges:

```
[root@c6402 /]# mysql -u root -proot

Welcome to the MySQL monitor. Commands end with ; or \g.
Your MySQL connection id is 11
Server version: 5.1.73 Source distribution

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affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input
statement.

mysql> CREATE USER 'dbuser'@'localhost' IDENTIFIED BY 'dbuser';
Query OK, 0 rows affected (0.00 sec)
```

```
mysql> GRANT ALL PRIVILEGES ON *.* TO 'dbuser'@'localhost';
Query OK, 0 rows affected (0.00 sec)

mysql> CREATE USER 'dbuser'@'%' IDENTIFIED BY 'dbuser';
Query OK, 0 rows affected (0.00 sec)

mysql> GRANT ALL PRIVILEGES ON *.* TO 'dbuser'@'%' ;
Query OK, 0 rows affected (0.00 sec)

mysql> FLUSH PRIVILEGES;
Query OK, 0 rows affected (0.00 sec)

mysql> GRANT ALL PRIVILEGES ON *.* TO 'dbuser'@'localhost' WITH GRANT
OPTION;
Query OK, 0 rows affected (0.00 sec)

mysql> GRANT ALL PRIVILEGES ON *.* TO 'dbuser'@'%' WITH GRANT OPTION;
Query OK, 0 rows affected (0.00 sec)

mysql>
```

8. Use the exit command to exit MySQL.
9. You should now be able to reconnect to the database as dbuser by using the following command:

```
mysql -u dbuser -pdbuser
```

After testing the dbuser login, use the **exit** command to exit MySQL.

10. Install the MySQL connector . jar file:

```
zypper install mysql-connector-java*
```

1.1.5.4.3. Ubuntu/Debian

To install a new instance of MySQL:

1. Connect to the host machine you plan to use for Hive and HCatalog.
2. Install MySQL server.

From a terminal window, enter:

```
apt-get install mysql-server
```

3. Start the instance.

```
/etc/init.d/mysql start
```

4. Set the root user password using the following command format:

```
mysqladmin -u root password $mysqlpassword
```

For example, to set the password to "root":

```
mysqladmin -u root password root
```

5. Remove unnecessary information from log and STDOUT.

```
mysqladmin -u root 2>&1 >/dev/null
```

6. Log in to MySQL as the root user:

```
mysql -u root -proot
```

7. Log in as the root user, create the dbuser, and grant it adequate privileges.

This user provides access to the Hive metastore. Use the following series of commands (shown here with the returned responses) to create dbuser with password dbuser.

```
[root@c6402 /]# mysql -u root -proot

Welcome to the MySQL monitor. Commands end with ; or \g.
Your MySQL connection id is 11
Server version: 5.1.73 Source distribution

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affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input
statement.

mysql> CREATE USER 'dbuser'@'localhost' IDENTIFIED BY 'dbuser';
Query OK, 0 rows affected (0.00 sec)

mysql> GRANT ALL PRIVILEGES ON *.* TO 'dbuser'@'localhost';
Query OK, 0 rows affected (0.00 sec)

mysql> CREATE USER 'dbuser'@'%' IDENTIFIED BY 'dbuser';
Query OK, 0 rows affected (0.00 sec)

mysql> GRANT ALL PRIVILEGES ON *.* TO 'dbuser'@'%';
Query OK, 0 rows affected (0.00 sec)

mysql> FLUSH PRIVILEGES;
Query OK, 0 rows affected (0.00 sec)

mysql> GRANT ALL PRIVILEGES ON *.* TO 'dbuser'@'localhost' WITH GRANT
OPTION;
Query OK, 0 rows affected (0.00 sec)

mysql> GRANT ALL PRIVILEGES ON *.* TO 'dbuser'@'%' WITH GRANT OPTION;
Query OK, 0 rows affected (0.00 sec)

mysql>
```

8. Use the exit command to exit MySQL.
9. You should now be able to reconnect to the database as dbuser, using the following command:

```
mysql -u dbuser -pdbuser
```


After testing the dbuser login, use the exit command to exit MySQL.

10. Install the MySQL connector JAR file.

```
apt-get install mysql-connector-java*
```

1.1.5.5. Configuring Oracle as the Metastore Database

You can select Oracle as the metastore database. For instructions on how to install the databases, see your third-party documentation. To configure Oracle as the Hive Metastore, install HDP and Hive, and then follow the instructions in "Set up Oracle DB for use with Hive Metastore" in this guide.

1.2. Virtualization and Cloud Platforms

Hortonworks Data Platform (HDP) is certified and supported when running on virtual or cloud platforms (for example, VMware vSphere or Amazon Web Services EC2) if the respective guest operating system is supported by HDP and any issues detected on these platforms are reproducible on the same supported operating system installed elsewhere.

See [HDP Operating System Requirements](#) for the list of supported operating systems for HDP.

1.3. Configuring Remote Repositories

The standard HDP install fetches the software from a remote yum repository over the Internet. To use this option, you must set up access to the remote repository and have an available Internet connection for each of your hosts. To download the HDP maven artifacts and build your own repository, see [Download the HDP Maven Artifacts](#)



Important

See the [HDP Release Notes](#) for the HDP 2.6.0.0 repo information.



Note

If your cluster does not have access to the Internet, or if you are creating a large cluster and you want to conserve bandwidth, you can instead provide a local copy of the HDP repository that your hosts can access. For more information, see [Deploying HDP in Production Data Centers with Firewalls](#) in the HDP Reference Guide.

- 6.x line of RHEL/CentOS/Oracle Linux

```
wget -nv https://archive.cloudera.com/p/HDP/2.x/2.6.0.3/centos6/hdp.repo -  
O /etc/yum.repos.d/hdp.repo
```

- 7.x line of RHEL/CentOS/Oracle Linux

```
wget -nv https://archive.cloudera.com/p/HDP/2.x/2.6.0.3/centos7/hdp.repo
```

- SLES

```
wget -nv https://archive.cloudera.com/p/HDP/2.x/2.6.0.3/susel1sp3/hdp.repo
```

- Ubuntu

```
apt-get update
wget https://archive.cloudera.com/p/HDP/2.x/2.6.0.3/ubuntu<version>/hdp.list
-O /etc/apt/sources.list.d/hdp.list
```

- Debian

```
apt-get update
wget https://archive.cloudera.com/p/HDP/2.x/2.6.0.3/debian<version>/hdp.list
-O /etc/apt/sources.list.d/hdp.list
```

1.4. Deciding on a Deployment Type

While it is possible to deploy all of HDP on a single host, you should use at least four hosts: one master host and three slaves.

1.5. Collect Information

To deploy your HDP, you need the following information:

- The fully qualified domain name (FQDN) for each host in your system, and the components you want to set up on each host. You can use `hostname -f` to check for the FQDN.
- If you install Apache Hive, HCatalog, or Apache Oozie, you need the host name, database name, user name, and password for the metastore instance.



Note

If you are using an existing instance, the `dbuser` you create for HDP must be granted ALL PRIVILEGES permissions on that instance.

1.6. Prepare the Environment

To deploy your HDP instance, you must prepare your deployment environment:

- [Enable NTP on Your Cluster \[17\]](#)
- [Disable SELinux \[19\]](#)
- [Disable IPTables \[19\]](#)

1.6.1. Enable NTP on Your Cluster

The clocks of all the nodes in your cluster must be synchronized. If your system does not have access to the Internet, you should set up a master node as an NTP xserver to achieve this synchronization.

Use the following instructions to enable NTP for your cluster:

1. Configure NTP clients by executing the following command on each node in your cluster:

- For RHEL/CentOS/Oracle Linux 6:

```
yum install ntp
```

- For RHEL/CentOS/Oracle Linux 7:

a. Configure the NTP clients:

```
yum install ntp
```

b. Enable the service:

```
systemctl enable ntpd
```

c. Start NTPD:

```
systemctl start ntpd
```

- For SLES:

```
zypper install ntp
```

- For Ubuntu and Debian:

```
apt-get install ntp
```

2. Enable the service by executing the following command on each node in your cluster:

- For RHEL/CentOS/Oracle Linux:

```
chkconfig ntpd on
```

- For SLES, Ubuntu, and Debian:

```
chkconfig ntp on
```

3. Start the NTP. Execute the following command on all the nodes in your cluster.

- For RHEL/CentOS/Oracle Linux:

```
/etc/init.d/ntpd start
```

- For SLES:

```
/etc/init.d/ntp start
```

- For Ubuntu and Debian:

```
/etc/init.d/ntp start
```

4. If you want to use an existing NTP server as the X server in your environment, complete the following steps:

- a. Configure the firewall on the local NTP server to enable UDP input traffic on Port 123 and replace 192.168.1.0/24 with the IP addresses in the cluster, as shown in the following example using RHEL hosts:

```
# iptables -A RH-Firewall-1-INPUT -s 192.168.1.0/24 -m state --state NEW -p udp --dport 123 -j ACCEPT
```

- b. Save and restart iptables. Execute the following command on all the nodes in your cluster:

```
# service iptables save  
  
# service iptables restart
```

- c. Finally, configure clients to use the local NTP server. Edit the `/etc/ntp.conf` file and add the following line:

```
server $LOCAL_SERVER_IP OR HOSTNAME
```

1.6.2. Disable SELinux

The Security-Enhanced (SE) Linux feature should be disabled during the installation process.

1. Check the state of SELinux. On all the host machines, execute the following command:

```
getenforce
```

If the command returns "disabled" or "permissive" as the response, no further actions are required. If the result is `enabled`, proceed to Step 2.

2. Disable SELinux either temporarily for each session or permanently.

- Disable SELinux temporarily by executing the following command:

```
setenforce 0
```

- Disable SELinux permanently in the `/etc/sysconfig/selinux` file by changing the value of the `SELINUX` field to `permissive` or `disabled`. Restart your system.

1.6.3. Disable IPTables

Because certain ports must be open and available during installation, you should temporarily disable iptables. If the security protocols at your installation do not allow you to disable iptables, you can proceed with them on if all of the relevant ports are open and available; otherwise, cluster installation fails. See "Configuring Ports" in the *HDP Reference Guide* for more information.

- On all RHEL/CentOS 6 host machines, execute the following commands to disable iptables:

```
chkconfig iptables off  
  
service iptables stop
```

Restart iptables after your setup is complete.

- On RHEL/CENTOS 7 host machines, execute the following commands to disable firewalld:

```
systemctl stop firewalld
```

```
systemctl mask firewalld
```

Restart firewalld after your setup is complete.

- On Ubuntu and Debian host machines, execute the following command to disable iptables:

```
service ufw stop
```

Restart iptables after your setup is complete.



Important

If you leave iptables enabled and do not set up the necessary ports, the cluster installation fails.

1.7. Download Companion Files

You can download and extract a set of companion files, including script files and configuration files, that you can then modify to match your own cluster environment:

To download and extract the files:

```
wget https://archive.cloudera.com/p/HDP/tools/2.6.0.3/  
hdp_manual_install_rpm_helper_files-2.6.0.3.8.tar.gz  
tar zxvf hdp_manual_install_rpm_helper_files-2.6.0.3.8.tar.gz
```



Important

See the [HDP Release Notes](#) for the HDP 2.6.0.0 repo information.

1.8. Define Environment Parameters

You must set up specific users and directories for your HDP installation by using the following instructions:

1. Define directories.

The following table describes the directories you need for installation, configuration, data storage, process IDs, and log information based on the Apache Hadoop Services you plan to install. Use this table to define what you are going to use to set up your environment.



Note

The scripts.zip file that you downloaded in the supplied companion files includes a script, `directories.sh`, for setting directory environment parameters.

You should edit and source (or copy the contents to your `~/.bash_profile`) to set up these environment variables in your environment.

Table 1.1. Directories Needed to Install Core Hadoop

Hadoop Service	Parameter	Definition
HDFS	DFS_NAME_DIR	Space separated list of directories to which NameNode should store the file system image: for example, <code>/grid/hadoop/hdfs/nn /grid1/hadoop/hdfs/nn</code> .
HDFS	DFS_DATA_DIR	Space separated list of directories where DataNodes should store the blocks. For example, <code>/grid/hadoop/hdfs/dn /grid1/hadoop/hdfs/dn /grid2/hadoop/hdfs/dn</code> .
HDFS	FS_CHECKPOINT_DIR	Space separated list of directories where SecondaryNameNode should store the checkpoint image. For example, <code>/grid/hadoop/hdfs/snn /grid1/hadoop/hdfs/snn /grid2/hadoop/hdfs/snn</code> .
HDFS	HDFS_LOG_DIR	Directory for storing the HDFS logs. This directory name is a combination of a directory and the <code>\$HDFS_USER</code> . For example, <code>/var/log/hadoop/hdfs</code> , where <code>hdfs</code> is the <code>\$HDFS_USER</code> .
HDFS	HDFS_PID_DIR	Directory for storing the HDFS process ID. This directory name is a combination of a directory and the <code>\$HDFS_USER</code> . For example, <code>/var/run/hadoop/hdfs</code> , where <code>hdfs</code> is the <code>\$HDFS_USER</code> .
HDFS	HADOOP_CONF_DIR	Directory for storing the Hadoop configuration files. For example, <code>/etc/hadoop/conf</code> .
YARN	YARN_LOCAL_DIR	Space-separated list of directories where YARN should store temporary data. For example, <code>/grid/hadoop/yarn /grid1/hadoop/yarn /grid2/hadoop/yarn</code> .
YARN	YARN_LOG_DIR	Directory for storing the YARN logs. For example, <code>/var/log/hadoop/yarn</code> . This directory name is a combination of a directory and the <code>\$YARN_USER</code> . In the example <code>yarn</code> is the <code>\$YARN_USER</code> .
YARN	YARN_LOCAL_LOG_DIR	Space-separated list of directories where YARN stores container log data. For example, <code>/grid/hadoop/</code>

Hadoop Service	Parameter	Definition
		yarn/logs /grid1/hadoop/ yarn/log.
YARN	YARN_PID_DIR	Directory for storing the YARN process ID. For example, /var/run/hadoop/yarn. This directory name is a combination of a directory and the \$YARN_USER. In the example, yarn is the \$YARN_USER.
MapReduce	MAPRED_LOG_DIR	Directory for storing the JobHistory Server logs. For example, /var/log/hadoop/mapred. This directory name is a combination of a directory and the \$MAPRED_USER. In the example, mapred is the \$MAPRED_USER.

Table 1.2. Directories Needed to Install Ecosystem Components

Hadoop Service	Parameter	Definition
Pig	PIG_CONF_DIR	Directory in which to store the Apache Pig configuration files: for example, /etc/pig/conf.
Pig	PIG_LOG_DIR	Directory to store the Pig logs. For example, /var/log/pig.
Pig	PIG_PID_DIR	Directory to store the Pig process ID. For example, /var/run/pig.
Oozie	OOZIE_CONF_DIR	Directory to store the Oozie configuration files. For example, /etc/oozie/conf.
Oozie	OOZIE_DATA	Directory to store the Oozie data. For example, /var/db/oozie.
Oozie	OOZIE_LOG_DIR	Directory to store the Oozie logs. For example, /var/log/oozie.
Oozie	OOZIE_PID_DIR	Directory to store the Oozie process ID. For example, /var/run/oozie.
Oozie	OOZIE_TMP_DIR	Directory to store the Oozie temporary files. For example, /var/tmp/oozie.
Hive	HIVE_CONF_DIR	Directory to store the Hive configuration files. For example, /etc/hive/conf.
Hive	HIVE_LOG_DIR	Directory to store the Hive logs. For example, /var/log/hive.
Hive	HIVE_PID_DIR	Directory to store the Hive process ID. For example, /var/run/hive.
WebHCat	WEBHCAT_CONF_DIR	Directory to store the WebHCat configuration files. For example, /etc/hcatalog/conf/webhcat.
WebHCat	WEBHCAT_LOG_DIR	Directory to store the WebHCat logs. For example, var/log/webhcat.
WebHCat	WEBHCAT_PID_DIR	Directory to store the WebHCat process ID. For example, /var/run/webhcat.
HBase	HBASE_CONF_DIR	Directory to store the Apache HBase configuration files. For example, /etc/hbase/conf.

Hadoop Service	Parameter	Definition
HBase	HBASE_LOG_DIR	Directory to store the HBase logs. For example, /var/log/hbase.
HBase	HBASE_PID_DIR	Directory to store the HBase process ID. For example, /var/run/hbase.
ZooKeeper	ZOOKEEPER_DATA_DIR	Directory where Apache ZooKeeper stores data. For example, /grid/hadoop/zookeeper/data
ZooKeeper	ZOOKEEPER_CONF_DIR	Directory to store the ZooKeeper configuration files. For example, /etc/zookeeper/conf.
ZooKeeper	ZOOKEEPER_LOG_DIR	Directory to store the ZooKeeper logs. For example, /var/log/zookeeper.
ZooKeeper	ZOOKEEPER_PID_DIR	Directory to store the ZooKeeper process ID. For example, /var/run/zookeeper.
Sqoop	SQOOP_CONF_DIR	Directory to store the Apache Sqoop configuration files. For example, /etc/sqoop/conf.

If you use the companion files, the following screen provides a snapshot of how your directories .sh file should look after you edit the TODO variables:

```
#!/bin/sh

#
# Directories Script
#
# 1. To use this script, you must edit the TODO variables below for your
# environment.
#
# 2. Warning: Leave the other parameters as the default values. Changing
# these default values requires you to
# change values in other configuration files.
#
#
# Hadoop Service - HDFS
#
# Space separated list of directories where NameNode stores file system
# image. For example, /grid/hadoop/hdfs/nn /grid1/hadoop/hdfs/nn
DFS_NAME_DIR="TODO-LIST-OF-NAMENODE-DIRS" ;

# Space separated list of directories where DataNodes stores the blocks. For
# example, /grid/hadoop/hdfs/dn /grid1/hadoop/hdfs/dn /grid2/hadoop/hdfs/dn
DFS_DATA_DIR="TODO-LIST-OF-DATA-DIRS" ;

# Space separated list of directories where SecondaryNameNode stores
# checkpoint image. For example, /grid/hadoop/hdfs/snn /grid1/hadoop/hdfs/
#snn /grid2/hadoop/hdfs/snn
FS_CHECKPOINT_DIR="TODO-LIST-OF-SECONDARY-NAMENODE-DIRS" ;

# Directory to store the HDFS logs.
HDFS_LOG_DIR="/var/log/hadoop/hdfs" ;
```



```
# Directory to store the HDFS process ID.
HDFS_PID_DIR="/var/run/hadoop/hdfs";

# Directory to store the Hadoop configuration files.
HADOOP_CONF_DIR="/etc/hadoop/conf";

#
# Hadoop Service - YARN
#

# Space separated list of directories where YARN stores temporary data. For
# example, /grid/hadoop/yarn/local /grid1/hadoop/yarn/local /grid2/hadoop/
# yarn/local
YARN_LOCAL_DIR="TODO-LIST-OF-YARN-LOCAL-DIRS";

# Directory to store the YARN logs.
YARN_LOG_DIR="/var/log/hadoop/yarn";

# Space separated list of directories where YARN stores container log data.
# For example, /grid/hadoop/yarn/logs /grid1/hadoop/yarn/logs /grid2/hadoop/
# yarn/logs
YARN_LOCAL_LOG_DIR="TODO-LIST-OF-YARN-LOCAL-LOG-DIRS";

# Directory to store the YARN process ID.
YARN_PID_DIR="/var/run/hadoop/yarn";

#
# Hadoop Service - MAPREDUCE
#

# Directory to store the MapReduce daemon logs.
MAPRED_LOG_DIR="/var/log/hadoop/mapred";

# Directory to store the mapreduce jobhistory process ID.
MAPRED_PID_DIR="/var/run/hadoop/mapred";

#
# Hadoop Service - Hive
#

# Directory to store the Hive configuration files.
HIVE_CONF_DIR="/etc/hive/conf";

# Directory to store the Hive logs.
HIVE_LOG_DIR="/var/log/hive";

# Directory to store the Hive process ID.
HIVE_PID_DIR="/var/run/hive";

#
# Hadoop Service - WebHCat (Templeton)
#

# Directory to store the WebHCat (Templeton) configuration files.
WEBHCAT_CONF_DIR="/etc/hcatalog/conf/webhcat";

# Directory to store the WebHCat (Templeton) logs.
WEBHCAT_LOG_DIR="var/log/webhcat";

# Directory to store the WebHCat (Templeton) process ID.
```

```
WEBHCAT_PID_DIR="/var/run/webhcat";

#
# Hadoop Service - HBase
#

# Directory to store the HBase configuration files.
HBASE_CONF_DIR="/etc/hbase/conf";

# Directory to store the HBase logs.
HBASE_LOG_DIR="/var/log/hbase";

# Directory to store the HBase logs.
HBASE_PID_DIR="/var/run/hbase";

#
# Hadoop Service - ZooKeeper
#

# Directory where ZooKeeper stores data. For example, /grid1/hadoop/
zookeeper/data
ZOOKEEPER_DATA_DIR="TODO-ZOOKEEPER-DATA-DIR";

# Directory to store the ZooKeeper configuration files.
ZOOKEEPER_CONF_DIR="/etc/zookeeper/conf";

# Directory to store the ZooKeeper logs.
ZOOKEEPER_LOG_DIR="/var/log/zookeeper";

# Directory to store the ZooKeeper process ID.
ZOOKEEPER_PID_DIR="/var/run/zookeeper";

#
# Hadoop Service - Pig
#

# Directory to store the Pig configuration files.
PIG_CONF_DIR="/etc/pig/conf";

# Directory to store the Pig logs.
PIG_LOG_DIR="/var/log/pig";

# Directory to store the Pig process ID.
PIG_PID_DIR="/var/run/pig";

#
# Hadoop Service - Oozie
#

# Directory to store the Oozie configuration files.
OOZIE_CONF_DIR="/etc/oozie/conf"

# Directory to store the Oozie data.
OOZIE_DATA="/var/db/oozie"

# Directory to store the Oozie logs.
OOZIE_LOG_DIR="/var/log/oozie"

# Directory to store the Oozie process ID.
```

```

OOZIE_PID_DIR="/var/run/oozie"

# Directory to store the Oozie temporary files.
OOZIE_TMP_DIR="/var/tmp/oozie"

#
# Hadoop Service - Sqoop
#
SQOOP_CONF_DIR="/etc/sqoop/conf"

#
# Hadoop Service - Accumulo
#
ACCUMULO_CONF_DIR="/etc/accumulo/conf";

ACCUMULO_LOG_DIR="/var/log/accumulo"

```

2. The following table describes system user account and groups. Use this table to define what you are going to use in setting up your environment. These users and groups should reflect the accounts you create in [Create System Users and Groups](#). The `scripts.zip` file you downloaded includes a script, `usersAndGroups.sh`, for setting user and group environment parameters.

Table 1.3. Define Users and Groups for Systems

Parameter	Definition
HDFS_USER	User that owns the Hadoop Distributed File System (HDFS) services. For example, hdfs.
YARN_USER	User that owns the YARN services. For example, yarn.
ZOOKEEPER_USER	User that owns the ZooKeeper services. For example, zookeeper.
HIVE_USER	User that owns the Hive services. For example, hive.
WEBHCAT_USER	User that owns the WebHCat services. For example, hcat.
HBASE_USER	User that owns the HBase services. For example, hbase.
FALCON_USER	User that owns the Apache Falcon services. For example, falcon.
SQOOP_USER	User owning the Sqoop services. For example, sqoop.
KAFKA_USER	User owning the Apache Kafka services. For example, kafka.
OOZIE_USER	User owning the Oozie services. For example, oozie.
STORM_USER	User owning the Storm Services. For example, storm.
HADOOP_GROUP	A common group shared by services. For example, hadoop.
ACCUMULO_USER	User that owns the Accumulo services. For example, accumulo.
KNOX_USER	User that owns the Knox Gateway services. For example, knox.
NAGIOS_USER	User that owns the Nagios services. For example, nagios.

1.9. Creating System Users and Groups

In general, Apache Hadoop services should be owned by specific users and not by root or application users. The following table shows the typical users for Hadoop services. If you choose to install the HDP components using the RPMs, these users are automatically set up.

If you do not install with the RPMs, or want different users, then you must identify the users that you want for your Hadoop services and the common Hadoop group and create these accounts on your system.

To create these accounts manually, you must follow this procedure:

Add the user to the group.

```
useradd -G <groupname> <username>
```

Table 1.4. Typical System Users and Groups

Hadoop Service	User	Group
HDFS	hdfs	hadoop
YARN	yarn	hadoop
MapReduce	mapred	hadoop, mapred
Hive	hive	hadoop
HCatalog/WebHCatalog	hcat	hadoop
HBase	hbase	hadoop
Falcon	falcon	hadoop
Sqoop	sqoop	hadoop
ZooKeeper	zookeeper	hadoop
Oozie	oozie	hadoop
Knox Gateway	knox	hadoop
Nagios	nagios	nagios

1.10. Determining HDP Memory Configuration Settings

You can use either of two methods determine YARN and MapReduce memory configuration settings:

- [Running the YARN Utility Script \[27\]](#)
- [Calculating YARN and MapReduce Memory Requirements \[28\]](#)

The HDP utility script is the recommended method for calculating HDP memory configuration settings, but information about manually calculating YARN and MapReduce memory configuration settings is also provided for reference.

1.10.1. Running the YARN Utility Script

This section describes how to use the yarn-utils.py script to calculate YARN, MapReduce, Hive, and Tez memory allocation settings based on the node hardware specifications. The yarn-utils.py script is included in the HDP companion files. See [Download Companion Files](#).

To run the **yarn-utils.py** script, execute the following command from the folder containing the script `yarn-utils.py` options, where options are as follows:

Table 1.5. yarn-utils.py Options

Option	Description
-c CORES	The number of cores on each host
-m MEMORY	The amount of memory on each host, in gigabytes
-d DISKS	The number of disks on each host
-k HBASE	"True" if HBase is installed; "False" if not



Note

Requires python26 to run.

You can also use the `-h` or `--help` option to display a Help message that describes the options.

Example

Running the following command from the `hdp_manual_install_rpm_helper_files-2.6.0.0.$BUILD` directory:

```
python yarn-utils.py -c 16 -m 64 -d 4 -k True
```

Returns:

```
Using cores=16 memory=64GB disks=4 hbase=True
Profile: cores=16 memory=49152MB reserved=16GB usableMem=48GB disks=4
Num Container=8
Container Ram=6144MB
Used Ram=48GB
Unused Ram=16GB
yarn.scheduler.minimum-allocation-mb=6144
yarn.scheduler.maximum-allocation-mb=49152
yarn.nodemanager.resource.memory-mb=49152
mapreduce.map.memory.mb=6144
mapreduce.map.java.opts=-Xmx4096m
mapreduce.reduce.memory.mb=6144
mapreduce.reduce.java.opts=-Xmx4096m
yarn.app.mapreduce.am.resource.mb=6144
yarn.app.mapreduce.am.command-opts=-Xmx4096m
mapreduce.task.io.sort.mb=1792
tez.am.resource.memory.mb=6144
tez.am.launch.cmd-opts =-Xmx4096m
hive.tez.container.size=6144
hive.tez.java.opts=-Xmx4096m
```

1.10.2. Calculating YARN and MapReduce Memory Requirements

This section describes how to manually configure YARN and MapReduce memory allocation settings based on the node hardware specifications.

YARN takes into account all of the available compute resources on each machine in the cluster. Based on the available resources, YARN negotiates resource requests from

applications running in the cluster, such as MapReduce. YARN then provides processing capacity to each application by allocating containers. A *container* is the basic unit of processing capacity in YARN, and is an encapsulation of resource elements such as memory and CPU.

In an Apache Hadoop cluster, it is vital to balance the use of memory (RAM), processors (CPU cores), and disks so that processing is not constrained by any one of these cluster resources. As a general recommendation, allowing for two containers per disk and per core gives the best balance for cluster utilization.

When determining the appropriate YARN and MapReduce memory configurations for a cluster node, you should start with the available hardware resources. Specifically, note the following values on each node:

- RAM (amount of memory)
- CORES (number of CPU cores)
- DISKS (number of disks)

The total available RAM for YARN and MapReduce should take into account the Reserved Memory. Reserved memory is the RAM needed by system processes and other Hadoop processes (such as HBase):

reserved memory = stack memory reserve + HBase memory reserve (if HBase is on the same node)

You can use the values in the following table to determine what you need for reserved memory per node:

Table 1.6. Reserved Memory Recommendations

Total Memory per Node	Recommended Reserved System Memory	Recommended Reserved HBase Memory
4 GB	1 GB	1 GB
8 GB	2 GB	1 GB
16 GB	2 GB	2 GB
24 GB	4 GB	4 GB
48 GB	6 GB	8 GB
64 GB	8 GB	8 GB
72 GB	8 GB	8 GB
96 GB	12 GB	16 GB
128 GB	24 GB	24 GB
256 GB	32 GB	32 GB
512 GB	64 GB	64 GB

After you determine the amount of memory you need per node, you must determine the maximum number of containers allowed per node:

of containers = min (2*CORES, 1.8*DISKS, (total available RAM) / MIN_CONTAINER_SIZE)

DISKS is the value for `dfs.datanode.data.dir` (number of data disks) per machine.

MIN_CONTAINER_SIZE is the minimum container size (in RAM). This value depends on the amount of RAM available; in smaller memory nodes, the minimum container size should also be smaller.

The following table provides the recommended values:

Table 1.7. Recommended Container Size Values

Total RAM per Node	Recommended Minimum Container Size
Less than 4 GB	256 MB
Between 4 GB and 8 GB	512 MB
Between 8 GB and 24 GB	1024 MB
Above 24 GB	2048 MB

Finally, you must determine the amount of RAM per container:

RAM per container = max(MIN_CONTAINER_SIZE, (total available RAM, per containers))

Using the results of all the previous calculations, you can configure YARN and MapReduce.

Table 1.8. YARN and MapReduce Configuration Values

Configuration File	Configuration Setting	Value Calculation
yarn-site.xml	yarn.nodemanager.resource.memory-mb	= containers * RAM-per-container
yarn-site.xml	yarn.scheduler.minimum-allocation-mb	= RAM-per-container
yarn-site.xml	yarn.scheduler.maximum-allocation-mb	= containers * RAM-per-container
mapred-site.xml	mapreduce.map.memory.mb	= RAM-per-container
mapred-site.xml	mapreduce.reduce.memory.mb	= 2 * RAM-per-container
mapred-site.xml	mapreduce.map.java.opts	= 0.8 * RAM-per-container
mapred-site.xml	mapreduce.reduce.java.opts	= 0.8 * 2 * RAM-per-container
mapred-site.xml	yarn.app.mapreduce.am.resource.mb	= 2 * RAM-per-container
mapred-site.xml	yarn.app.mapreduce.am.command-opts	= 0.8 * 2 * RAM-per-container

Note: After installation, both yarn-site.xml and mapred-site.xml are located in the `/etc/hadoop/conf` folder.

Examples

Assume that your cluster nodes have 12 CPU cores, 48 GB RAM, and 12 disks:

Reserved memory = 6 GB system memory reserve + 8 GB for HBase min container size = 2 GB

If there is no HBase, then you can use the following calculation:

of containers = min (2*12, 1.8* 12, (48-6)/2) = min (24, 21.6, 21) = 21

RAM-per-container = max (2, (48-6)/21) = max (2, 2) = 2

Table 1.9. Example Value Calculations Without HBase

Configuration	Value Calculation
yarn.nodemanager.resource.memory-mb	= 21 * 2 = 42*1024 MB
yarn.scheduler.minimum-allocation-mb	= 2*1024 MB
yarn.scheduler.maximum-allocation-mb	= 21 * 2 = 42*1024 MB
mapreduce.map.memory.mb	= 2*1024 MB
mapreduce.reduce.memory.mb	= 2 * 2 = 4*1024 MB
mapreduce.map.java.opts	= 0.8 * 2 = 1.6*1024 MB
mapreduce.reduce.java.opts	= 0.8 * 2 * 2 = 3.2*1024 MB
yarn.app.mapreduce.am.resource.mb	= 2 * 2 = 4*1024 MB
yarn.app.mapreduce.am.command-opts	= 0.8 * 2 * 2 = 3.2*1024 MB

If HBase is included:

of containers = min (2*12, 1.8* 12, (48-6-8)/2) = min (24, 21.6, 17) = 17

RAM-per-container = max (2, (48-6-8)/17) = max (2, 2) = 2

Table 1.10. Example Value Calculations with HBase

Configuration	Value Calculation
yarn.nodemanager.resource.memory-mb	= 17 * 2 = 34*1024 MB
yarn.scheduler.minimum-allocation-mb	= 2*1024 MB
yarn.scheduler.maximum-allocation-mb	= 17 * 2 = 34*1024 MB
mapreduce.map.memory.mb	= 2*1024 MB
mapreduce.reduce.memory.mb	= 2 * 2 = 4*1024 MB
mapreduce.map.java.opts	= 0.8 * 2 = 1.6*1024 MB
mapreduce.reduce.java.opts	= 0.8 * 2 * 2 = 3.2*1024 MB
yarn.app.mapreduce.am.resource.mb	= 2 * 2 = 4*1024 MB
yarn.app.mapreduce.am.command-opts	= 0.8 * 2 * 2 = 3.2*1024 MB

Notes:

- Updating values for yarn.scheduler.minimum-allocation-mb without also changing yarn.nodemanager.resource.memory-mb, or changing yarn.nodemanager.resource.memory-mb without also changing yarn.scheduler.minimum-allocation-mb changes the number of containers per node.
- If your installation has a large amount of RAM but not many disks or cores, you can free RAM for other tasks by lowering both yarn.scheduler.minimum-allocation-mb and yarn.nodemanager.resource.memory-mb.
- With MapReduce on YARN, there are no longer preconfigured static slots for Map and Reduce tasks.

The entire cluster is available for dynamic resource allocation of Map and Reduce tasks as needed by each job. In the previous example cluster, with the previous configurations, YARN is able to allocate up to 10 Mappers (40/4) or 5 Reducers (40/8) on each node (or some other combination of Mappers and Reducers within the 40 GB per node limit).

1.11. Configuring NameNode Heap Size

NameNode heap size depends on many factors, such as the number of files, the number of blocks, and the load on the system. The following table provides recommendations for NameNode heap size configuration. These settings should work for typical Hadoop clusters in which the number of blocks is very close to the number of files (generally, the average ratio of number of blocks per file in a system is 1.1 to 1.2).

Some clusters might require further tweaking of the following settings. Also, it is generally better to set the total Java heap to a higher value.

Table 1.11. Recommended NameNode Heap Size Settings

Number of Files , in Millions	Total Java Heap (Xmx and Xms)	Young Generation Size (-XX:NewSize -XX:MaxNewSize)
< 1 million files	1126m	128m
1-5 million files	3379m	512m
5-10	5913m	768m
10-20	10982m	1280m
20-30	16332m	2048m
30-40	21401m	2560m
40-50	26752m	3072m
50-70	36889m	4352m
70-100	52659m	6144m
100-125	65612m	7680m
125-150	78566m	8960m
150-200	104473m	8960m



Note

Hortonworks recommends a maximum of 300 million files on the NameNode.

You should also set `-XX:PermSize` to 128m and `-XX:MaxPermSize` to 256m.

Following are the recommended settings for `HADOOP_NAMENODE_OPTS` in the `hadoop-env.sh` file (replacing the `#####` placeholder for `-XX:NewSize`, `-XX:MaxNewSize`, `-Xms`, and `-Xmx` with the recommended values from the table):

```
-server -XX:ParallelGCThreads=8 -XX:+UseConcMarkSweepGC -XX:ErrorFile=/var/
log/hadoop/$USER/hs_err_pid%p.log -XX:NewSize=##### -XX:MaxNewSize=##### -
Xms##### -Xmx##### -XX:PermSize=128m -XX:MaxPermSize=256m -Xloggc:/var/log/
hadoop/$USER/gc.log-`date +%Y%m%d%H%M` -verbose:gc -XX:+PrintGCDetails -XX:
+PrintGCTimeStamps -XX:+PrintGCDateStamps -Dhadoop.security.logger=INFO,DRFAS
-Dhdfs.audit.logger=INFO,DRFAUDIT ${HADOOP_NAMENODE_OPTS}
```

If the cluster uses a secondary NameNode, you should also set `HADOOP_SECONDARYNAMENODE_OPTS` to `HADOOP_NAMENODE_OPTS` in the `hadoop-env.sh` file:

```
HADOOP_SECONDARYNAMENODE_OPTS=$HADOOP_NAMENODE_OPTS
```

Another useful `HADOOP_NAMENODE_OPTS` setting is `-XX:+HeapDumpOnOutOfMemoryError`. This option specifies that a heap dump should be

executed when an out-of-memory error occurs. You should also use `-XX:HeapDumpPath` to specify the location for the heap dump file:

```
-XX:+HeapDumpOnOutOfMemoryError -XX:HeapDumpPath=./etc/heapdump.hprof
```

1.12. Allocating Adequate Log Space for HDP

Logs are an important part of managing and operating your HDP cluster. The directories and disks that you assign for logging in HDP must have enough space to maintain logs during HDP operations. Allocate at least 10 GB of free space for any disk you want to use for HDP logging.

1.13. Downloading the HDP Maven Artifacts

The Hortonworks Release Engineering team hosts all the released HDP maven artifacts at <http://repo.hortonworks.com/content/repositories/releases/>.

Other than the release artifacts, some non-Hortonworks artifacts are necessary for building the HDP stack. These third-party artifacts are hosted in the Hortonworks nexus repository:

<http://repo.hortonworks.com/content/repositories/jetty-hadoop/>

and

<http://repo.hortonworks.com/content/repositories/re-hosted/>

If developers want to develop an application against the HDP stack, and they also have a maven repository manager in-house, then they can proxy these three repositories and continue referring to the internal maven groups repo.

If developers do not have access to their in-house maven repos, they can directly use the Hortonworks groups repo.

2. Installing Apache ZooKeeper

This section describes installing and testing Apache ZooKeeper, a centralized tool for providing services to highly distributed systems.



Note

HDFS and YARN depend on ZooKeeper, so install ZooKeeper first.

1. [Install the ZooKeeper Package \[34\]](#)
2. [Securing ZooKeeper with Kerberos \(optional\) \[34\]](#)
3. [Securing ZooKeeper Access \[35\]](#)
4. [Set Directories and Permissions \[37\]](#)
5. [Set Up the Configuration Files \[38\]](#)
6. [Start ZooKeeper \[39\]](#)

2.1. Install the ZooKeeper Package



Note

In a production environment, Hortonworks recommends installing ZooKeeper server on three (or a higher odd number) nodes to ensure that ZooKeeper service is available.

On all nodes of the cluster that you have identified as ZooKeeper servers, type:

- For RHEL/CentOS/Oracle Linux

```
yum install zookeeper-server
```

- For SLES

```
zypper install zookeeper
```

- For Ubuntu and Debian:

```
apt-get install zookeeper
```



Note

Grant the zookeeper user shell access on Ubuntu and Debian.

```
usermod -s /bin/bash zookeeper
```

2.2. Securing ZooKeeper with Kerberos (optional)

(Optional) To secure ZooKeeper with Kerberos, perform the following steps on the host that runs KDC (Kerberos Key Distribution Center):

1. Start the `kadmin.local` utility:

```
/usr/sbin/kadmin.local
```

2. Create a principal for ZooKeeper:

```
sudo kadmin.local -q 'addprinc zookeeper/  
<ZOOKEEPER_HOSTNAME>@STORM.EXAMPLE.COM'
```

3. Create a keytab for ZooKeeper:

```
sudo kadmin.local -q "ktadd -k /tmp/zk.keytab zookeeper/  
<ZOOKEEPER_HOSTNAME>@STORM.EXAMPLE.COM"
```

4. Copy the keytab to all ZooKeeper nodes in the cluster.



Note

Verify that only the ZooKeeper and Storm operating system users can access the ZooKeeper keytab.

5. Administrators must add the following properties to the `zoo.cfg` configuration file located at `/etc/zookeeper/conf`:

```
authProvider.1 = org.apache.zookeeper.server.auth.SASLAuthenticationProvider  
kerberos.removeHostFromPrincipal = true  
kerberos.removeRealmFromPrincipal = true
```



Note

Grant the zookeeper user shell access on Ubuntu and Debian.

```
usermod -s /bin/bash zookeeper
```

2.3. Securing ZooKeeper Access

The default value of `yarn.resourcemanager.zk-acl` allows anyone to have full access to the znode. Hortonworks recommends that you modify this permission to restrict access by performing the steps in the following sections.

- [ZooKeeper Configuration \[35\]](#)
- [YARN Configuration \[36\]](#)
- [HDFS Configuration \[37\]](#)

2.3.1. ZooKeeper Configuration



Note

The steps in this section only need to be performed once for the HDP cluster. If this task has been done to secure HBase for example, then there is no need

to repeat these ZooKeeper steps if the YARN cluster uses the same ZooKeeper server.

1. Create a keytab for ZooKeeper called `zookeeper.service.keytab` and save it to `/etc/security/keytabs`.

```
sudo kadmin.local -q "ktadd -k /tmp/zk.keytab zookeeper/
<ZOOKEEPER_HOSTNAME>@STORM.EXAMPLE.COM"
```

2. Add the following to the `zoo.cfg` file:

```
authProvider.1=org.apache.zookeeper.server.auth.SASLAuthenticationProvider
jaasLoginRenew=3600000
kerberos.removeHostFromPrincipal=true
kerberos.removeRealmFromPrincipal=true
```

3. Create the `zookeeper_client_jaas.conf` file.

```
Client {
com.sun.security.auth.module.Krb5LoginModule required
useKeyTab=false
useTicketCache=true;
};
```

4. Create the `zookeeper_jaas.conf` file.

```
Server {
com.sun.security.auth.module.Krb5LoginModule required
useKeyTab=true
storeKey=true
useTicketCache=false
keyTab="$PATH_TO_ZOOKEEPER_KEYTAB"
(such as "/etc/security/keytabs/zookeeper.service.keytab")
principal="zookeeper/$HOST";
(such as "zookeeper/xuan-sec-yarn-ha-2.novalocal@SCL42.HORTONWORKS.COM");
};
```

5. Add the following information to `zookeeper-env-sh`:

```
export CLIENT_JVMFLAGS="-Djava.security.auth.login.config=/etc/zookeeper/
conf/zookeeper_client_jaas.conf"
export SERVER_JVMFLAGS="-Xmx1024m
-Djava.security.auth.login.config=/etc/zookeeper/conf/zookeeper_jaas.conf"
```

2.3.2. YARN Configuration



Note

The following steps must be performed on all nodes that launch the ResourceManager.

1. Create a new configuration file called `yarn_jaas.conf` in the directory that contains the Hadoop Core configurations (typically, `/etc/hadoop/conf`).

```
Client {
com.sun.security.auth.module.Krb5LoginModule required
useKeyTab=true
storeKey=true
```

```

useTicketCache=false
keyTab="$PATH_TO_RM_KEYTAB"
(such as "/etc/security/keytabs/rm.service.keytab")
principal="rm/$HOST";
(such as "rm/xuan-sec-yarn-ha-1.novalocal@EXAMPLE.COM");
};

```

2. Add a new property to the `yarn-site.xml` file.

```

<property>
<name>yarn.resourcemanager.zk-acl</name>
<value>sasl:rm:rwcd</value>
</property>

```



Note

Because `yarn-resourcemanager.zk-acl` is set to `sasl`, you do not need to set any value for `yarn.resourcemanager.zk-auth`. Setting the value to `sasl` also means that you cannot run the command `addauth<scheme><auth>` in the `zkclient` CLI.

3. Add a new `YARN_OPTS` to the `yarn-env.sh` file and make sure this `YARN_OPTS` is picked up when you start your ResourceManagers.

```

YARN_OPTS="$YARN_OPTS -Dzookeeper.sasl.client=true
-Dzookeeper.sasl.client.username=zookeeper
-Djava.security.auth.login.config=/etc/hadoop/conf/yarn_jaas.conf
-Dzookeeper.sasl.clientconfig=Client"

```

2.3.3. HDFS Configuration

1. In the `hdfs-site.xml` file, set the following property, for security of ZooKeeper based fail-over controller. when NameNode HA is enabled:

```

<property>
  <name>ha.zookeeper.acl</name>
  <value>sasl:nn:rwcd</value>
</property>

```

2.4. Set Directories and Permissions

Create directories and configure ownership and permissions on the appropriate hosts as described below. If any of these directories already exist, we recommend deleting and recreating them.

Hortonworks provides a set of configuration files that represent a working ZooKeeper configuration. (See [Download Companion Files.](#)) You can use these files as a reference point, however, you need to modify them to match your own cluster environment.

If you choose to use the provided configuration files to set up your ZooKeeper environment, complete the following steps to create the appropriate directories.

1. Execute the following commands on all nodes:

```

mkdir -p $ZOOKEEPER_LOG_DIR;

```

```
chown -R $ZOOKEEPER_USER:$HADOOP_GROUP $ZOOKEEPER_LOG_DIR;
chmod -R 755 $ZOOKEEPER_LOG_DIR;

mkdir -p $ZOOKEEPER_PID_DIR;
chown -R $ZOOKEEPER_USER:$HADOOP_GROUP $ZOOKEEPER_PID_DIR;
chmod -R 755 $ZOOKEEPER_PID_DIR;

mkdir -p $ZOOKEEPER_DATA_DIR;
chmod -R 755 $ZOOKEEPER_DATA_DIR;
chown -R $ZOOKEEPER_USER:$HADOOP_GROUP $ZOOKEEPER_DATA_DIR
```

where:

- `$ZOOKEEPER_USER` is the user owning the ZooKeeper services. For example, `zookeeper`.
 - `$ZOOKEEPER_LOG_DIR` is the directory to store the ZooKeeper logs. For example, `/var/log/zookeeper`.
 - `$ZOOKEEPER_PID_DIR` is the directory to store the ZooKeeper process ID. For example, `/var/run/zookeeper`.
 - `$ZOOKEEPER_DATA_DIR` is the directory where ZooKeeper stores data. For example, `/grid/hadoop/zookeeper/data`.
2. Initialize the ZooKeeper data directories with the 'myid' file. Create one file per ZooKeeper server, and put the number of that server in each file:

```
vi $ZOOKEEPER_DATA_DIR/myid
```

- In the myid file on the first server, enter the corresponding number: **1**
- In the myid file on the second server, enter the corresponding number: **2**
- In the myid file on the third server, enter the corresponding number: **3**

2.5. Set Up the Configuration Files

You must set up several configuration files for ZooKeeper. Hortonworks provides a set of configuration files that represent a working ZooKeeper configuration. (See [Download Companion Files](#). You can use these files as a reference point, however, you need to modify them to match your own cluster environment.

If you choose to use the provided configuration files to set up your ZooKeeper environment, complete the following steps:

1. Extract the ZooKeeper configuration files to a temporary directory.

The files are located in the `configuration_files/zookeeper` directories where you decompressed the companion files.

2. Modify the configuration files.

In the respective temporary directories, locate the `zookeeper-env.sh` file and modify the properties based on your environment including the JDK version you downloaded.

3. Edit the `zookeeper-env.sh` file to match the Java home directory, ZooKeeper log directory, ZooKeeper PID directory in your cluster environment and the directories you set up above.

See below for an example configuration:

4. Edit the `zoo.cfg` file to match your cluster environment. Below is an example of a typical `zoo.cfg` file:

```
dataDir=$zk.data.directory.path
server.1=$zk.server1.full.hostname:2888:3888
server.2=$zk.server2.full.hostname:2888:3888
server.3=$zk.server3.full.hostname:2888:3888
```

5. Copy the configuration files.

- On all hosts create the config directory:

```
rm -r $ZOOKEEPER_CONF_DIR ;
mkdir -p $ZOOKEEPER_CONF_DIR ;
```

- Copy all the ZooKeeper configuration files to the `$ZOOKEEPER_CONF_DIR` directory.
- Set appropriate permissions:

```
chmod a+x $ZOOKEEPER_CONF_DIR/ ;
chown -R $ZOOKEEPER_USER:$HADOOP_GROUP $ZOOKEEPER_CONF_DIR/./ ;
chmod -R 755 $ZOOKEEPER_CONF_DIR/./
```

Note:

- `$ZOOKEEPER_CONF_DIR` is the directory to store the ZooKeeper configuration files. For example, `/etc/zookeeper/conf`.
- `$ZOOKEEPER_USER` is the user owning the ZooKeeper services. For example, `zookeeper`.

2.6. Start ZooKeeper

To install and configure HBase and other Hadoop ecosystem components, you must start the ZooKeeper service and the ZKFC:

```
sudo -E -u zookeeper bash -c "export ZOOCFGDIR=$ZOOKEEPER_CONF_DIR ; export
ZOOCFG=zoo.cfg;
    source $ZOOKEEPER_CONF_DIR/zookeeper-env.sh ; $ZOOKEEPER_HOME/bin/
zkServer.sh
    start"
```

For example:

3. Installing HDFS, YARN, and MapReduce

This section describes how to install the Hadoop Core components, HDFS, YARN, and MapReduce.

Complete the following instructions to install Hadoop Core components:

1. [Set Default File and Directory Permissions \[40\]](#)
2. [Install the Hadoop Packages \[40\]](#)
3. [Install Compression Libraries \[41\]](#)
4. [Create Directories \[41\]](#)

3.1. Set Default File and Directory Permissions

Set the default operating system file and directory permissions to 0022 (022).

Use the `umask` command to confirm that the permissions are set as necessary. For example, to see what the current `umask` setting are, enter:

```
umask
```

If you want to set a default `umask` for all users of the OS, edit the `/etc/profile` file, or other appropriate file for system-wide shell configuration.

Ensure that the `umask` is set for all terminal sessions that you use during installation.

3.2. Install the Hadoop Packages

Execute the following command on all cluster nodes.

- For RHEL/CentOS/Oracle Linux:

```
yum install hadoop hadoop-hdfs hadoop-libhdfs hadoop-yarn hadoop-  
mapreduce hadoop-client openssl
```

- For SLES:

```
zypper install hadoop hadoop-hdfs hadoop-libhdfs hadoop-yarn  
hadoop- mapreduce hadoop-client openssl
```

- For Ubuntu/Debian:

```
apt-get install hadoop hadoop-hdfs libhdfs0 hadoop-yarn hadoop-  
mapreduce hadoop-client openssl
```

3.3. Install Compression Libraries

Make the following compression libraries available on all the cluster nodes.

3.3.1. Install Snappy

Install Snappy on all the nodes in your cluster. At each node:

- For RHEL/CentOS/Oracle Linux:

```
yum install snappy snappy-devel
```

- For SLES:

```
zypper install snappy snappy-devel
```

- For Ubuntu/Debian:

```
apt-get install libsnappy1 libsnappy-dev
```

3.3.2. Install LZO

Execute the following command at all the nodes in your cluster:

- RHEL/CentOS/Oracle Linux:

```
yum install lzo lzo-devel hadoopplzo hadoopplzo-native
```

- For SLES:

```
zypper install lzo lzo-devel hadoopplzo hadoopplzo-native
```

- For Ubuntu/Debian:

```
apt-get install liblzo2-2 liblzo2-dev hadoopplzo
```

3.4. Create Directories

Create directories and configure ownership + permissions on the appropriate hosts as described below.

Before you begin:

- If any of these directories already exist, we recommend deleting and recreating them.
- Hortonworks provides a set of configuration files that represent a working ZooKeeper configuration. (See [Download Companion Files](#). You can use these files as a reference point, however, you need to modify them to match your own cluster environment.

Use the following instructions to create appropriate directories:

1. [Create the NameNode Directories \[42\]](#)

2. [Create the SecondaryNameNode Directories \[42\]](#)
3. [Create DataNode and YARN NodeManager Local Directories \[42\]](#)
4. [Create the Log and PID Directories \[43\]](#)
5. [Symlink Directories with hdp-select \[45\]](#)

3.4.1. Create the NameNode Directories

On the node that hosts the NameNode service, execute the following commands:

```
mkdir -p $DFS_NAME_DIR;
chown -R $HDFS_USER:$HADOOP_GROUP $DFS_NAME_DIR;
chmod -R 755 $DFS_NAME_DIR;
```

Where:

- `$DFS_NAME_DIR` is the space separated list of directories where NameNode stores the file system image. For example, `/grid/hadoop/hdfs/nn /grid1/hadoop/hdfs/nn`.
- `$HDFS_USER` is the user owning the HDFS services. For example, `hdfs`.
- `$HADOOP_GROUP` is a common group shared by services. For example, `hadoop`.

3.4.2. Create the SecondaryNameNode Directories

On all the nodes that can potentially run the SecondaryNameNode service, execute the following commands:

```
mkdir -p $FS_CHECKPOINT_DIR;
chown -R $HDFS_USER:$HADOOP_GROUP $FS_CHECKPOINT_DIR;
chmod -R 755 $FS_CHECKPOINT_DIR;
```

where:

- `$FS_CHECKPOINT_DIR` is the space-separated list of directories where SecondaryNameNode should store the checkpoint image. For example, `/grid/hadoop/hdfs/snn /grid1/hadoop/hdfs/snn /grid2/hadoop/hdfs/snn`.
- `$HDFS_USER` is the user owning the HDFS services. For example, `hdfs`.
- `$HADOOP_GROUP` is a common group shared by services. For example, `hadoop`.

3.4.3. Create DataNode and YARN NodeManager Local Directories

At each DataNode, execute the following commands:

```
mkdir -p $DFS_DATA_DIR;
chown -R $HDFS_USER:$HADOOP_GROUP $DFS_DATA_DIR;
chmod -R 750 $DFS_DATA_DIR;
```

where:

- `$DFS_DATA_DIR` is the space-separated list of directories where DataNodes should store the blocks. For example, `/grid/hadoop/hdfs/dn /grid1/hadoop/hdfs/dn /grid2/hadoop/hdfs/dn`.
- `$HDFS_USER` is the user owning the HDFS services. For example, `hdfs`.
- `$HADOOP_GROUP` is a common group shared by services. For example, `hadoop`.

At each ResourceManager and all DataNodes, execute the following commands:

```
mkdir -p $YARN_LOCAL_DIR;
chown -R $YARN_USER:$HADOOP_GROUP $YARN_LOCAL_DIR;
chmod -R 755 $YARN_LOCAL_DIR;
```

where:

- `$YARN_LOCAL_DIR` is the space separated list of directories where YARN should store container log data. For example, `/grid/hadoop/yarn/local /grid1/hadoop/yarn/local /grid2/hadoop/yarn/local`.
- `$YARN_USER` is the user owning the YARN services. For example, `yarn`.
- `$HADOOP_GROUP` is a common group shared by services. For example, `hadoop`.

At each ResourceManager and all DataNodes, execute the following commands:

```
mkdir -p $YARN_LOCAL_LOG_DIR;
chown -R $YARN_USER:$HADOOP_GROUP $YARN_LOCAL_LOG_DIR;
chmod -R 755 $YARN_LOCAL_LOG_DIR;
```

where:

- `$YARN_LOCAL_LOG_DIR` is the space-separated list of directories where YARN should store temporary data. For example, `/grid/hadoop/yarn/logs /grid1/hadoop/yarn/logs /grid2/hadoop/yarn/logs`.
- `$YARN_USER` is the user owning the YARN services. For example, `yarn`.
- `$HADOOP_GROUP` is a common group shared by services. For example, `hadoop`.

3.4.4. Create the Log and PID Directories

Each ZooKeeper service requires a log and PID directory. In this section, you create directories for each service. If you choose to use the companion file scripts, these environment variables are already defined and you can copy and paste the examples into your terminal window.

3.4.4.1. HDFS Logs

At all nodes, execute the following commands:

```
mkdir -p $HDFS_LOG_DIR;
chown -R $HDFS_USER:$HADOOP_GROUP $HDFS_LOG_DIR;
chmod -R 755 $HDFS_LOG_DIR;
```

where:

- `$HDFS_LOG_DIR` is the directory for storing the HDFS logs.

This directory name is a combination of a directory and the `$HDFS_USER`. For example, `/var/log/hadoop/hdfs`, where `hdfs` is the `$HDFS_USER`.

- `$HDFS_USER` is the user owning the HDFS services. For example, `hdfs`.
- `$HADOOP_GROUP` is a common group shared by services. For example, `hadoop`.

3.4.4.2. Yarn Logs

At all nodes, execute the following commands:

```
mkdir -p $YARN_LOG_DIR;
chown -R $YARN_USER:$HADOOP_GROUP $YARN_LOG_DIR;
chmod -R 755 $YARN_LOG_DIR;
```

where:

- `$YARN_LOG_DIR` is the directory for storing the YARN logs.

This directory name is a combination of a directory and the `$YARN_USER`. For example, `/var/log/hadoop/yarn`, where `yarn` is the `$YARN_USER`.

- `$YARN_USER` is the user owning the YARN services. For example, `yarn`.
- `$HADOOP_GROUP` is a common group shared by services. For example, `hadoop`.

3.4.4.3. HDFS Process

At all nodes, execute the following commands:

```
mkdir -p $HDFS_PID_DIR;
chown -R $HDFS_USER:$HADOOP_GROUP $HDFS_PID_DIR;
chmod -R 755 $HDFS_PID_DIR;
```

where:

- `$HDFS_PID_DIR` is the directory for storing the HDFS process ID.

This directory name is a combination of a directory and the `$HDFS_USER`. For example, `/var/run/hadoop/hdfs` where `hdfs` is the `$HDFS_USER`.

- `$HDFS_USER` is the user owning the HDFS services. For example, `hdfs`.
- `$HADOOP_GROUP` is a common group shared by services. For example, `hadoop`.

3.4.4.4. Yarn Process ID

At all nodes, execute the following commands:

```
mkdir -p $YARN_PID_DIR;
chown -R $YARN_USER:$HADOOP_GROUP $YARN_PID_DIR;
chmod -R 755 $YARN_PID_DIR;
```

where:

- `$YARN_PID_DIR` is the directory for storing the YARN process ID.

This directory name is a combination of a directory and the `$YARN_USER`. For example, `/var/run/hadoop/yarn` where `yarn` is the `$YARN_USER`.

- `$YARN_USER` is the user owning the YARN services. For example, `yarn`.
- `$HADOOP_GROUP` is a common group shared by services. For example, `hadoop`.

3.4.4.5. JobHistory Server Logs

At all nodes, execute the following commands:

```
mkdir -p $MAPRED_LOG_DIR;
chown -R $MAPRED_USER:$HADOOP_GROUP $MAPRED_LOG_DIR;
chmod -R 755 $MAPRED_LOG_DIR;
```

where:

- `$MAPRED_LOG_DIR` is the directory for storing the JobHistory Server logs.

This directory name is a combination of a directory and the `$MAPRED_USER`. For example, `/var/log/hadoop/mapred` where `mapred` is the `$MAPRED_USER`.

- `$MAPRED_USER` is the user owning the MAPRED services. For example, `mapred`.
- `$HADOOP_GROUP` is a common group shared by services. For example, `hadoop`.

3.4.4.6. JobHistory Server Process ID

At all nodes, execute the following commands:

```
mkdir -p $MAPRED_PID_DIR;
chown -R $MAPRED_USER:$HADOOP_GROUP $MAPRED_PID_DIR;
chmod -R 755 $MAPRED_PID_DIR;
```

where:

- `$MAPRED_PID_DIR` is the directory for storing the JobHistory Server process ID.

This directory name is a combination of a directory and the `$MAPRED_USER`. For example, `/var/run/hadoop/mapred` where `mapred` is the `$MAPRED_USER`.

- `$MAPRED_USER` is the user owning the MAPRED services. For example, `mapred`.
- `$HADOOP_GROUP` is a common group shared by services. For example, `hadoop`.

3.4.5. Symlink Directories with hdp-select



Important

HDP 2.6.0 installs `hdp-select` automatically with the installation or upgrade of the first HDP component.

To prevent version-specific directory issues for your scripts and updates, Hortonworks provides `hdp-select`, a script that symlinks directories to `hdp-current` and modifies paths for configuration directories.

Determine the version number of the `hdp-select` installed package:

```
yum list | grep hdp (on Cent OS6)
```

```
rpm -q -a | grep hdp (on Cent OS7)
```

```
dpkg -l | grep hdp (on Ubuntu)
```

For example:

```
/usr/bin/hdp-select set all 2.6.0.0-<$BUILD>
```

Run `hdp-select set all` on the NameNode and on all DataNodes. If YARN is deployed separately, also run `hdp-select` on the Resource Manager and all Node Managers.

```
hdp-select set all 2.6.0.0-<$BUILD>
```

4. Setting Up the Hadoop Configuration

This section describes how to set up and edit the deployment configuration files for HDFS and MapReduce.

You must be set up several configuration files for HDFS and MapReduce. Hortonworks provides a set of configuration files that represent a working HDFS and MapReduce configuration. (See [Download Companion Files](#).) You can use these files as a reference point, however, you need to modify them to match your own cluster environment.

If you choose to use the provided configuration files to set up your HDFS and MapReduce environment, complete the following steps:

1. Extract the core Hadoop configuration files to a temporary directory.

The files are located in the `configuration_files/core_hadoop` directory where you decompressed the companion files.

2. Modify the configuration files.

In the temporary directory, locate the following files and modify the properties based on your environment.

Search for TODO in the files for the properties to replace. For further information, see "Define Environment Parameters" in this guide.

- Edit `core-site.xml` and modify the following properties:

```
<property>
  <name>fs.defaultFS</name>
  <value>hdfs://$namenode.full.hostname:8020</value>
  <description>Enter your NameNode hostname</description>
</property>

<property>
  <name>hdp.version</name>
  <value>${hdp.version}</value>
  <description>Replace with the actual HDP version</description>
</property>
```

- Edit `hdfs-site.xml` and modify the following properties:

```
<property>
  <name>dfs.namenode.name.dir</name>
  <value>/grid/hadoop/hdfs/nn,/grid1/hadoop/hdfs/nn</value>
  <description>Comma-separated list of paths. Use the list of
  directories from $DFS_NAME_DIR. For example, /grid/hadoop/hdfs/nn,/grid1/
  hadoop/hdfs/nn.</description>
</property>

<property>
  <name>dfs.datanode.data.dir</name>
  <value>file:///grid/hadoop/hdfs/dn, file:///grid1/hadoop/hdfs/dn</
  value>
```



```

    <description>Comma-separated list of paths. Use the list of
    directories from $DFS_DATA_DIR. For example, file:///grid/hadoop/hdfs/dn,
    file:///grid1/ hadoop/hdfs/dn.</description>
</property>

<property>
  <name>dfs.namenode.http-address</name>
  <value>$namenode.full.hostname:50070</value>
  <description>Enter your NameNode hostname for http access.</
description>
</property>

<property>
  <name>dfs.namenode.secondary.http-address</name>
  <value>$secondary.namenode.full.hostname:50090</value>
  <description>Enter your Secondary NameNode hostname.</description>
</property>

<property>
  <name>dfs.namenode.checkpoint.dir</name>
  <value>/grid/hadoop/hdfs/snn,/grid1/hadoop/hdfs/snn,/grid2/hadoop/
hdfs/snn</value>
  <description>A comma-separated list of paths. Use the list of
  directories from $FS_CHECKPOINT_DIR. For example, /grid/hadoop/hdfs/snn,
  sbr/grid1/hadoop/hdfs/ snn,sbr/grid2/hadoop/hdfs/snn </description>
</property>

<property>
  <name>dfs.namenode.checkpoint.edits.dir</name>
  <value>/grid/hadoop/hdfs/snn,/grid1/hadoop/hdfs/snn,/grid2/hadoop/
hdfs/snn</value>
  <description>A comma-separated list of paths. Use the list of
  directories from $FS_CHECKPOINT_DIR. For example, /grid/hadoop/hdfs/snn,
  sbr/grid1/hadoop/hdfs/ snn,sbr/grid2/hadoop/hdfs/snn </description>
</property>

<property>
  <name>dfs.namenode.rpc-address</name>
  <value>namenode_host_name:8020>
  <description>The RPC address that handles all clients requests.</
description>
</property>

<property>
  <name>dfs.namenode.https-address</name>
  <value>namenode_host_name:50470>
  <description>The namenode secure http server address and port.</
description>
</property>

```



Note

The maximum value of the NameNode new generation size (-XX:MaxNewSize) should be 1/8 of the maximum heap size (-Xmx). Ensure that you check the default setting for your environment.

- Edit `yarn-site.xml` and modify the following properties:

```
<property>
  <name>yarn.resourcemanager.scheduler.class</name>
  <value>org.apache.hadoop.yarn.server.resourcemanager.scheduler.
capacity.CapacityScheduler</value>
</property>

<property>
  <name>yarn.resourcemanager.resource-tracker.address</name>
  <value>${resourcemanager.full.hostname}:8025</value>
  <description>Enter your ResourceManager hostname.</description>
</property>

<property>
  <name>yarn.resourcemanager.scheduler.address</name>
  <value>${resourcemanager.full.hostname}:8030</value>
  <description>Enter your ResourceManager hostname.</description>
</property>

<property>
  <name>yarn.resourcemanager.address</name>
  <value>${resourcemanager.full.hostname}:8050</value>
  <description>Enter your ResourceManager hostname.</description>
</property>

<property>
  <name>yarn.resourcemanager.admin.address</name>
  <value>${resourcemanager.full.hostname}:8141</value>
  <description>Enter your ResourceManager hostname.</description>
</property>

<property>
  <name>yarn.nodemanager.local-dirs</name>
  <value>/grid/hadoop/yarn/local,/grid1/hadoop/yarn/local</value>
  <description>Comma separated list of paths. Use the list of
directories from $YARN_LOCAL_DIR.For example, /grid/hadoop/yarn/local,/
grid1/hadoop/yarn/ local.</description>
</property>

<property>
  <name>yarn.nodemanager.log-dirs</name>
  <value>/grid/hadoop/yarn/log</value>
  <description>Use the list of directories from $YARN_LOCAL_LOG_DIR.
For example, /grid/hadoop/yarn/log,/grid1/hadoop/yarn/ log,/grid2/hadoop/
yarn/log</description>
</property>

<property>
  <name>yarn.nodemanager.recovery</name.dir>
  <value>{hadoop.tmp.dir}/yarn-nm-recovery</value>
</property>

<property>
  <name>yarn.log.server.url</name>
  <value>http://${jobhistoryserver.full.hostname}:19888/jobhistory/logs/
</ value>
  <description>URL for job history server</description>
</property>

<property>
```

```

    <name>yarn.resourcemanager.webapp.address</name>
    <value>$resourcemanager.full.hostname:8088</value>
    <description>URL for job history server</description>
  </property>

  <property>
    <name>yarn.timeline-service.webapp.address</name>
    <value><Resource_Manager_full_hostname>:8188</value>
  </property>

```

- Edit `mapred-site.xml` and modify the following properties:

```

<property>
  <name>mapreduce.jobhistory.address</name>
  <value>$jobhistoryserver.full.hostname:10020</value>
  <description>Enter your JobHistoryServer hostname.</description>
</property>

<property>
  <name>mapreduce.jobhistory.webapp.address</name>
  <value>$jobhistoryserver.full.hostname:19888</value>
  <description>Enter your JobHistoryServer hostname.</description>
</property>

```

3. On each node of the cluster, create an empty file named `dfs.exclude` inside `$HADOOP_CONF_DIR`. Append the following to `/etc/profile`:

```

touch $HADOOP_CONF_DIR/dfs.exclude
JAVA_HOME=<java_home_path>
export JAVA_HOME
HADOOP_CONF_DIR=/etc/hadoop/conf/
export HADOOP_CONF_DIR
export PATH=$PATH:$JAVA_HOME:$HADOOP_CONF_DIR

```

4. **Optional:** Configure MapReduce to use Snappy Compression.

To enable Snappy compression for MapReduce jobs, edit `core-site.xml` and `mapred-site.xml`.

- Add the following properties to `mapred-site.xml`:

```

<property>
  <name>mapreduce.admin.map.child.java.opts</name>
  <value>-server -XX:NewRatio=8 -Djava.library.path=/usr/hdp/current/
hadoop/lib/native/ -Djava.net.preferIPv4Stack=true</value>
  <final>true</final>
</property>

<property>
  <name>mapreduce.admin.reduce.child.java.opts</name>
  <value>-server -XX:NewRatio=8 -Djava.library.path=/usr/hdp/current/
hadoop/lib/native/ -Djava.net.preferIPv4Stack=true</value>
  <final>true</final>
</property>

```

- Add the SnappyCodec to the codecs list in `core-site.xml`:

```

<property>
  <name>io.compression.codecs</name>

```

```
<value>org.apache.hadoop.io.compress.GzipCodec,org.apache.hadoop.io.compress.DefaultCodec,org.apache.hadoop.io.compress.SnappyCodec</value>
</property>
```

5. **Optional:** If you are using the `LinuxContainerExecutor`, you must set up `container-executor.cfg` in the `config` directory. The file must be owned by `root:root`. The settings are in the form of `key=value` with one key per line. There must be entries for all keys. If you do not want to assign a value for a key, you can leave it unset in the form of `key=#`.

The keys are defined as follows:

- `yarn.nodemanager.linux-container-executor.group` - the configured value of `yarn.nodemanager.linux-container-executor.group`. This must match the value of `yarn.nodemanager.linux-container-executor.group` in `yarn-site.xml`.
 - `banned.users` - a comma separated list of users who cannot run `container-executor`.
 - `min.user.id` - the minimum value of user id, this is to prevent system users from running `container-executor`.
 - `allowed.system.users` - a comma separated list of allowed system users.
6. Replace the default memory configuration settings in `yarn-site.xml` and `mapred-site.xml` with the YARN and MapReduce memory configuration settings you calculated previously. Fill in the memory/CPU values that match what the documentation or helper scripts suggests for your environment.
7. Copy the configuration files.

- On all hosts in your cluster, create the Hadoop configuration directory:

```
rm -rf $HADOOP_CONF_DIR
mkdir -p $HADOOP_CONF_DIR
```

where `$HADOOP_CONF_DIR` is the directory for storing the Hadoop configuration files. For example, `/etc/hadoop/conf`.

- Copy all the configuration files to `$HADOOP_CONF_DIR`.
- Set the appropriate permissions:

```
chown -R $HDFS_USER:$HADOOP_GROUP $HADOOP_CONF_DIR/./
chmod -R 755 $HADOOP_CONF_DIR/./
```

where:

- `$HDFS_USER` is the user owning the HDFS services. For example, `hdfs`.
- `$HADOOP_GROUP` is a common group shared by services. For example, `hadoop`.

8. Set the Concurrent Mark-Sweep (CMS) Garbage Collector (GC) parameters.

On the NameNode host, open the `etc/hadoop/conf/hadoop-env.sh` file. Locate `export HADOOP_NAMENODE_OPTS=<parameters>` and add the following parameters:

```
-XX:+UseCMSInitiatingOccupancyOnly  
-XX:CMSInitiatingOccupancyFraction=70
```

By default CMS GC uses a set of heuristic rules to trigger garbage collection. This makes garbage collection less predictable and tends to delay collection until the old generation is almost fully occupied. Initiating it in advance allows garbage collection to complete before the old generation is full, and thus avoid Full GC (i.e. a stop-the-world pause).

- `-XX:+UseCMSInitiatingOccupancyOnly` prevents the use of GC heuristics.
- `-XX:CMSInitiatingOccupancyFraction=<percent>` tells the Java VM when CMS should be triggered. Basically, it allows the creation of a buffer in heap, which can be filled with data while CMS is running. This percent should be back-calculated from the speed with which memory is consumed in the old generation during production load. If this percent is set too low, the CMS runs too often; if it is set too high, the CMS is triggered too late and [concurrent mode failure](#) may occur. The recommended setting for `-XX:CMSInitiatingOccupancyFraction` is 70, which means that the application should utilize less than 70% of the old generation.

5. Validating the Core Hadoop Installation

Use the following instructions to start core Hadoop and perform the smoke tests:

1. [Format and Start HDFS \[53\]](#)
2. [Smoke Test HDFS \[53\]](#)
3. [Configure YARN and MapReduce \[54\]](#)
4. [Start YARN \[56\]](#)
5. [Start MapReduce JobHistory Server \[56\]](#)
6. [Smoke Test MapReduce \[57\]](#)

5.1. Format and Start HDFS

1. Modify the JAVA_HOME value in the `hadoop-env.sh` file:

```
export JAVA_HOME=/usr/java/default
```

2. Execute the following commands on the NameNode host machine:

```
su - $HDFS_USER
/usr/hdp/current/hadoop-hdfs-namenode/bin/hdfs namenode -format
/usr/hdp/current/hadoop-client/sbin/hadoop-daemon.sh --config
  $HADOOP_CONF_DIR start namenode
```

3. Execute the following commands on the SecondaryNameNode:

```
su - $HDFS_USER
/usr/hdp/current/hadoop-client/sbin
  /hadoop-daemon.sh --config $HADOOP_CONF_DIR start secondarynamenode
```

4. Execute the following commands on all DataNodes:

```
su - $HDFS_USER
/usr/hdp/current/hadoop-hdfs-datanode/../../hadoop/sbin/hadoop-daemon.sh --
  config $HADOOP_CONF_DIR start datanode
```

Where `$HADOOP_CONF_DIR` is the directory for storing the Hadoop configuration files. For example, `/etc/hadoop/conf`.

Where `$HDFS_USER` is the HDFS user, for example, `hdfs`.

5.2. Smoke Test HDFS

1. Determine if you can reach the NameNode server with your browser:

```
http://$namenode.full.hostname:50070
```

2. Create the hdfs user directory in HDFS:

```
su - $HDFS_USER
hdfs dfs -mkdir -p /user/hdfs
```

3. Try copying a file into HDFS and listing that file:

```
su - $HDFS_USER
hdfs dfs -copyFromLocal /etc/passwd passwd
hdfs dfs -ls
```

4. Use the Namenode web UI and the Utilities menu to browse the file system.

5.3. Configure YARN and MapReduce

After you install Hadoop, modify your configs.

1. As the HDFS user, for example 'hdfs', upload the MapReduce tarball to HDFS.

```
su - $HDFS_USER
hdfs dfs -mkdir -p /hdp/apps/<hdp_version>/mapreduce/
hdfs dfs -put /usr/hdp/current/hadoop-client/mapreduce.tar.gz /hdp/apps/
<hdp_version>/mapreduce/
hdfs dfs -chown -R hdfs:hadoop /hdp
hdfs dfs -chmod -R 555 /hdp/apps/<hdp_version>/mapreduce
hdfs dfs -chmod 444 /hdp/apps/<hdp_version>/mapreduce/mapreduce.tar.gz
```

Where \$HDFS_USER is the HDFS user, for example hdfs, and <hdp_version> is the current HDP version, for example 2.6.0.0.

2. Copy mapred-site.xml from the companion files and make the following changes to mapred-site.xml:

- Add:

```
<property>
  <name>mapreduce.admin.map.child.java.opts</name>
  <value>-server -Djava.net.preferIPv4Stack=true -Dhdp.version=${hdp.
version}</value>
  <final>true</final>
</property>
```



Note

You do not need to modify \${hdp.version}.

- Modify the following existing properties to include \${hdp.version}:

```
<property>
  <name>mapreduce.admin.user.env</name>
  <value>LD_LIBRARY_PATH=/usr/hdp/${hdp.version}/hadoop/lib/native:/
usr/hdp/${hdp.version}/hadoop/lib/native/Linux-amd64-64</value>
</property>
```

```
<property>
  <name>mapreduce.application.framework.path</name>
  <value>/hdp/apps/${hdp.version}/mapreduce/mapreduce.tar.gz#mr-
framework</value>
</property>

<property>
<name>mapreduce.application.classpath</name>
<value>${PWD}/mr-framework/hadoop/share/hadoop/mapreduce/*:${PWD}/mr-
framework/hadoop/share/hadoop/mapreduce/lib/*:${PWD}/mr-framework/hadoop/
share/hadoop/common/*:${PWD}/mr-framework/hadoop/share/hadoop/common/lib/
*:${PWD}/mr-framework/hadoop/share/hadoop/yarn/*:${PWD}/mr-framework/hadoop/
share/hadoop/yarn/lib/*:${PWD}/mr-framework/hadoop/share/hadoop/hdfs/*:
${PWD}/mr-framework/hadoop/share/hadoop/hdfs/lib/*:/usr/hdp/${hdp.version}/
hadoop/lib/hadoop-lzo-0.6.0.${hdp.version}.jar:/etc/hadoop/conf/secure</
value>
</property>
```



Note

You do not need to modify `${hdp.version}`.

3. Copy yarn-site.xml from the companion files and modify:

```
<property>
  <name>yarn.application.classpath</name>
  <value>${HADOOP_CONF_DIR},/usr/hdp/${hdp.version}/hadoop-client/*,
/usr/hdp/${hdp.version}/hadoop-client/lib/*,
/usr/hdp/${hdp.version}/hadoop-hdfs-client/*,
/usr/hdp/${hdp.version}/hadoop-hdfs-client/lib/*,
/usr/hdp/${hdp.version}/hadoop-yarn-client/*,
/usr/hdp/${hdp.version}/hadoop-yarn-client/lib/*</value>
</property>
```

4. For secure clusters, you must create and configure the container-executor.cfg configuration file:

- Create the container-executor.cfg file in `/etc/hadoop/conf/`.
- Insert the following properties:

```
yarn.nodemanager.linux-container-executor.group=hadoop
banned.users=hdfs,yarn,mapred
min.user.id=1000
```

- Set the file `/etc/hadoop/conf/container-executor.cfg` file permissions to only be readable by root:

```
chown root:hadoop /etc/hadoop/conf/container-executor.cfg
chmod 400 /etc/hadoop/conf/container-executor.cfg
```

- Set the container-executor program so that only root or hadoop group users can execute it:

```
chown root:hadoop /usr/hdp/${hdp.version}/hadoop-yarn/bin/container-
executor
chmod 6050 /usr/hdp/${hdp.version}/hadoop-yarn/bin/container-executor
```


5.4. Start YARN



Note

To install and configure the Timeline Server see [Configuring the Timeline Server](#).

1. As \$YARN_USER, run the following command from the ResourceManager server:

```
su -l yarn -c "/usr/hdp/current/hadoop-yarn-resourcemanager/sbin/yarn-daemon.sh --config $HADOOP_CONF_DIR start resourcemanager"
```

2. As \$YARN_User, run the following command from all NodeManager nodes:

```
su -l yarn -c "/usr/hdp/current/hadoop-yarn-nodemanager/sbin/yarn-daemon.sh --config $HADOOP_CONF_DIR start nodemanager"
```

where: \$HADOOP_CONF_DIR is the directory for storing the Hadoop configuration files. For example, /etc/hadoop/conf.

5.5. Start MapReduce JobHistory Server

1. Change permissions on the container-executor file.

```
chown -R root:hadoop /usr/hdp/current/hadoop-yarn*/bin/container-executor
chmod -R 6050 /usr/hdp/current/hadoop-yarn*/bin/container-executor
```



Note

If these permissions are not set, the healthcheck script returns an error stating that the DataNode is UNHEALTHY.

2. Execute these commands from the JobHistory server to set up directories on HDFS:

```
su $HDFS_USER
hdfs dfs -mkdir -p /mr-history/tmp
hdfs dfs -mkdir -p /mr-history/done

hdfs dfs -chmod 1777 /mr-history
hdfs dfs -chmod 1777 /mr-history/tmp
hdfs dfs -chmod 1770 /mr-history/done

hdfs dfs -chown $MAPRED_USER:$MAPRED_USER_GROUP /mr-history
hdfs dfs -chown $MAPRED_USER:$MAPRED_USER_GROUP /mr-history/tmp
hdfs dfs -chown $MAPRED_USER:$MAPRED_USER_GROUP /mr-history/done
```

Where

```
$MAPRED_USER : mapred
$MAPRED_USER_GROUP: mapred or hadoop
```

```
hdfs dfs -mkdir -p /app-logs
hdfs dfs -chmod 1777 /app-logs
hdfs dfs -chown $YARN_USER:$HADOOP_GROUP /app-logs
```

Where

```
$YARN_USER : yarn
$HADOOP_GROUP: hadoop
```

3. Run the following command from the JobHistory server:

```
su -l $YARN_USER -c "/usr/hdp/current/hadoop-mapreduce-historyserver/sbin/mr-jobhistory-daemon.sh --config $HADOOP_CONF_DIR start historyserver"
```

`$HADOOP_CONF_DIR` is the directory for storing the Hadoop configuration files. For example, `/etc/hadoop/conf`.

5.6. Smoke Test MapReduce

1. Browse to the ResourceManager:

```
http://$resourcemanager.full.hostname:8088/
```

2. Create a `$CLIENT_USER` in all of the nodes and add it to the `users` group.

```
useradd client  
usermod -a -G users client
```

3. As the `HDFS` user, create a `/user/$CLIENT_USER`.

```
sudo su - $HDFS_USER  
hdfs dfs -mkdir /user/$CLIENT_USER  
hdfs dfs -chown $CLIENT_USER:$CLIENT_USER /user/$CLIENT_USER  
hdfs dfs -chmod -R 755 /user/$CLIENT_USER
```

4. Run the smoke test as the `$CLIENT_USER`. Using Terasort, sort 10GB of data.

```
su - $CLIENT_USER  
/usr/hdp/current/hadoop-client/bin/hadoop jar /usr/hdp/current/hadoop-mapreduce-client/hadoop-mapreduce-examples-*.jar teragen 10000 tmp/teragenout  
/usr/hdp/current/hadoop-client/bin/hadoop jar /usr/hdp/current/hadoop-mapreduce-client/hadoop-mapreduce-examples-*.jar terasort tmp/teragenout  
tmp/terasortout
```

6. Installing Apache HBase

This section describes installing and testing Apache HBase, a distributed, column-oriented database that provides the ability to access and manipulate data randomly in the context of the large blocks that make up HDFS.



Note

You must install and configure ZooKeeper prior to installing HBase. See [Installing ZooKeeper](#).

1. [Install the HBase Package \[58\]](#)
2. [Set Directories and Permissions \[59\]](#)
3. [Set Up the Configuration Files \[59\]](#)
4. [Validate the Installation \[63\]](#)
5. [Starting the HBase Thrift and REST Servers \[63\]](#)

6.1. Install the HBase Package

Prerequisites

1. You must have at least core Hadoop on your system. See [Configure the Remote Repositories](#) for more information.
2. Verify the HDP repositories are available:

```
yum list hbase
```

The output should list at least one HBase package similar to the following:

```
hbase.noarch <$version>
```

If yum responds with "Error: No matching package to list" as shown below, yum cannot locate a matching RPM. This can happen if the repository hosting the HDP RPMs is unavailable, or has been disabled. Follow the instructions at [Configure the Remote Repositories](#) to configure private repository before proceeding.

```
Error: No matching package to list.
```

Installation

On hosts identified as HBase Master/RegionServers, type:

The files are located in the `configuration_files/hbase` directory in the companion files.

- For RHEL/CentOS/Oracle Linux

```
yum install hbase
```

- For SLES

```
zypper install hbase
```

- For Ubuntu

```
apt-get install hbase
```

6.2. Set Directories and Permissions

Create directories and configure ownership and permissions on the appropriate hosts as described below. Hortonworks provides a set of configuration files that represent a working ZooKeeper configuration. (See [Download Companion Files](#). You can use these files as a reference point, however, you need to modify them to match your own cluster environment.

If you choose to use the provided configuration files to set up your ZooKeeper environment, complete the following steps to create the appropriate directories. If any of these directories already exist, we recommend deleting and recreating them.

1. Execute the following commands on all nodes:

```
mkdir -p $HBASE_LOG_DIR;
chown -R $HBASE_USER:$HADOOP_GROUP $HBASE_LOG_DIR;
chmod -R 755 $HBASE_LOG_DIR;

mkdir -p $HBASE_PID_DIR;
chown -R $HBASE_USER:$HADOOP_GROUP $HBASE_PID_DIR;
chmod -R 755 $HBASE_PID_DIR;
```

where:

- \$HBASE_LOG_DIR is the directory to store the HBase logs. For example, `/var/log/hbase`.
- \$HBASE_PID_DIR is the directory to store the HBase process ID. For example, `/var/run/hbase`.
- \$HBASE_USER is the user owning the HBase services. For example, `hbase`.
- \$HADOOP_GROUP is a common group shared by services. For example, `hadoop`.

6.3. Set Up the Configuration Files



Note

To enable Kerberos for clusters with dual home network setting, each HBase RegionServer must have its own key. See [Setting Up Security for Manual Installs](#).

You must set up several configuration files for HBase and ZooKeeper. Hortonworks provides a set of configuration files that represent a working ZooKeeper configuration. (See [Download Companion Files](#)). You can use these files as a reference point, however, you need to modify them to match your own cluster environment.

If you choose to use the provided configuration files to set up your ZooKeeper environment, complete the following steps:

1. Extract the HBase configuration files to a temporary directory.

The files are located in the `configuration_files/hbase` directory in the companion files.

2. Modify the configuration files.

In the respective temporary directories, locate the following files and modify the properties based on your environment.

- Review the `zoo.cfg` file and locate the ZooKeeper servers.

```
dataDir=$zk.data.directory.path
server.1=$zk.server1.full.hostname:2888:3888
server.2=$zk.server2.full.hostname:2888:3888
server.3=$zk.server3.full.hostname:2888:3888
```

- Edit `hbase-site.xml` and modify the following properties:

```
<property>
  <name>hbase.rootdir</name>
  <value>hdfs://$hbase.namenode.full.hostname:8020/apps/hbase/data</value>
  <description>Enter the HBase NameNode server hostname</description>
</property>

<property>
  <name>hbase.zookeeper.quorum</name>
  <value>$zk.server1.full.hostname,$zk.server2.full.hostname,$zk.server3.full.hostname</value>
  <description>Comma separated list of ZooKeeper servers (match to what is specified in zoo.cfg but without portnumbers)</description>
</property>
```

- If you are using a REST server to connect to HBase secured by Kerberos:

- You must also add the following properties to `hbase-site.xml`:

```
<property>
  <name>hbase.rest.authentication.type</name>
  <value>kerberos</value>
  <description>Enter the authentication method for the REST server.</description>
</property>

<property>
  <name>hbase.rest.kerberos.principal</name>
  <value>hbase/_HOST@EXAMPLE.COM</value>
  <description>Enter the Kerberos principal for the REST server to use to interact with HBase.</description>
</property>

<property>
  <name>hbase.rest.keytab.file</name>
  <value>/etc/security/keytabs/hbase.service.keytab</value>
```

```

    <description>Enter the location of the keytab file for the REST
    server to use to interact with HBase.</description>
  </property>

  <property>
    <name>hbase.rest.authentication.kerberos.principal</name>
    <value>HTTP/_HOST@EXAMPLE.COM</value>
    <description>Enter the Kerberos principal for accepting SPNEGO-
    authenticated REST requests.</description>
  </property>

  <property>
    <name>hbase.rest.authentication.kerberos.keytab</name>
    <value>/etc/security/keytabs/spnego.service.keytab</value>
    <description>Enter the location of the keytab file for accepting
    SPNEGO-authenticated REST requests.</description>
  </property>

```



Important

You must set the primary component part of the value for `hbase.rest.authentication.kerberos.principal` to **HTTP**. SPNEGO authentication **requires** that the Kerberos principal's primary component (the first element, up to the forward-slash ("/") or at-symbol ("@") to be **HTTP**.

- After adding these properties to the `hbase-site.xml` file, you must grant HBase permissions to the user specified by the value of the `hbase.rest.kerberos.principal` property:

```
grant '<user-name>', '<permissions>', '<table>' [, '<column-family>' [,
  '<column-qualifier>']]
```

For example, if user = HTTP, permissions = RWXCA, table = sales, and column = 1:

```
grant 'hbase', 'RWXCA', 'sales', '1'
```

- Ensure that the `core-site.xml` file also contains the corresponding proxy user configuration properties for the configured REST server user.

```

<property>
  <name>hadoop.proxyuser.USER.hosts</name>
  <value>*</value>
</property>

<property>
  <name>hadoop.proxyuser.USER.groups</name>
  <value>*</value>
</property>

<property>
  <name>hadoop.proxyuser.USER.users</name>
  <value>*</value>
</property>

```

For example, if user = hbase and we wanted to allow the users `alice` and `bob` to be impersonated only from the REST server host `10.0.0.1`

```

<property>
  <name>hadoop.proxyuser.hbase.hosts</name>
  <value>10.0.0.1</value>
</property>

<property>
  <name>hadoop.proxyuser.hbase.users</name>
  <value>alice,bob</value>
</property>

```

- Edit the `regionservers` file and list all the RegionServers hostnames (separated by newline character) in your environment. For example, see the sample `regionservers` file with hostnames `RegionServer1` through `RegionServer9`. Use full host names (FQDNs).

```

RegionServer1
RegionServer2
RegionServer3
RegionServer4
RegionServer5
RegionServer6
RegionServer7
RegionServer8
RegionServer9

```

3. Copy the configuration files.

- On all hosts create the config directory:

```

rm -r $HBASE_CONF_DIR;
mkdir -p $HBASE_CONF_DIR;

```

- Copy all of the HBase configuration files to the `$HBASE_CONF_DIR`.
- Set appropriate permissions:

```

chmod a+x $HBASE_CONF_DIR/;
chown -R $HBASE_USER:$HADOOP_GROUP $HBASE_CONF_DIR/./;
chmod -R 755 $HBASE_CONF_DIR/./

```

where:

- `$HBASE_CONF_DIR` is the directory to store the HBase configuration files. For example, `/etc/hbase/conf`.
- `$HBASE_USER` is the user owning the HBase services. For example, `hbase`.

4. Review `hbase-site.xml` and `hbase-env.sh`. In the `hbase-env.sh` file, check the Java heap size for HBase master and Region servers (`Xms` and `Xmx` settings in `HBASE_MASTER_OPTS` and `HBASE_REGIONSERVER_OPTS`). Compare the Region server heap size with the recommended HBase memory values listed in Table 1.6 in [Determine HDP Memory Configuration Settings](#).

6.4. Add Configuration Parameters for Bulk Load Support

Follow these steps to configure bulk load support for backup and restore:

1. Register `org.apache.hadoop.hbase.backup.BackupHFileCleaner` through `hbase.master.hfilecleaner.plugins`.

`org.apache.hadoop.hbase.backup.BackupHFileCleaner` is responsible for keeping bulk loaded hfiles so that incremental backup can pick them up.

2. Register `org.apache.hadoop.hbase.backup.BackupObserver` through `hbase.coprocessor.region.classes`.

`org.apache.hadoop.hbase.backup.BackupObserver` is notified when bulk load completes and writes records into `hbase:backup` table.

6.5. Validate the Installation

Use these steps to validate your installation.

1. Start HBase.

- Execute the following command from the HBase Master node:

```
su -l hbase -c "/usr/hdp/current/hbase-master/bin/hbase-daemon.sh start master; sleep 25"
```

- Execute the following command from each HBase Region Server node:

```
su -l hbase -c "/usr/hdp/current/hbase-regionserver/bin/hbase-daemon.sh start regionserver"
```

2. Smoke Test HBase.

From a terminal window, enter:

```
su - $HBASE_USER
hbase shell
```

In the HBase shell, enter the following command:

```
status 'detailed'
```

6.6. Starting the HBase Thrift and REST Servers

Administrators must manually start the Thrift and REST servers for HBase.

Starting the HBase Thrift and REST Servers in the Foreground

Where `<port>` is the service's port, and `<info port>` is the port for the web-ui with information about the service, use the following command to start the HBase Thrift server in the foreground:


```
hbase thrift start -p <port> --infoport <infoport>
```

Where <port> is the service's port, and <info port> is the port for the web-ui with information about the service, use the following command to start the HBase REST server in the foreground:

```
hbase rest start -p <port> --infoport <infoport>
```

Starting the HBase Thrift Server in the Background

Where <port> is the service's port, and <info port> is the port for the web-ui with information about the service, use the following command to start the HBase Thrift server in the background:

```
/usr/hdp/current/hbase-master/bin/hbase-daemon.sh start thrift -p <port> --infoport <infoport>
```

Where <port> is the service's port, and <info port> is the port for the web-ui with information about the service, use the following command to start the HBase REST server in the background:

```
/usr/hdp/current/hbase-master/bin/hbase-daemon.sh start rest -p <port> --infoport <infoport>
```

For additional information, see the Starting and Stopping the REST Server and Thrift API and Filter Language sections of [Apache HBase Reference Guide](#).

7. Installing Apache Phoenix

To install Apache Phoenix, complete the following instructions on all HBase RegionServers and all master nodes.

1. [Installing the Phoenix Package \[65\]](#)
2. [Configuring HBase for Phoenix \[65\]](#)
3. [Configuring Phoenix to Run in a Secure Cluster \[66\]](#)
4. [Validating the Phoenix Installation \[67\]](#)
5. [Troubleshooting Phoenix \[69\]](#)

7.1. Installing the Phoenix Package

Run the following command to install Phoenix:

- RHEL/CentOS/Oracle Linux

```
yum install phoenix
```

- SLES

```
zypper install phoenix
```

- Ubuntu

```
apt-get install phoenix
```

7.2. Configuring HBase for Phoenix

To enable global indexing and local indexing in Phoenix, complete the following steps.

1. Add the following properties to the `hbase-site.xml` file on all HBase nodes, the Master server, and all RegionServers.

- Set `hbase.defaults.for.version.skip` to true:

```
<property>
  <name>hbase.defaults.for.version.skip</name>
  <value>true</value>
</property>
```

- Set `hbase.regionserver.wal.codec` to enable custom Write Ahead Log ("WAL") edits to be written as follows:

```
<property>
  <name>hbase.regionserver.wal.codec</name>
  <value>org.apache.hadoop.hbase.regionserver.wal.IndexedWALEditCodec</value>
```

```
</property>
```

- Set the following properties to prevent deadlocks from occurring during index maintenance for global indexes by ensuring index updates are processed with a higher priority than data updates. The property settings also ensure metadata RPC calls are processed with a higher priority than data RPC calls.

```
<property>
  <name>hbase.region.server.rpc.scheduler.factory.class</name>
  <value>org.apache.hadoop.hbase.ipc.PhoenixRpcSchedulerFactory</value>
  <description>Factory to create the Phoenix RPC Scheduler that uses
  separate queues for index and metadata updates</description>
</property>

<property>
  <name>hbase.rpc.controllerfactory.class</name>
  <value>org.apache.hadoop.hbase.ipc.controller.
  ServerRpcControllerFactory</value>
  <description>Factory to create the Phoenix RPC Scheduler that uses
  separate queues for index and metadata updates</description>
</property>
```

2. To enable user-defined functions, configure the following property in the `hbase-site.xml` file on all HBase nodes.

```
<property>
  <name>phoenix.functions.allowUserDefinedFunctions</name>
  <value>true</value>
  <description>enable UDF functions</description>
</property>
```

3. Restart the HBase Master server and the RegionServers.



Note

Repairing overlap regions inconsistencies using the **hbck** tool can result in a situation where local indexes are inconsistent with the data in the table. If you know the database schema, you can fix this issue by dropping and recreating all local indexes of the table after the **hbck** tool completes its operation. Alternatively, you can rebuild the local indexes using the following ALTER query:

```
ALTER INDEX IF EXISTS index_name ON data_table_name REBUILD
```



Note

During local index creation manual splits and bulk loads fail because they are disabled. Avoid massive data insertion (bulk loads and batch upserts) during local index creation.

7.3. Configuring Phoenix to Run in a Secure Cluster

To configure Phoenix to run in a secure Hadoop cluster, set `HBASE_CONF_PATH` as follows:

```
export HBASE_CONF_PATH=HBASE_CONFIG_DIR:HADOOP_CONFIG_DIR
```

For example:

```
export HBASE_CONF_PATH=/etc/hbase/conf:/etc/hadoop/conf
```

Alternately, you can use the pre-2.2 method:

1. Link the HBase configuration file with the Phoenix libraries:

```
ln -sf <HBASE_CONFIG_DIR>/hbase-site.xml /usr/hdp/current/  
phoenix-client/bin/hbase-site.xml
```

2. Link the Hadoop configuration file with the Phoenix libraries:

```
ln -sf <HADOOP_CONFIG_DIR>/core-site.xml /usr/hdp/current/  
phoenix-client/bin/core-site.xml
```

```
ln -sf <HADOOP_CONFIG_DIR>/hdfs-site.xml /usr/hdp/current/  
phoenix-client/bin/hdfs-site.xml
```



Note

When running the `pssql.py` and `sqlline.py` Phoenix scripts in secure mode, you can safely ignore the following warnings:

```
14/04/19 00:56:24 WARN util.NativeCodeLoader: Unable to  
load native- hadoop library for your platform... using  
builtin-java classes where applicable 14/04/19 00:56:24  
WARN util.DynamicClassLoader: Failed to identify the  
fs of dir hdfs://<HOSTNAME>:8020/apps/hbase/data/lib,  
ignoredjava.io.IOException: No FileSystem for scheme: hdfs
```

7.4. Validating the Phoenix Installation

Validating a Native Phoenix Installation on an Unsecured Cluster

To validate your installation, log in as the `hbase` user, navigate to the Phoenix home directory, and run the following smoke tests:

```
cd /usr/hdp/current/phoenix-client/bin/ ./pssql.py  
localhost:2181:/hbase-unsecure  
/usr/hdp/current/phoenix-client/doc/examples/WEB_STAT.sql  
/usr/hdp/current/phoenix-client/doc/examples/WEB_STAT.csv  
/usr/hdp/current/phoenix-client/doc/examples/WEB_STAT_QUERIES.sql
```

Where `localhost` is your ZooKeeper node.

Validating a Native Phoenix Installation on a Cluster Secured with Kerberos

To validate your installation, log in as the `hbase` user, and perform the following actions:

1. Set the `HBASE_CONF_PATH` for a secured cluster:

```
export HBASE_CONF_PATH=/etc/hbase/conf:/etc/hadoop/conf
```



Note

For more information, see [Configuring Phoenix to Run in a Secure Cluster](#)

2. Obtain a valid Kerberos ticket by running `kinit`. For example:

```
kinit -k -t /etc/security/keytabs/hbase.headless.keytab hbase
```

3. Navigate to the Phoenix home directory, and run the following smoke tests:

```
cd /usr/hdp/current/phoenix-client/bin/ ./psql.py
localhost:2181:/hbase-unsecure
/usr/hdp/current/phoenix-client/doc/examples/WEB_STAT.sql
/usr/hdp/current/phoenix-client/doc/examples/WEB_STAT.csv
/usr/hdp/current/phoenix-client/doc/examples/WEB_STAT_QUERIES.sql
```

Where `localhost` is your ZooKeeper node and you replace `/hbase-unsecure` with your secured ZooKeeper node. Check the value of `zookeeper.znode.parent` in the `hbase-site.xml` configuration file to confirm the directory path.

Validating the JDBC Connection to External Applications

If you are running external applications, it is recommended that you test the connection to HBase using the following connection strings for the Phoenix JDBC driver:

1. Add `hbase-site.xml` and `core-site.xml` to your application or client's class path:

```
set CLASSPATH=<path_to_hbase-site.xml>;<path_to_core-site.xml>
```

2. Depending on whether you have an unsecured cluster or a cluster secured with Kerberos, use one of the following connection strings to connect to HBase.

- **For unsecured clusters:**

```
jdbc:phoenix:<ZooKeeper_host_name>:<port_number>:<root_node>
```

Where `<ZooKeeper_host_name>` can specify one host or several hosts. If you specify several ZooKeeper hosts, insert commas between host names. For example, `<ZK_host1, ZK_host2, ZK_host3>`.

Example:

```
jdbc:phoenix:zk_quorum:2181:zk_parent
```

- **For clusters secured with Kerberos:**

```
jdbc:phoenix:<ZooKeeper_host_name>:<port_number>:<secured_ZooKeeper_node>:<principal_name>
```

Where `<secured_ZooKeeper_node>` is the path to the secured ZooKeeper node, and `<HBase_headless_keytab_file>` is the location of this keytab file.

Example:

```
jdbc:phoenix:zk_quorum:2181:/hbase-secure:hbase@EXAMPLE.COM:/hbase-secure/keytab/keytab_file
```



Note

If any part of the connection string is omitted, the corresponding property value (hbase.zookeeper.quorum, hbase.zookeeper.property.clientPort, or zookeeper.znode.parent) from the hbase-site.xml configuration file is used. 2181 is the default port.

7.5. Troubleshooting Phoenix

You might encounter a runtime exception similar to the following:

```
Exception in thread "main" java.lang.IllegalAccessError: class com.google.protobuf.HBaseZeroCopyByteString cannot access its superclass com.google.protobuf.LiteralByteString
    at java.lang.ClassLoader.defineClass1(Native Method)
    at java.lang.ClassLoader.defineClass(ClassLoader.java:800)
    at java.security.SecureClassLoader.defineClass(SecureClassLoader.java:142)
```

To resolve this issue, place hbase-protocol*.jar immediately after hbase-site.xml in the HADOOP_CLASSPATH environment variable:

```
HADOOP_CLASSPATH=/path/to/hbase-site.xml:/path/to/hbase-protocol.jar
```

8. Installing and Configuring Apache Tez

Apache Tez is an extensible YARN framework that can be used to build high-performance batch and interactive data processing applications. Tez dramatically improves MapReduce processing speed while maintaining its ability to scale to petabytes of data. Tez can also be used by other Hadoop ecosystem components such as Apache Hive and Apache Pig to dramatically improve query performance.

1. [Prerequisites \[70\]](#)
2. [Installing the Tez Package \[70\]](#)
3. [Configuring Tez \[71\]](#)
4. [Creating a New Tez View Instance \[79\]](#)
5. [Validating the Tez Installation \[80\]](#)
6. [Troubleshooting \[80\]](#)

8.1. Prerequisites

Verify that your cluster is upgraded to HDP 2.6.0 or higher before installing Tez.



Note

Please note that the instructions for installing and configuring Tez on HDP 2.6.0 are different than the instructions for Tez on HDP 2.1 and on HDP 2.2.

Hadoop administrators can also install Tez using Ambari, which may reduce installation time by automating the installation across all cluster nodes.

8.2. Installing the Tez Package

On all client/gateway nodes:

1. Install the Tez RPMs on all client/gateway nodes:

- For RHEL/CentOS/Oracle Linux:

```
yum install tez
```

- For SLES:

```
zypper install tez
```

- For Ubuntu or Debian:

```
apt-get install tez
```

2. Execute the following commands from any one of the cluster client nodes to upload the Tez tarball into HDFS:

```
su - $HDFS_USER
```

```

hdfs dfs -mkdir -p /hdp/apps/<hdp_version>/tez/
hdfs dfs -put /usr/hdp/<hdp_version>/tez/lib/tez.tar.gz /hdp/apps/
<hdp_version>/tez/
hdfs dfs -chown -R $HDFS_USER:$HADOOP_USER /hdp
hdfs dfs -chmod -R 555 /hdp/apps/<hdp_version>/tez
hdfs dfs -chmod -R 444 /hdp/apps/<hdp_version>/tez/tez.tar.gz

```

Where:

\$HDFS_USER is the user that owns the HDFS service. For example, hdfs. <hdp_version> is the current HDP version, such as 2.6.0.0.

3. Execute the following command to verify that the files were copied in Step 2:

```

su - $HDFS_USER
hdfs dfs -ls /hdp/apps/<hdp_version>/tez

```

This command returns a message similar to the following:

```

Found 1 items
-r--r--r-- 3 hdfs hadoop 36518223 2015-02-12 15:35 /hdp/apps/2.6.0.0-2800/
tez/tez.tar.gz

```

8.3. Configuring Tez

Perform the following steps to configure Tez for your Hadoop cluster:

1. Create a `tez-site.xml` configuration file and place it in the `/etc/tez/conf` configuration directory. A sample `tez-site.xml` file is included in the `configuration_files/tez` folder in the HDP companion files.
2. In the `tez-site.xml` file, configure the `tez.lib.uris` property with the HDFS path containing the Tez tarball file.

```

...
<property>
  <name>tez.lib.uris</name>
  <value>/hdp/apps/<hdp_version>/tez/tez.tar.gz</value>
</property>
...

```

Where <hdp_version> is the current HDP version, such as 2.6.0.0.

Table 8.1. Tez Configuration Parameters

Configuration Parameter	Description	Default Value
<code>tez.am.acls.enabled</code>	Enables or disables access control list checks on Application Master (AM) and history data.	true
<code>tez.am.am-rm.heartbeat.interval-ms.max</code>	The maximum heartbeat interval between the AM and RM in milliseconds.	250
<code>tez.am.client.am.port-range</code>	Range of ports that the AM can use when binding for client connections. Leave this blank to use all possible ports.	No default setting. The format is a number range. For example, 10000-19999
<code>tez.am.container.idle.release-timeout-max.millis</code>	The maximum amount of time to hold on to a container if no task can be	20000

Configuration Parameter	Description	Default Value
	assigned to it immediately. Only active when reuse is enabled.	
tez.am.container.idle.release-timeout-min.millis	The minimum amount of time to hold on to a container that is idle. Only active when reuse is enabled.	10000
tez.am.container.reuse.enabled	Configuration that specifies whether a container should be reused.	true
tez.am.container.reuse.locality.delay-allocation-millis	The amount of time to wait before assigning a container to the next level of locality. NODE -> RACK -> NON_LOCAL	250
tez.am.container.reuse.non-local-fallback.enabled	Specifies whether to reuse containers for non-local tasks. Active only if reuse is enabled.	false
tez.am.container.reuse.rack-fallback.enabled	Specifies whether to reuse containers for rack local tasks. Active only if reuse is enabled.	true
tez.am.launch.cluster-default.cmd-opts	Note: This property should only be set by administrators – it should not be used by non-administrative users. Cluster default Java options for the Tez AppMaster process. These are prepended to the properties specified with tez.am.launch.cmd-opts.	-server -Djava.net.preferIPv4Stack=true -Dhdp.version=\${hdp.version}
tez.am.launch.cmd-opts	Command line options that are provided during the launch of the Tez AppMaster process. Do not set any Xmx or Xms in these launch options so that Tez can determine them automatically.	-XX:+PrintGCDetails -verbose:gc -XX:+PrintGCTimeStamps -XX:+UseNUMA -XX:+UseParallelGC
tez.am.launch.env	Environment settings for the Tez AppMaster process.	LD_LIBRARY_PATH= \$LD_LIBRARY_PATH: \$HADOOP_COMMON_HOME/lib/ native/
tez.am.log.level	Root logging level passed to the Tez Application Master. Simple configuration: Set the log level for all loggers. For example, set to INFO. This sets the log level to INFO for all loggers. Advanced configuration: Set the log level for all classes, along with a different level for some classes. For example, set to DEBUG;org.apache.hadoop.ipc=INFO;org.apache.hadoop.security=INFO This sets the log level for all loggers to DEBUG, except for org.apache.hadoop.ipc and org.apache.hadoop.security, which are set to INFO. Note: The global log level must always be the first parameter. For example: DEBUG;org.apache.hadoop.ipc=INFO;org.apache.hadoop.security=INFO is valid.	INFO

Configuration Parameter	Description	Default Value
	<code>org.apache.hadoop.ipc=INFO;org.apache.hadoop.security=INFO</code> is <i>not</i> valid.	
<code>tez.am.max.app.attempts</code>	Specifies the total number of times that the app master is re-run in case recovery is triggered.	2
<code>tez.am.maxtaskfailures.per.node</code>	The maximum number of allowed task attempt failures on a node before it gets marked as blacklisted.	10
<code>tez.am.modify-acls</code>	Enables specified users or groups to modify operations on the AM such as submitting DAGs, pre-warming the session, killing DAGs, or shutting down the session. Format: comma-separated list of users, followed by a whitespace, and then a comma-separated list of groups. For example, "lhale,msmith administrators,users"	No default setting
<code>tez.am.resource.cpu.vcores</code>	The number of virtual cores to be used by the AppMaster process. Set this to > 1 if the RM Scheduler is configured to support virtual cores.	1
<code>tez.am.resource.memory.mb</code>	The amount of memory to be used by the AppMaster. Used only if the value is not specified explicitly by the DAG definition.	1536
<code>tez.am.session.min.held-containers</code>	The minimum number of containers that are held in session mode. Not active in non-session mode. Enables an idle session that is not running a DAG to hold on to a minimum number of containers to provide fast response times for the next DAG.	0
<code>tez.am.task.max.failed.attempts</code>	The maximum number that can fail for a particular task before the task fails. This does not count killed attempts. A task failure results in a DAG failure. Must be an integer.	4
<code>tez.am.view-acls</code>	AM view ACLs. This setting enables the specified users or groups to view the status of the AM and all DAGs that run within the AM. Format: a comma-separated list of users, a whitespace, and then a comma-separated list of groups. For example, "lhale,msmith administrators,users"	No default value
<code>tez.cluster.additional.classpath.prefix</code>	Specify additional classpath information to be used for Tez AM and all containers. This is prepended to the classpath before all framework specific components have been specified.	<code>/usr/hdp/\${hdp.version}/hadoop/lib/hadoop-lzo-0.6.0.\${hdp.version}.jar:/etc/hadoop/conf/secure</code>
<code>tez.container.max.java.heap.fraction</code>	A double value. Tez automatically determines the Xmx for the Java virtual machines that are used to run Tez tasks and Application Masters. This is enabled if the Xmx or Xms values have not been specified in the	0.8

Configuration Parameter	Description	Default Value
	launch command options. Automatic Xmx calculation is preferred because Tez can determine the best value based on the actual allocation of memory to tasks in the cluster. The value should be greater than 0 and less than 1.	
tez.counters.max	The number of allowed counters for the executing DAG.	2000
tez.counters.max.groups	The number of allowed counter groups for the executing DAG.	1000
tez.generate.debug.artifacts	Generates debug artifacts such as a text representation of the submitted DAG plan.	false
tez.grouping.max-size	Upper size limit (in bytes) of a grouped split, to avoid generating an excessively large split. Replaces tez.am.grouping.max-size	1073741824 (1 GB)
tez.grouping.min-size	Lower size limit (in bytes) of a grouped split, to avoid generating too many splits.	52428800 (50 MB)
tez.grouping.split-waves	The multiplier for available queue capacity when determining number of tasks for a Vertex. When set to its default value of 1.7 with 100% queue available implies generating a number of tasks roughly equal to 170% of the available containers on the queue.	1.7
tez.history.logging.service.class	The class to be used for logging history data. Set to org.apache.tez.dag.history.logging.ats.ATSHistoryLoggingService to log to ATS. Set to org.apache.tez.dag.history.logging.impl.SimpleHistoryLoggingService to log to the filesystem specified by \${fs.defaultFS}.	org.apache.tez.dag.history.logging.ats.ATSHistoryLoggingService
tez.lib.uris	Comma-delimited list of the location of the Tez libraries which is localized for DAGs. Specifying a single .tar.gz or .tgz assumes that a compressed version of the tez libs is being used. This is uncompressed into a tezlibs directory when running containers, and tezlibs/;tezlibs/lib/ are added to the classpath (after . and .*). If multiple files are specified - files are localized as regular files, contents of directories are localized as regular files (non-recursive).	There is no default value, but it should be set to: /hdp/apps/\${hdp.version}/tez/tez.tar.gz, or the location of the tez tarball on HDFS, or the appropriate distributed filesystem path.
tez.queue.name	This property should not be set in tez-site.xml. Instead, it can be provided on the command line when you are launching a job to determine which YARN queue to submit a job to.	No default setting
tez.runtime.compress	Specifies whether intermediate data should be compressed or not.	true
tez.runtime.compress.codec	The codec to be used if compressing intermediate data. Only applicable if tez.runtime.compress is enabled.	org.apache.hadoop.io.compress.SnappyCodec

Configuration Parameter	Description	Default Value
tez.runtime.io.sort.factor	The number of streams to merge at once while sorting files. This determines the number of open file handles.	10
tez.runtime.io.sort.mb	The size of the sort buffer when output is sorted.	512
tez.runtime.sorter.class	Which sorter implementation to use. Valid values: <ul style="list-style-type: none"> LEGACY PIPELINED <p>The legacy sorter implementation is based on the Hadoop MapReduce shuffle implementation. It is restricted to 2GB memory limits.</p> <p>Pipeline sorter is a more efficient sorter that supports > 2GB sort buffers.</p>	PIPELINED
tez.runtime.sort.spill.percent	The soft limit in the serialization buffer. Once this limit is reached, a thread begins to spill the contents to disk in the background. <p>Note:Collection is not blocked if this threshold is exceeded while a spill is already in progress, so spills can be larger than this threshold when it is set to less than .5</p>	0.8
tez.runtime.unordered.output.buffer.size-mb	The size of the buffer when output is not sorted.	100
tez.session.am.dag.submit.timeout.secs	Time (in seconds) for which the Tez AM should wait for a DAG to be submitted before shutting down.	300
tez.session.client.timeout.secs	Time (in seconds) to wait for AM to come up when trying to submit a DAG from the client.	-1
tez.shuffle-vertex-manager.max-src-fraction	In case of a ScatterGather connection, once this fraction of source tasks have completed, all tasks on the current vertex can be scheduled. Number of tasks ready for scheduling on the current vertex scales linearly between min-fraction and max-fraction.	0.4
tez.shuffle-vertex-manager.min-src-fraction	In case of a ScatterGather connection, the fraction of source tasks which should complete before tasks for the current vertex are scheduled.	0.2
tez.staging-dir	The staging directory used while submitting DAGs.	/tmp/\${user.name}/staging
tez.task.am.heartbeat.counter.interval.ms.max	Time interval at which task counters are sent to the AM.	4000
tez.task.generate.counters.per.io	Sets whether to generate counters per IO or not. Enabling this renames CounterGroups/CounterNames, making them unique per vertex edge instead of unique per vertex.	true

Configuration Parameter	Description	Default Value
tez.task.get-task.sleep.interval-ms.max	Maximum amount of time, in seconds, to wait before a task asks an AM for another task.	200
tez.task.launch.cluster-default.cmd-opts	<p>Note: This property should only be set by administrators – it should not be used by non-administrative users.</p> <p>Cluster default Java options for tasks. These are prepended to the properties specified with tez.task.launch.cmd-opts</p>	-server -Djava.net.preferIPv4Stack=true -Dhdp.version=\${hdp.version}
tez.task.launch.cmd-opts	Java options for tasks. The Xmx value is derived based on tez.task.resource.memory.mb and is 80% of this value by default. Used only if the value is not specified explicitly by the DAG definition.	-XX:+PrintGCDetails -verbose:gc -XX:+PrintGCTimeStamps -XX:+UseNUMA -XX:+UseParallelGC
tez.task.launch.env	Additional execution environment entries for Tez. This is not an additive property. You must preserve the original value if you want to have access to native libraries. Used only if the value is not specified explicitly by the DAG definition.	LD_LIBRARY_PATH=/usr/hdp/\${hdp.version}/hadoop/lib/native:/usr/hdp/\${hdp.version}/hadoop/lib/native/Linux-amd64-64/
tez.task.log.level	<p>Root logging level that is passed to the Tez tasks.</p> <p>Simple configuration: Set the log level for all loggers. For example, set to INFO. This sets the log level to INFO for all loggers.</p> <p>Advanced configuration: Set the log level for all classes, along with a different level for some classes. For example, set to DEBUG;org.apache.hadoop.ipc=INFO;org.apache.hadoop.security=INFO</p> <p>This sets the log level for all loggers to DEBUG, except for org.apache.hadoop.ipc and org.apache.hadoop.security, which are set to INFO.</p> <p>Note:The global log level must always be the first parameter. For example:</p> <p>DEBUG;org.apache.hadoop.ipc=INFO;org.apache.hadoop.security=INFO is valid.</p> <p>org.apache.hadoop.ipc=INFO;org.apache.hadoop.security=INFO is not valid.</p>	INFO
tez.task.max-events-per-heartbeat	Maximum number of events to fetch from the AM by the tasks in a single heartbeat.	500
tez.task.resource.cpu.vcores	The number of virtual cores to be used by the Tez tasks. Set this to > 1 if RM Scheduler is configured to support virtual cores.	1

Configuration Parameter	Description	Default Value
tez.task.resource.memory.mb	The amount of memory to be used by launched tasks. Used only if the value is not specified explicitly by the DAG definition.	1024
tez.use.cluster.hadoop-libs	Specifies whether Tez uses the cluster Hadoop libraries. This property should not be set in <code>tez-site.xml</code> , or if it is set, the value should be false.	false



Note

There are no additional steps required to secure Tez if your cluster is already configured for security.

To monitor the progress of a Tez job or to analyze the history of a Tez job, set up the Tez View in Ambari. For information about setting up the Tez view, see [Configuring Your Cluster for Tez View](#) in the HDP Ambari Views Guide.

8.4. Setting Up Tez for the Tez UI

Tez provides a UI that interfaces with the application Timeline Server. This Tez UI web application displays a live, historical view of Tez inside of the Tez UI web application.

The Tez UI requires Tez 0.6.0 or above.

The instructions in this section are for Hive and Tez. Hive 2 and LLAP require an Ambari installation. See [Apache Hive Performance Tuning](#).

Setting up Tez for the Tez UI requires the three general tasks:

1. [Setting Up Tez for the Tez UI \[77\]](#)
2. [Deploying the Tez UI \[78\]](#)
3. [Additional Steps for the Application Timeline Server \[79\]](#)

8.4.1. Setting Up Tez for the Tez UI

Add the following properties to the `tez-site.xml` file:

```
<property>
  <description>Enable Tez to use the Timeline Server for History Logging</description>
  <name>tez.history.logging.service.class</name>
  <value>org.apache.tez.dag.history.logging.ats.ATSHistoryLoggingService</value>
</property>

<property>
  <description>URL of the location where Tez UI is hosted</description>
  <name>tez.tez-ui.history-url.base</name>
  <value>http://<webserver-host:9999/tez-ui/</value>
</property>
```

8.4.2. Deploying the Tez UI

1. Obtain the `tez-ui.war` file in one of the following ways:
 - Use the `tez-ui.war` file from the binary artifacts packaged with HDP.
 - Use the `tez-ui.war` from the Maven repo for your release of HDP.
 - Build your own `tez-ui.war` from the source. Refer to the `README.txt` file in the `tez-ui` module.
2. Extract the contents of war.
3. Host the contents of the war on a webserver. The Tez UI consists only of `html`, `js`, and `css` files. It does not require complex server-side hosting.

8.4.2.1. Configuring the Timeline Server URL and Resource Manager UI URL

The Tez UI attempts to connect to Timeline Server using the same host as the Tez UI, by default. This means that, if the UI is hosted on `localhost`, the Timeline Server URL is assumed to be `http(s)://localhost:8188` and the Resource manager web url is assumed to be `http(s)://localhost:8088`.

If the Timeline Server or Resource manager is hosted on a different host, the Tez UI requires that the corresponding changes are configured in `scripts/configs.js` (within the extracted `tez-ui.war`). To do this, uncomment the following lines and set the `hostname` and `port` appropriately. `timelineBaseUrl` maps to YARN Timeline Server and `RMWebUrl` maps to YARN ResourceManager.

```
// timelineBaseUrl: 'http://localhost:8188',  
// RMWebUrl: 'http://localhost:8088',
```

8.4.2.2. Hosting the UI in Tomcat

Follow these steps to host the UI in tomcat:

1. Remove old deployments from `$TOMCAT_HOME/webapps`.
2. Extract the war into `$TOMCAT_HOME/webapps/tez-ui/`.
3. Modify `scripts/config.js` if needed.
4. Restart tomcat.

After the restart, the UI should be available under the `tez-ui/` path.

8.4.2.3. Hosting the UI Using a Standalone Webserver

Follow these steps to host the UI using a standalone webserver:

1. Untar the war file.

2. Modify the `scripts/config.js` files if necessary.
3. Copy the resulting directory to the document root of the web server.
4. Restart the webserver.

8.4.3. Additional Steps for the Application Timeline Server

This section requires Apache Hadoop 2.6.0 or above.

For the Timeline Server to correctly function with the Tez UI, set up the following configurations in the `yarn-site.xml` file. If you are running in a distributed setup, replace `localhost` with the name of the actual hostname.

```
...
<property>
  <description>Indicate to clients whether Timeline service is enabled or not.
  If enabled, the TimelineClient library used by end-users will post entities
  and events to the Timeline server.</description>
  <name>yarn.timeline-service.enabled</name>
  <value>>true</value>
</property>

<property>
  <description>The hostname of the Timeline service web application.</
description>
  <name>yarn.timeline-service.hostname</name>
  <value>localhost</value>
</property>

<property>
  <description>Enables cross-origin support (CORS) for web services where
  cross-origin web response headers are needed. For example, javascript making
  a web services request to the timeline server.</description>
  <name>yarn.timeline-service.http-cross-origin.enabled</name>
  <value>>true</value>
</property>

<property>
  <description>Publish YARN information to Timeline Server</description>
  <name>yarn.resourcemanager.system-metrics-publisher.enabled</name>
  <value>>true</value>
</property>
...
```

For additional information regarding the Application Timeline Server, refer to [The YARN Timeline Server](#) in the Apache documentation.

For a Tez UI and YARN Timeline Server compatibility matrix, see [YARN Timeline and Hadoop Versions](#) in the Apache documentation.

8.5. Creating a New Tez View Instance

To create a new Tez View instance, refer to [Creating or Editing the Tez View Instance](#). Tez Views are part of the Ambari Views Framework, which allows developers to create UI

components that "plug into" the Ambari Web interface. These views can also be used in manual configurations with components such as Tez.

8.6. Validating the Tez Installation

Use the following procedure to run an example Tez application, such as OrderedWordCount, and validate your Tez installation.

1. Create a sample test.txt file:

```
foo
bar
foo
bar
foo
```

2. Log in as the \$HDFS_USER. The \$HDFS_USER is the user that owns the HDFS service. For example, **hdfs**:

```
su $HDFS_USER
```

3. Create a /tmp/input/ directory in HDFS and copy the test.txt file into that directory:

```
hdfs dfs -mkdir -p /tmp/input/
hdfs dfs -put test.txt /tmp/input/
```

4. Execute the following command to run the OrderedWordCount application using Tez:

```
hadoop jar /usr/hdp/current/tez-client/tez-examples-*.jar orderedwordcount /
tmp/input/test.txt /tmp/out
```

5. Run the following command to verify the word count:

```
hdfs dfs -cat '/tmp/out/*'
```

This should return:

```
foo 3
bar 2
```

8.7. Troubleshooting

To troubleshoot your Tez installation and configuration, refer first to [Using the Tez View](#). You can also view the Tez logs to help troubleshoot problems with your installation and configuration. Tez logs are accessible through the YARN CLI using the yarn logs command.

```
yarn logs -applicationId <APPLICATION_ID> [OPTIONS]
```

The application ID is listed at the end of the output for a running application, as shown below in the OrderedWordCount application output:

```
14/02/26 14:45:33 INFO examples.OrderedWordCount: DAG 1 completed. FinalState=
SUCCEEDED14/02/26
14:45:33 INFO client.TezSession: Shutting down Tez Session, sessionName=
OrderedWordCountSession, applicationId=application_1393449467938_0001
```

9. Installing Apache Hive and Apache HCatalog

This section describes installing and testing Apache Hive, a tool for creating higher level SQL queries using HiveQL, the tool's native language, that can be compiled into sequences of MapReduce programs. It also describes installing and testing Apache HCatalog, a metadata abstraction layer that insulates users and scripts from how and where data is physically stored.

Complete the following instructions to install Hive and HCatalog:

1. [Installing the Hive-HCatalog Package \[81\]](#)
2. [Setting Up the Hive/HCatalog Configuration Files \[83\]](#)
3. [Setting Up the Database for the Hive Metastore \[87\]](#)
4. [Setting up RDBMS for use with Hive Metastore \[89\]](#)
5. [Enabling Tez for Hive Queries \[90\]](#)
6. [Disabling Tez for Hive Queries \[90\]](#)
7. [Configuring Tez with the Capacity Scheduler \[90\]](#)
8. [Validating Hive-on-Tez Installation \[91\]](#)
9. [Installing Apache Hive LLAP \[92\]](#)
10. [LLAP Prerequisites \[92\]](#)
11. [Preparing to Install LLAP \[92\]](#)
12. [Installing LLAP on an Unsecured Cluster \[93\]](#)
13. [Installing LLAP on a Secured Cluster \[95\]](#)
14. [Stopping the LLAP Service \[102\]](#)
15. [Tuning LLAP for Performance \[102\]](#)

9.1. Installing the Hive-HCatalog Package



Note

It is recommended that you set the soft and hard limits for number of processes that the user hive can consume in your server `/etc/security/limits.conf` file as follows.

For non-secured clusters:

<code><hive user ID></code>	soft	nproc	128
<code><hive user ID></code>	hard	nproc	1024

For secured clusters:

<code><hive user ID></code>	soft	nproc	128
<code><hive user ID></code>	hard	nproc	32768

1. On all client/gateway nodes (on which Hive programs are executed), Hive Metastore Server, and HiveServer2 machine, install the Hive RPMs.

- For RHEL/CentOS/Oracle Linux:

```
yum install hive-hcatalog
```

- For SLES:

```
zypper install hive-hcatalog
```

- For Ubuntu:

```
apt-get install hive-hcatalog
```

2. (Optional) Download and install the database connector .jar file for your Hive metastore database.

By default, Hive uses an embedded Derby database for its metastore. However, Derby is not recommended for production use. Use MySQL, Oracle, SQL Server, or Postgres for production use.

You need to install the appropriate JDBC connector for your Hive metastore database. Hortonworks recommends using an embedded instance of the Hive Metastore with HiveServer2. An embedded metastore runs in the same process with HiveServer2 rather than as a separate daemon.

**Important**

If you are using MySQL, you must use `mysql-connector-java-5.1.35.zip` or later JDBC driver.

For example, if you previously installed MySQL, you would use the following steps to install the MySQL JDBC connector:

- a. Execute the following command on the Hive metastore machine.

- For RHEL/CENTOS/ORACLE LINUX:

```
yum install mysql-connector-java*
```

- For SLES:

```
zypper install mysql-connector-java*
```

- For UBUNTU/Debian:

```
apt-get install mysql-connector-java*
```

- b. After the install, the MySQL connector .jar file is placed in the `/usr/share/java/` directory. Copy the downloaded .jar file to the `/usr/hdp/current/hive-client/lib/` directory on your Hive host machine.
- c. Verify that the .jar file has at least the minimum set of permissions required.

9.2. Setting Up the Hive/HCatalog Configuration Files



Note

When using HiveServer2 in HTTP mode, you must configure the mapping from Kerberos Principals to short names in the "hadoop.security.auth_to_local" property setting in the `core-site.xml` file.

Use the following instructions to set up the Hive/HCatalog configuration files. Hortonworks provides a set of configuration files that represent a working Hive/HCatalog configuration. (See [Download Companion Files](#). You can use these files as a reference point, however, you need to modify them to match your own cluster environment.

If you choose to use the provided configuration files to set up your Hive/HCatalog environment, complete the following steps:

1. Extract the configuration files to a temporary directory.

The files are located in the `configuration_files/hive` directories where you decompressed the companion files.

2. Modify the configuration files.

In the `configuration_files/hive` directory, edit the `hive-site.xml` file and modify the properties based on your environment.

Edit the connection properties for your Hive metastore database in `hive-site.xml` to match your own cluster environment.



Warning

To prevent memory leaks in unsecure mode, disable file system caches by setting the following parameters to true in `hive-site.xml`:

- `fs.hdfs.impl.disable.cache`
- `fs.file.impl.disable.cache`

3. **(Optional)** If you want storage-based authorization for Hive, set the following Hive authorization parameters in the `hive-site.xml` file:

```
<property>
```

```

    <name>hive.metastore.pre-event.listeners</name>
    <value>org.apache.hadoop.hive.ql.security.authorization.
AuthorizationPreEventListener</value>
</property>

<property>
  <name>hive.security.metastore.authorization.manager</name>
  <value>org.apache.hadoop.hive.ql.security.authorization.
StorageBasedAuthorizationProvider</value>
</property>

<property>
  <name>hive.security.authenticator.manager</name>
  <value>org.apache.hadoop.hive.ql.security.ProxyUserAuthenticator</
value>
</property>

```

Hive also supports SQL standard authorization. See "Hive Authorization" for more information about Hive authorization models.

4. For a remote Hive metastore database, use the following hive-site.xml property value to set the IP address (or fully-qualified domain name) and port of the metastore host.

```

<property>
  <name>hive.metastore.uris</name>
  <value>thrift://$metastore.server.full.hostname:9083</value>
  <description>URI for client to contact metastore server. To enable
HiveServer2, leave the property value empty.
  </description>
</property>

```

To enable HiveServer2 for remote Hive clients, assign a value of a single empty space to this property. Hortonworks recommends using an embedded instance of the Hive Metastore with HiveServer2. An embedded metastore runs in the same process with HiveServer2 rather than as a separate daemon. You can also configure HiveServer2 to use an embedded metastore instance from the command line:

```
hive --service hiveserver2 -hiveconf hive.metastore.uris=""
```

5. **(Optional)** By default, Hive ensures that column names are unique in query results returned for SELECT statements by prepending column names with a table alias. Administrators who do not want a table alias prefix to table column names can disable this behavior by setting the following configuration property:

```

<property>
  <name>hive.resultset.use.unique.column.names</name>
  <value>>false</value>
</property>

```



Important

Hortonworks recommends that deployments disable the DataNucleus cache by setting the value of the `datanucleus.cache.level2.type` configuration parameter to `none`. The `datanucleus.cache.level2` configuration parameter is ignored, and assigning a value of `none` to this parameter does not have the desired effect.

9.2.1. HDP-Utility script

You can also use the HDP utility script to fine-tune memory configuration settings based on node hardware specifications. For information on where to get the HDP-Utility script, see [Determine HDP Memory Configuration Settings](#)

Copy the configuration files.

- On all Hive hosts create the Hive configuration directory:

```
rm -r $HIVE_CONF_DIR ; mkdir -p $HIVE_CONF_DIR;
```

- Copy all the configuration files to the \$HIVE_CONF_DIR directory.
- Set appropriate permissions:

```
chown -R $HIVE_USER:$HADOOP_GROUP $HIVE_CONF_DIR/./ ; chmod -R 755 $HIVE_CONF_DIR/./ ;
```

where:

- \$HIVE_CONF_DIR is the directory to store the Hive configuration files. For example, /etc/hive/conf.
- \$HIVE_USER is the user owning the Hive services. For example, hive.
- \$HADOOP_GROUP is a common group shared by services. For example, hadoop.

9.2.2. Configure Hive and HiveServer2 for Tez

The `hive-site.xml` file in the HDP companion files includes the settings for Hive and HiveServer2 for Tez.

If you have already configured the `hive-site.xml` connection properties for your Hive metastore database, the only remaining task would be to adjust `hive.tez.container.size` and `hive.tez.java.opts` values as described in the following section. You can also use the HDP utility script described earlier in this guide to calculate these Tez memory configuration settings.

9.2.2.1. Hive-on-Tez Configuration Parameters

Apart from the configurations generally recommended for Hive and HiveServer2 and included in the `hive-site.xml` file in the HDP companion files, for a multi-tenant use case, only the following configurations are required in the `hive-site.xml` configuration file to configure Hive for use with Tez.

Table 9.1. Hive Configuration Parameters

Configuration Parameter	Description	Default Value
hive.execution.engine	This setting determines whether Hive queries are executed using Tez or MapReduce.	If this value is set to "mr," Hive queries are executed using MapReduce. If this value is set to "tez," Hive queries

Configuration Parameter	Description	Default Value
		are executed using Tez. All queries executed through HiveServer2 use the specified hive.execution.engine setting.
hive.tez.container.size	The memory (in MB) to be used for Tez tasks.	-1 (not specified) If this is not specified, the memory settings from the MapReduce configurations (mapreduce.map.memory.mb) are used by default for map tasks.
hive.tez.java.opts	Java command line options for Tez.	If this is not specified, the MapReduce java.opts settings (mapreduce.map.java.opts) are used by default.
hive.server2.tez.default.queues	A comma-separated list of queues configured for the cluster.	The default value is an empty string, which prevents execution of all queries. To enable query execution with Tez for HiveServer2, this parameter must be configured.
hive.server2.tez.sessions.per.default.queue	The number of sessions for each queue named in the hive.server2.tez.default.queues.	1; Larger clusters might improve performance of HiveServer2 by increasing this number.
hive.server2.tez.initialize.default.sessions	Enables a user to use HiveServer2 without enabling Tez for HiveServer2. Users might potentially want to run queries with Tez without a pool of sessions.	false
hive.server2.enable.doAs	Required when the queue-related configurations above are used.	false

9.2.2.2. Examples of Hive-Related Configuration Properties:

```

<property>
  <name>hive.execution.engine</name>
  <value>tez</value>
</property>

<property>
  <name>hive.tez.container.size</name>
  <value>-1</value>
  <description>Memory in mb to be used for Tez tasks. If this is not
  specified (-1)
  then the memory settings for map tasks are used from mapreduce
  configuration</description>
</property>

<property>
  <name>hive.tez.java.opts</name>
  <value></value>
  <description>Java opts to be specified for Tez tasks. If this is not
  specified
  then java opts for map tasks are used from mapreduce configuration</
  description>
</property>

<property>
  <name>hive.server2.tez.default.queues</name>
  <value>default</value>
</property>

```

```
<property>
  <name>hive.server2.tez.sessions.per.default.queue</name>
  <value>1</value>
</property>

<property>
  <name>hive.server2.tez.initialize.default.sessions</name>
  <value>>false</value>
</property>

<property>
  <name>hive.server2.enable.doAs</name>
  <value>>false</value>
</property>
```



Note

Users running HiveServer2 in data analytic tools such as Tableau must reconnect to HiveServer2 after switching between the Tez and MapReduce execution engines.

You can retrieve a list of queues by executing the following command: `hadoop queue -list`.

9.2.2.3. Using Hive-on-Tez with Capacity Scheduler

You can use the `tez.queue.name` property to specify which queue is used for Hive-on-Tez jobs. You can also set this property in the Hive shell, or in a Hive script.

9.3. Setting Up the Database for the Hive Metastore

Use the following steps to set up the database for your Hive Metastore. This step must be performed when you start the metastore for the first time.

1. Initialize the Hive Metastore database schema:

```
$HIVE_HOME/bin/schematool -initSchema -dbType $databaseType
```

The value for `$databaseType` can be **derby**, **mysql**, **oracle**, **mssql**, or **postgres**.

`$HIVE_HOME` is by default configured to `usr/hdp/current/hive`.

2. Turn off autocreation of schemas. Edit `hive-site.xml` to set the value of `datanucleus.autoCreateSchema` to `false`:

```
<property>
  <name>datanucleus.autoCreateSchema</name>
  <value>>false</value>
  <description>Creates necessary schema on a startup if one doesn't
  exist</ description>
</property>
```

3. Start the Hive Metastore service.


```
su - $HIVE_USER -c "nohup /usr/hdp/current/hive-metastore/bin/
hive --service metastore>/var/log/hive/hive.out 2>/var/log/hive/
hive.log &"
```



Note

You might receive the following error after running the `su - hive` command:

```
su hive This account is currently not available.
```

If you get this error, you might need to reassign the `$HIVE_USER` shell. You can confirm this by looking for the following line in `etc/passwd`:

```
hive:x:493:493:Hive:/var/lib/hive:/sbin/nologin63
```

This indicates that the `$HIVE_USER` is assigned to the `sbin/nologin` shell, which blocks access. You can use the following command to assign the `$HIVE_USER` to the `bin/bash` shell.

```
sudo chsh -s /bin/bash hive
```

This command should return the following:

```
Changing shell for hive. Shell changed.
```

You should then be able to successfully run the `su - $HIVE_USER` command.

4. Smoke test Hive.

- Open Hive command line shell by entering the following in a terminal window:

```
hive
```

- Run sample commands:

```
show databases;create table test(col1 int, col2 string); show
tables;
```

5. Start HiveServer2:

- ```
su - $HIVE_USER
nohup /usr/hdp/current/hive-server2/bin/hiveserver2 >/var/log/hive/
hiveserver2.out 2> /var/log/hive/hiveserver2.log &
```

#### 6. Smoke test HiveServer2:

- Open Beeline command line shell to interact with HiveServer2:

```
/usr/hdp/current/hive-client/bin/beeline
```

- Establish connection to server:

```
!connect jdbc:hive2://$hive.server.full.hostname:10000 $HIVE_USER
password org.apache.hive.jdbc.HiveDriver
```

- Run sample commands:

```
show databases; create table test2(a int, b string); show tables;
```

## 9.4. Setting up RDBMS for use with Hive Metastore

Hive supports multiple databases. This section uses Oracle as an example. To use an Oracle database as the Hive Metastore database, you must have already installed HDP and Hive.



### Important

When Hive is configured to use an Oracle database and [transactions are enabled in Hive](#), queries might fail with the error `org.apache.hadoop.hive ql.lockmgr.LockException: No record of lock could be found, might have timed out`. This can be caused by a bug in the [BoneCP connection pooling library](#). In this case, Hortonworks recommends that you set the `datanucleus.connectionPoolingType` property to `dbcp` so the [DBCP component](#) is used.

To set up Oracle for use with Hive:

1. On the Hive Metastore host, install the appropriate JDBC .jar file.
  - Download the [Oracle JDBC \(OJDBC\) driver](#).
  - Select "Oracle Database 11g Release 2 - ojdbc6.jar"
  - Copy the .jar file to the Java share directory:

```
cp ojdbc6.jar /usr/share/java/
```



### Note

Make sure the .jar file has the appropriate permissions - 644.

2. Create a user for Hive and grant it permissions using SQL\*Plus, the Oracle database administration utility:

```
sqlplus sys/root as sysdba
CREATE USER $HIVEUSER IDENTIFIED BY $HIVEPASSWORD;
GRANT SELECT_CATALOG_ROLE TO $HIVEUSER;
GRANT CONNECT, RESOURCE TO $HIVEUSER;
QUIT;
```

Where \$HIVEUSER is the Hive user name and \$HIVEPASSWORD is the Hive user password.

## 9.5. Enabling Tez for Hive Queries

### Limitations

This release of Tez does not support the following actions:

- Index creation
- Skew joins

To enable Tez for Hive Queries:

1. Run the following command to copy the `hive-exec-*.jar` to HDFS at `/apps/hive/install/`:

```
su - $HIVE_USER
hadoop fs -mkdir /apps/hive/install
hadoop fs -copyFromLocal /usr/hdp/<hdp_version>/hive/lib/hive-exec-*<hdp
version>*.jar /apps/hive/install/
```

2. Enable Hive to use Tez DAG APIs. On the Hive client machine, add the following to your Hive script or execute it in the Hive shell:

```
set hive.execution.engine=tez;
```

## 9.6. Disabling Tez for Hive Queries

To disable Tez for Hive queries:

On the Hive client machine, add the following to your Hive script or execute it in the Hive shell:

```
set hive.execution.engine=mr;
```

Tez is then disabled for Hive queries.

## 9.7. Configuring Tez with the Capacity Scheduler

You can use the `tez.queue.name` property to specify which queue is used for Tez jobs. Currently the Capacity Scheduler is the default scheduler in HDP. In general, this is not limited to the Capacity Scheduler, but applies to any YARN queue.

If no queues are configured, the default queue is used, which means that 100% of the cluster capacity is used to run Tez jobs. If queues are configured, a queue name must be configured for each YARN application.

Setting `tez.queue.name` in `tez-site.xml` applies to Tez applications that use that configuration file. To assign separate queues for each application, separate `tez-site.xml` files are required, or the application can pass this configuration to Tez while submitting the Tez DAG.

For example, in Hive you can use the `tez.queue.name` property in `hive-site.xml` to specify the queue to use for Hive-on-Tez jobs. To assign Hive-on-Tez jobs to use the "engineering" queue, add the following property to `hive-site.xml`:

```
<property>
 <name>tez.queue.name</name>
 <value>engineering</value>
</property>
```

Setting this configuration property in `hive-site.xml` affects all Hive queries that read that configuration file.

To assign Hive-on-Tez jobs to use the "engineering" queue in a Hive query, use the following commands in the Hive shell or in a Hive script:

```
bin/hive --hiveconf tez.queue.name=engineering
```

## 9.8. Validating Hive-on-Tez Installation

Use the following procedure to validate your configuration of Hive-on-Tez:

1. Create a sample `test.txt` file:

```
echo -e "alice miller\t49\t3.15" > student.txt
```

2. Upload the new data file to HDFS:

```
su - $HDFS_USER hadoop fs -mkdir -p /user/test/student hadoop fs
-copyFromLocal student.txt /user/test/student hadoop fs -chown hive:hdfs
/user/test/student/student.txt hadoop fs -chmod 775
/user/test/student/student.txt
```

3. Open the Hive command-line shell:

```
su - $HDFS_USER
```

4. Create a table named "student" in Hive:

```
hive> CREATE EXTERNAL TABLE student(name string, age int, gpa
double) ROW FORMAT DELIMITED FIELDS TERMINATED BY '\t' STORED AS
TEXTFILE LOCATION '/user/test/student';
```

5. Execute the following query in Hive:

```
hive> SELECT COUNT(*) FROM student;
```

If Hive-on-Tez is configured properly, this query should return successful results similar to the following:

	VERTICES	STATUS	TOTAL	COMPLETED	RUNNING	PENDING	FAILED
KILLED							
Map 1 .....		SUCCEEDED	117	117	0	0	0
0							
Reducer 2 .....		SUCCEEDED	1	1	0	0	0
0							

```
VERTICES: 02/02 [>>] 100% ELAPSED TIME: 445.02 s
```

```
Status: DAG finished successfully in 445.02 seconds
Time taken: 909.882 seconds
```

## 9.9. Installing Apache Hive LLAP

Hive low-latency analytical processing (LLAP) provides you with extended query execution in Hive that consists of:

- A persistent daemon that provides execution and caching of data
- A tightly integrated directed acyclic graph (DAG)-based framework

The primary benefit of using LLAP is to enhance your query execution times. Small, short queries can be processed by the daemon. For more information about LLAP, refer to [Hive LLAP on Your Cluster](#).

## 9.10. LLAP Prerequisites

Before installing LLAP, make sure that your cluster meets the following prerequisites:

**Table 9.2.**

Prerequisite	Description
Cluster Stack Version	HDP 2.6.0
(Optional) Ambari Version	Apache Ambari 2.5.0
Components	<ul style="list-style-type: none"> <li>• Apache HDFS</li> <li>• Apache Hive</li> <li>• Apache MapReduce2</li> <li>• Apache Slider</li> <li>• Apache Tez</li> <li>• Apache YARN</li> <li>• Apache ZooKeeper</li> </ul>
Configuration Files	<ul style="list-style-type: none"> <li>• tez-site.xml</li> <li>• hive-site.xml</li> </ul>
JDK	JDK8u60 or later

## 9.11. Preparing to Install LLAP



### Note

HDP 2.6 ships with Hive and Hive 2.0, and Tez and Tez\_hive2. Install Hive and Tez as usual; install Hive 2.0 and Tez\_hive2 on the nodes where HiveServer2 will run and where the Hive client exists.

1. Install Java JDK8u60 or later to the same path on each server in your cluster.
2. Set the `JAVA_HOME` environment variable to the path where you install the JDK and then export it to child processes:

```
export JAVA_HOME=<path/to/jdk1.8.0_60>
export PATH=$JAVA_HOME/bin:$PATH:
```

## 9.12. Installing LLAP on an Unsecured Cluster

On the computer where Hive2 is installed, follow these steps:

1. Log in as user hive:

```
sudo su -
su $HIVE_USER
```

2. Generate the LLAP package:

```
hive --service llap --name <llap_svc_name> --instances
<number_of_cluster_nodes>
--cache <cache_size>m --xmx <heap_size>m --size
((<cache_size>+<heap_size>)*1.05)m
--executors <number_of_cores> --loglevel <WARN|INFO>
--args " -XX:+UseG1GC -XX:+ResizeTLAB -XX:+UseNUMA -XX:-ResizePLAB"
```

**Table 9.3.**

Parameter	Recommended Value
<code>--instances &lt;cache_size&gt;</code>	Number of cluster nodes to use LLAP.
<code>--cache &lt;cache_size&gt;</code>	<code>&lt;YARN_maximum_container_size&gt; -</code> <code>(&lt;hive.tez.container.size&gt; &lt;number_of_cores&gt;)</code>  <code>&lt;hive.tez.container.size&gt;</code> is the setting for this property, found in the <code>hive-site.xml</code> file. Depending on the size of the node, specify a minimum between 1 GB through 4 GB.
<code>--xmx &lt;heap_size&gt;</code>	For medium-sized nodes: <code>&lt;hive.tez.container.size&gt; * &lt;number of cores&gt; * (0.8 to 0.95)</code>  <code>&lt;hive.tez.container.size&gt;</code> is the setting for this property found in the <code>hive-site.xml</code> file.  Ensure that the setting for <code>--xmx</code> is 1 GB less than <code>(&lt;hive.tez.container.size&gt; * &lt;number_of_cores&gt;)</code> . For smaller nodes, use the same formula, multiplied by 0.8.
<code>--executors &lt;number_of_cores&gt;</code>	Set to the number of CPU cores available on nodes running NodeManager. Set this value even if CPU scheduling is enabled in YARN.

3. Set the `--loglevel` parameter to `INFO` when you are troubleshooting or testing.

The `INFO` option provides verbose output. In a production environment, set the `--loglevel` parameter to `WARN`, which outputs a message to the logs only if there is a warning or error. This makes the logs easier to read and reduces load on the node.



## Note

The recommended values listed in the previous table represent a sample configuration. LLAP also can be configured to use a fraction of node resources.

The following message is returned, confirming that the LLAP package was created:  
Prepared llap-slider-<date>/run.sh for running LLAP on Slider

4. Verify that the following LLAP and HiveServer2 properties are set in the `hive-site.xml` file, which can be located in the `/etc/hive/conf/` or the `/etc/hive/conf/conf.server/` directory:

**Table 9.4. LLAP Properties to Set in `hive-site.xml`**

Property	Values
<code>hive.execution.mode</code>	<code>llap</code>
<code>hive.llap.execution.mode</code>	<code>all</code>
<code>hive.llap.daemon.service.hosts</code>	<code>@&lt;llap_service_name&gt;</code>

`<llap_service_name>` is the service name that you specified when you generated the LLAP package in Step 2.

**Table 9.5. HiveServer2 Properties to Set in `hive-site.xml` to Enable Concurrent Queries with LLAP**

Property	Values
<code>hive.server2.tez.default.queues</code>	Queue to use for the LLAP sessions. These correspond to YARN queues of the same name. For example, <code>default</code> .
<code>hive.server2.tez.initialize.default.sessions</code>	<code>True</code>
<code>hive.server2.tez.sessions.per.default.queue</code>	Set to the number of concurrent queries to run on the queues that are configured by <code>hive.server2.tez.default.queues</code> . This setting launches long-running Tez AMs (sessions).

5. Example of these properties set in the `hive-site.xml` file:

```
<property>
 <name>hive.execution.mode</name>
 <value>llap</value>
</property>

<property>
 <name>hive.llap.execution.mode</name>
 <value>ALL</value>
</property>

<property>
 <name>hive.llap.daemon.service.hosts</name>
 <value>@<llap_service_name></value>
</property>

<property>
```

```
<name>hive.server2.tez.default.queues</name>
<value>default</value>
</property>

<property>
<name>hive.server2.tez.initialize.default.sessions</name>
<value>true</value>
</property>

<property>
<name>hive.server2.tez.sessions.per.default.queue</name>
<value>1</value>
</property>
```

## 9.13. Installing LLAP on a Secured Cluster

### 9.13.1. Prerequisites

- Cluster is available and is already secured with Kerberos.
- Slider and ZooKeeper are installed on the cluster.
- The Hadoop directory is in the same location on each node so the native binary can be accessed, which supports secure I/O.



#### Important

- You should have a method to execute commands and upload files on all nodes in the cluster from one "setup" or "jump" node. This can be set up with passwordless ssh (pssh) or by using a FOR loop with a list of nodes.
- On the "setup" node, add Java tools to the system path.
- All passwords, user names, and paths in this section of the document are provided as examples unless otherwise noted. Change them for your deployment as appropriate.

### 9.13.2. Installing LLAP on a Secured Cluster

Review the prerequisites for installing LLAP on a secured cluster before you begin.

1. Ensure that user hive exists on each node, and configure the following:

- a. Create local directories that are similar to those set up for the `yarn.nodemanager.local-dirs` property:

```
mkdir -p /grid/0/hadoop/llap/local
chown -R hive /grid/0/hadoop/llap
```

- b. On the "setup" node, ensure that user hive has access to its HDFS home directory:

```
hadoop fs -mkdir -p /user/hive
hadoop fs -chown -R hive /user/hive r
```

2. Set up keytabs.



You can perform this step on the "setup" machine and distribute it to the cluster, or you can perform this step on each node. The following example shows how to perform this step on each node. Use `kadmin.local` if under root; otherwise, use `kadmin`.

3. On each node (specified by their fully qualified domain names), create the host and headless principals, and a keytab with each:

```
kadmin.local -q 'addprinc -randkey hive@EXAMPLE.COM'
kadmin.local -q "addprinc -randkey hive/<fqdn>@EXAMPLE.COM"
kadmin.local -q 'cpw -pw hive hive'
kadmin.local -q "xst -norandkey -k /etc/security/keytabs/hive.keytab hive/
<fqdn>@EXAMPLE.COM"
kadmin.local -q "xst -norandkey -k /etc/security/keytabs/hive.keytab
hive@EXAMPLE.COM"
chown hive /etc/security/keytabs/hive.keytab
```

4. On the "setup" node, create and install, as user `hive`, the headless keytab for Slider:

```
kadmin.local -q "xst -norandkey -k hive.headless.keytab hive@EXAMPLE.COM"
chown hive hive.headless.keytab
kinit -kt /etc/security/keytabs/hive.keytab hive@EXAMPLE.COM
slider install-keytab --keytab hive.headless.keytab --folder hive --
overwrite
```

5. If you want to use web UI SSL, set up the keystore for SSL.

Note that Keystore is often set up for other web UIs: for example HiveServer2. If the keystore is not already set up, perform the following steps:

- a. Create the Certificate Authority (CA).

- i. On the setup node, create the CA parameters:

```
cat > /tmp/cainput << EOF
US
California
Palo Alto
Example Certificate Authority
Certificate Authority
example.com
.
EOF
```

- ii. Create the CA:



### Note

The `JAVA_HOME` must be set. The default Java truststore password must be changed.

```
mkdir -p /etc/security/certs/
openssl genrsa -out /etc/security/certs/ca.key 4096
cat /tmp/cainput | openssl req -new -x509 -days 36525 -key /etc/
security/certs/ca.key \
-out /etc/security/certs/ca.crt
echo 01 > /etc/security/certs/ca.srl
```

```
echo 01 > /etc/security/certs/ca.ser
keytool -importcert -noprompt -alias example-ca -keystore \
 $JAVA_HOME/jre/lib/security/cacerts -storepass changeit -file \
 /etc/security/certs/ca.crt
rm /tmp/cainput
```

b. Create the certificate.

On the "setup" node, create the keystore parameters. In the following example, llap00 is the password specified for the new keystore:

```
hostname -f > /tmp/keyinput
hostname -d >> /tmp/keyinput
cat >> /tmp/keyinput << EOF
Example Corp
Palo Alto
CA
US
yes
llap00
llap00
EOF
```

c. Generate a keystore, a certificate request, and a certificate, and then import the certificate into the keystore:

```
cat /tmp/keyinput | keytool -genkey -alias hive -keyalg RSA -keystore \
 /etc/security/certs/keystore.jks -keysize 4096 -validity 36525 -
 storepass llap00
keytool -certreq -alias hive -keystore /etc/security/certs/keystore.jks \
 -storepass llap00 -file /etc/security/certs/server.csr
openssl x509 -req -days 36525 -in /etc/security/certs/server.csr \
 -CA /etc/security/certs/ca.crt -CAkey /etc/security/certs/ca.key \
 -CAserial /etc/security/certs/ca.ser -out /etc/security/certs/server.crt
keytool -import -alias hive -keystore /etc/security/certs/keystore.jks \
 -storepass llap00 -trustcacerts -file /etc/security/certs/server.crt
chown hive:hadoop /etc/security/certs/keystore.jks /etc/security/certs/
server.crt
chmod 640 /etc/security/certs/keystore.jks /etc/security/certs/server.crt
rm /tmp/keyinput
```

d. Distribute the keystore and certificate to each node:

i. On each node, create the directory:

```
mkdir -p /etc/security/certs
```

ii. Upload the files from the "setup" node:

```
scp ... /etc/security/certs/* ...@node:/etc/security/certs/
```

iii. Import the CA:

```
chown hive:hadoop /etc/security/certs/*
chmod 640 /etc/security/certs/keystore.jks /etc/security/certs/server.
crt
keytool -importcert -noprompt -alias example-ca -keystore \
 $JAVA_HOME/jre/lib/security/cacerts -storepass changeit -file \
 /etc/security/certs/ca.crt
```

- e. Configure LLAP and generate the package.

Specify the following properties in the `/etc/hive/conf/hive-site.xml` file:

**Table 9.6. Properties to Set in `hive-site.xml` for Secured Clusters**

Property	Values
<code>hive.llap.daemon.work.dirs</code>	<code>hive.llap.daemon.work.dirs</code>
<code>hive.llap.daemon.keytab.file</code>	<code>hive.llap.daemon.keytab.file</code>
<code>hive.llap.daemon.service.principal</code>	<code>hive.llap.daemon.service.principal</code>
<code>hive.llap.daemon.service.ssl</code>	<code>True</code>
<code>hive.llap.zk.sm.principal</code>	<code>hive@EXAMPLE.COM</code>
<code>hive.llap.zk.sm.keytab.file</code>	<code>/etc/security/keytabs/hive.keytab</code>
<code>hive.llap.zk.sm.connectionString</code>	ZooKeeper connection string: for example, <code>&lt;machine:port,machine:port, ...&gt;</code>
<code>hadoop.security.authentication</code>	<code>kerberos</code>
<code>hadoop.security.authorization</code>	<code>true</code>

Following is an example of these properties set in the `llap-daemon-site.xml` file:

```
<property>
 <name>hive.llap.daemon.work.dirs</name>
 <value>/grid/0/hadoop/llap/local</value>
</property>

<property>
 <name>hive.llap.daemon.keytab.file</name>
 <value>/etc/security/keytabs/hive.keytab</value>
</property>

<property>
 <name>hive.llap.daemon.service.principal</name>
 <value>hive/_HOST@EXAMPLE.COM</value>
</property>

<property>
 <name>hive.llap.daemon.service.ssl</name>
 <value>>true</value>
</property>

<property>
 <name>hive.llap.zk.sm.principal</name>
 <value>hive@EXAMPLE.COM</value>
</property>

<property>
 <name>hive.llap.zk.sm.keytab.file</name>
 <value>>/etc/security/keytabs/hive.keytab</value>
</property>

<property>
 <name>hive.llap.zk.sm.connectionString</name>
 <value>127.0.0.1:2181,128.0.0.1:2181,129.0.0.1:2181</value>
</property>

<property>
```

```

 <name>hadoop.security.authentication</name>
 <value>kerberos</value>
</property>

<property>
 <name>hadoop.security.authorization</name>
 <value>true</value>
</property>

```

Optionally, you can also use `hive.llap.daemon.acl` and `hive.llap.management.acl` to restrict access to the LLAP daemon protocols.

The Hive user must have access to both.

- a. Specify the following properties in the `ssl-server.xml` file.

Ensure that you perform this step before you create the LLAP package.

**Table 9.7. Properties to Set in `ssl-server.xml` for LLAP on Secured Clusters**

Property	Values
<code>ssl.server.truststore.location</code>	Path to Java truststore: for example, <code>/jre/lib/security/cacerts</code>
<code>ssl.server.keystore.location</code>	<code>/etc/security/certs/keystore.jks</code>
<code>ssl.server.truststore.password</code>	changeit Note: This is the default password.
<code>ssl.server.keystore.password</code>	<code>llap00</code>
<code>ssl.server.keystore.keypassword</code>	<code>llap00</code>

Following is an example of these properties set in the `ssl-server.xml` file:

```

<property>
 <name>ssl.server.truststore.location</name>
 <value>/jre/lib/security/cacerts</value>
</property>

<property>
 <name>ssl.server.keystore.location</name>
 <value>/etc/security/certs/keystore.jks</value>
</property>

<property>
 <name>ssl.server.truststore.password</name>
 <value>strong_password</value>
</property>

<property>
 <name>ssl.server.keystore.password</name>
 <value>llap00</value>
</property>

<property>
 <name>ssl.server.keystore.keypassword</name>
 <value>llap00</value>
</property>

```

Generate the LLAP package.



## Important

Ensure that JAVA\_HOME and HADOOP\_HOME are set before generating the package. JAVA\_HOME and the site.global.library\_path property in the appConfig.json configuration file are set using JAVA\_HOME and HADOOP\_HOME. If you see problems such as a missing native library, check the appConfig.json configuration file.

Make sure that LLAP package generation is done under user hive because some HDFS paths in the configuration are user-specific. You can modify the paths after package generation.

- b. To generate the LLAP package, run the following command, setting parameters as described in the LLAP Package Parameters table:

```
hive --service llap --name <llap_svc_name> --instances
<number_of_cluster_nodes>
--cache <cache_size>m --xmx <heap_size>m --size ((<cache_size>
+<heap_size>)*1.05)m
--executors <number_of_cores> --loglevel <WARN|INFO>
--args " -XX:+UseG1GC -XX:+ResizeTLAB -XX:+UseNUMA -XX:-ResizePLAB"
```

**Table 9.8. LLAP Package Parameters**

Parameter	Recommended Value (based on daemons using all available node resources)
--instances <cache_size>	Set to number of cluster nodes that you to use for LLAP.
--cache <cache_size>	<YARN_maximum_container_size> - (<hive.tez.container.size> * <number_of_cores>)  <hive.tez.container.size> is the setting for this property found in the hive-site.xml file. Depending on the size of the node, specify a minimum of 1-4 GB.
--xmx <heap_size>	For medium-sized nodes:  <hive.tez.container.size> * <number_of_cores> * (0.8 to 0.95)  Where <hive.tez.container.size> is the setting for this property found in the hive-site.xml file.  Ensure that the setting for --xmx is 1GB less than (<hive.tez.container.size> * <number_of_cores>).  For smaller nodes:  Use the same formula as for medium-sized nodes, but multiply by 0.8
--executors <number_of_cores>	Set to the number of CPU cores available on nodes running NodeManager. Set this value even if CPU scheduling is enabled in YARN.

Set the --loglevel parameter to INFO when you are troubleshooting or testing. The INFO option provides verbose output. In a production environment, set the --loglevel parameter to WARN, which only outputs a message to the logs if there is a warning or error. This makes the logs easier to read and reduces load on the node.



## Note

The recommended values listed in the LLAP Package Parameters table represent a sample configuration. LLAP also can be configured to use a fraction of node resources.

- c. Specify the keytab settings in the slider-appmaster section of the appConfig.json configuration file if they have not already been specified:

```
"components": {
 "slider-appmaster": {
... existing settings ...
"slider.hdfs.keytab.dir": ".slider/keytabs/llap",
"slider.am.login.keytab.name": "hive.headless.keytab",
"slider.keytab.principal.name": "hive@EXAMPLE.COM"
```

### 9.13.3. Validating the Installation on a Secured Cluster

1. Make sure that you are logged in as user hive.
2. Verify that the following properties are set as follows in the hive-site.xml file that is being used by HiveServer2:
  - hive.execution.mode = llap
  - hive.llap.execution.mode = all
  - hive.llap.daemon.service.hosts = @<llap\_service\_name>
3. From the hive user home directory, start the LLAP service:

```
cd ~ ./llap-slider-<date>/run.sh
```

<date> is the date that you generated the LLAP package. To verify that you have the correct <date>, on the node where you generated the LLAP package, make sure you are in the hive user home directory and view the subdirectories:

```
cd ~ ls
```

4. There is a subdirectory named llap-slider-<date>. This subdirectory contains the run.sh script you use to start the LLAP service.
5. As user hive, run the Hive CLI and HiveServer2 to run test queries.

If you are using the Hive CLI, you must kinit.
6. After running test queries, check the following:
  - Check the logs on YARN for the Slider application that is running LLAP.

Look for changes that indicate that LLAP is processing the test queries.
  - Using the ResourceManager UI, monitor the Tez AM (session) to make sure that it does not launch new containers to run the query.

## 9.14. Stopping the LLAP Service

Where `<llap_svc_name>` is the name you specified when you generated the LLAP package, use the following command to stop the LLAP service:

```
slider stop <llap_svc_name>
```

## 9.15. Tuning LLAP for Performance

To make sure that the LLAP service is performing as well as possible, you might need to tune the following properties in the `/etc/hadoop/conf/yarn-site.xml` file:

- `yarn.nodemanager.resource.memory-mb`
- `yarn.scheduler.minimum-allocation-mb`
- `yarn.scheduler.maximum-allocation-mb`

For information about tuning these properties, see [Determine HDP Memory Configuration Settings](#) in this guide.

You can also tune performance for the LLAP service by monitoring the `hive.tez.container.size` property that is in the `hive-site.xml` configuration file. For more information about tuning this property, see the [SQL Optimization and Planning Properties](#) in the *Apache Hive Performance Tuning Guide*.

Finally, you can tune LLAP for performance by adding nodes to the cluster, which adds additional YARN NodeManagers.

## 10. Installing Apache Pig

This section describes installing and testing Apache Pig, a platform for creating high-level data flow programs that can be compiled into sequences of MapReduce programs using Pig Latin, the platform's native language.

Complete the following tasks to install Pig:

1. [Install the Pig Package \[103\]](#)
2. [Validate the Installation \[103\]](#)

### 10.1. Install the Pig Package

On all the hosts where you execute Pig programs, install the package.

- For RHEL or CentOS:

```
yum install pig
```

- For SLES:

```
zypper install pig
```

- For Ubuntu or Debian:

```
apt-get install pig
```

The package installs Pig libraries to `/usr/hdp/current/pig-client`. Pig configuration files are placed in `/usr/hdp/current/pig-client/conf`.

### 10.2. Validate the Installation

To validate your installation:

1. On the host machine where Pig is installed, run the following commands:

```
su - $HDFS_USER/usr/hdp/current/hadoop-client/bin/
fs -copyFromLocal /etc/passwd passwd
```

2. Create a Pig script file named `/tmp/id.pig` that contains the following Pig Latin commands:

```
A = load 'passwd' using PigStorage(':');
B = foreach A generate $0 as id; store B into '/
tmp/id.out';
```

3. Run the Pig script:

```
su - $HDFS_USER
pig -l /tmp/pig.log /tmp/id.pig
```



# 11. Installing Apache WebHCat

This section describes installing and testing Apache WebHCat, which provides a REST interface to Apache HCatalog services like job submission and eventing.

To install WebHCat:

1. [Install the WebHCat Package \[104\]](#)
2. [Upload the Pig, Hive and Sqoop tarballs to HDFS \[104\]](#)
3. [Set Directories and Permissions \[105\]](#)
4. [Modify WebHCat Configuration Files \[106\]](#)
5. [Set Up HDFS User and Prepare WebHCat Directories \[107\]](#)
6. [Validate the Installation \[108\]](#)

## 11.1. Install the WebHCat Package

On the WebHCat server machine, install the necessary RPMs or packages.

- For RHEL/CentOS/Oracle Linux:

```
yum install hive-hcatalog hive-webhcat pig
```

- For SLES:

```
zypper install hive-hcatalog hive-webhcat pig
```

- For Ubuntu:

```
apt-get install hive-hcatalog hive-webhcat pig
```

## 11.2. Upload the Pig, Hive and Sqoop tarballs to HDFS

Upload the Pig, Hive, and Sqoop tarballs to HDFS as the \$HDFS\_User. The following code shows an example:

```
hdfs dfs -mkdir -p /hdp/apps/<hdp-version>/pig/
hdfs dfs -mkdir -p /hdp/apps/<hdp-version>/hive/
hdfs dfs -mkdir -p /hdp/apps/<hdp-version>/sqoop/
hdfs dfs -put /usr/hdp/<hdp-version>/pig/pig.tar.gz /hdp/apps/<hdp-version>/
pig/
hdfs dfs -put /usr/hdp/<hdp-version>/hive/hive.tar.gz /hdp/apps/<hdp-version>/
hive/
hdfs dfs -put /usr/hdp/<hdp-version>/sqoop/sqoop.tar.gz /hdp/apps/<hdp-
version>/sqoop/
hdfs dfs -chmod -R 555 /hdp/apps/<hdp-version>/pig
```

```

hdfs dfs -chmod -R 444 /hdp/apps/<hdp-version>/pig/pig.tar.gz
hdfs dfs -chmod -R 555 /hdp/apps/<hdp-version>/hive
hdfs dfs -chmod -R 444 /hdp/apps/<hdp-version>/hive/hive.tar.gz
hdfs dfs -chmod -R 555 /hdp/apps/<hdp-version>/sqoop
hdfs dfs -chmod -R 444 /hdp/apps/<hdp-version>/sqoop/sqoop.tar.gz
hdfs dfs -chown -R $HDFS_USER:$HADOOP_USER /hdp

```

## 11.3. Set Directories and Permissions

Create directories and configure ownership and permissions on the appropriate hosts as described below. If any of these directories already exist, Hortonworks recommends that you delete them and recreate them.

Hortonworks provides a set of configuration files that represent a working WebHCat configuration. (See [Download Companion Files](#). You can use these files as a reference point, however, you need to modify them to match your own cluster environment.

If you choose to use the provided configuration files to set up your WebHCat environment, complete the following steps to set up the WebHCat configuration files:

1. Execute the following commands on your WebHCat server machine to create log and PID directories.

```

mkdir -p $WEBHCAT_LOG_DIR
chown -R $WEBHCAT_USER:$HADOOP_GROUP $WEBHCAT_LOG_DIR
chmod -R 755 $WEBHCAT_LOG_DIR

```

```

mkdir -p $WEBHCAT_PID_DIR
chown -R $WEBHCAT_USER:$HADOOP_GROUP $WEBHCAT_PID_DIR
chmod -R 755 $WEBHCAT_PID_DIR

```

where:

- \$WEBHCAT\_LOG\_DIR is the directory to store the WebHCat logs. For example, `/var/log/webhcat`.
  - \$WEBHCAT\_PID\_DIR is the directory to store the WebHCat process ID. For example, `/var/run/webhcat`.
  - \$WEBHCAT\_USER is the user owning the WebHCat services. For example, `hcat`.
  - \$HADOOP\_GROUP is a common group shared by services. For example, `hadoop`.
2. Set permissions for the WebHCat server to impersonate users on the Hadoop cluster:
    - a. Create a UNIX user to run the WebHCat server.
    - b. Modify the Hadoop `core-site.xml` file and set the following properties:

**Table 11.1. Hadoop core-site.xml File Properties**

Variable	Value
<code>hadoop.proxyuser.USER.groups</code>	A comma-separated list of the UNIX groups whose users are impersonated.

Variable	Value
hadoop.proxyuser.USER.hosts	A comma-separated list of the hosts that run the HCatalog and JobTracker servers.

- If you are running WebHCat on a secure cluster, create a Kerberos principal for the WebHCat server with the name **USER/host@realm**, and set the WebHCat configuration variables **templeton.kerberos.principal** and **templeton.kerberos.keytab**.

## 11.4. Modify WebHCat Configuration Files

Hortonworks provides a set of configuration files that represent a working WebHCat configuration. (See [Download Companion Files](#). You can use these files as a reference point, however, you need to modify them to match your own cluster environment.

If you choose to use the provided configuration files to set up your WebHCat environment, complete the following steps to modify the WebHCat config files:

- Extract the WebHCat configuration files to a temporary directory.

The files are located in the `configuration_files/hive-webhcat` directory where you decompressed the companion files.

- Modify the configuration files.

In the temporary directory, locate the following files and modify the properties based on your environment.

- Edit the `webhcat-site.xml` file and modify the following properties:

```
<property>
 <name>templeton.hive.properties</name>
 <value>hive.metastore.local=false,hive.metastore.uris=thrift://
$METASTORE-HOSTNAME:9083,hive.metastore.sasl.enabled=yes,hive.metastore.
execute.setugi=true,hive.metastore.warehouse.dir=/apps/hive/warehouse</
value>
 <description>Properties to set when running Hive.</description>
</property>

<property>
 <name>templeton.zookeeper.hosts</name>
 <value>$zookeeper1.full.hostname:2181,$zookeeper1.full.
hostname:2181,..</value>
 <description>ZooKeeper servers, as comma separated HOST:PORT pairs.
</description>
</property>
```

- In `core-site.xml`, make sure the following properties are also set to allow WebHcat to impersonate groups and hosts:

```
<property>
 <name>hadoop.proxyuser.hcat.groups</name>
 <value>*</value>
</property>

<property>
 <name>hadoop.proxyuser.hcat.hosts</name>
```

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

where:

- `hadoop.proxyuser.hcat.group` is a comma-separated list of the UNIX groups whose users may be impersonated.
- `hadoop.proxyuser.hcat.hosts` is a comma-separated list of the hosts that are allowed to submit requests using `hcat`.

### 3. Set up the updated WebHCat configuration files.

#### a. Delete any existing WebHCat configuration files:

```
rm -rf $WEBHCAT_CONF_DIR/*
```

#### b. Copy all of the modified config files to `$WEBHCAT_CONF_DIR` and set appropriate permissions:

```
chown -R $WEBHCAT_USER:$HADOOP_GROUP $WEBHCAT_CONF_DIR
chmod -R 755 $WEBHCAT_CONF_DIR
```

where:

- `$WEBHCAT_CONF_DIR` is the directory to store the WebHCat configuration files. For example, `/etc/hcatalog/conf/webhcat`.
- `$WEBHCAT_USER` is the user owning the WebHCat services. For example, `hcat`.
- `$HADOOP_GROUP` is a common group shared by services. For example, `hadoop`.

## 11.5. Set Up HDFS User and Prepare WebHCat Directories

### 1. Set up the WebHCat user.

```
Login as $HDFS_USER
hdfs dfs -mkdir /user/$WEBHCAT_USER
hdfs dfs -chown -R $WEBHCAT_USER:$HDFS_USER /user/$WEBHCAT_USER
hdfs dfs -mkdir /apps/webhcat
```

### 2. Prepare WebHCat directories on HDFS.

```
hdfs dfs -copyFromLocal /usr/hdp/<hdp_version>/pig/pig.tar.gz /apps/webhcat/
hdfs dfs -copyFromLocal /usr/hdp/<hdp_version>/hive.tar.gz /apps/webhcat/
hdfs dfs -copyFromLocal /usr/hdp/<hdp_version>/hadoop-mapreduce/hadoop-streaming*.jar /apps/webhcat/
```

### 3. Set appropriate permissions for the HDFS user and the webhcat directory.

```
hdfs fs -chown -R $WEBHCAT_USER:$HDFS_USER /apps/webhcat
hdfs fs -chmod -R 755 /apps/webhcat
```

where:

- `$WEBHCAT_USER` is the user owning the WebHCat services. For example, `hcat`.

## 11.6. Validate the Installation

1. Start the WebHCat server and log in as `$WEBHCAT_USER`:

```
su - $WEBHCAT_USER
export HADOOP_HOME=/usr/hdp/current/hadoop-client
/usr/hdp/current/hive-webhcat/sbin/webhcat_server.sh start
```

2. Type the following URL into your browser:

```
http://$WebHCat.server.full.hostname:50111/templeton/v1/status
```

The following message is returned if your installation is valid:

```
{"status": "ok", "version": "v1"}
```

## 12. Installing Apache Oozie

This section describes installing and testing Apache Oozie, a server based workflow engine optimized for running workflows that execute Hadoop jobs.

To install Oozie:

1. [Install the Oozie Package \[109\]](#)
2. [Set Directories and Permissions \[112\]](#)
3. [Set Up the Oozie Configuration Files \[113\]](#)
4. [Configure Your Database for Oozie \[119\]](#)
5. [Set up the Sharelib \[120\]](#)
6. [Validate the Installation \[120\]](#)

### 12.1. Install the Oozie Package

#### Prerequisites

1. You must have at least core Hadoop on your system. See [Configure the Remote Repositories](#) for more information.
2. Verify the HDP repositories are available:

```
yum list oozie
```

The output should list at least one Oozie package similar to the following:

```
oozie.noarch <version>
```

If yum responds with "Error: No matching package to list" as shown below, yum cannot locate a matching RPM. This can happen if the repository hosting the HDP RPMs is unavailable, or has been disabled. Follow the instructions at [Configure the Remote Repositories](#) to configure private repository before proceeding.

```
Error: No matching package to list.
```

#### Installation

1. On the Oozie server, install the necessary RPMs.
  - For RHEL/CentOS/Oracle Linux:

```
yum install oozie oozie-client
```

- For SLES:

```
zypper install oozie oozie-client
```

- For Ubuntu and Debian:

```
apt-get install oozie oozie-client
```

2. On the Oozie client (typically a gateway machine), install the oozie-client package.

For RHEL/CentOS/Oracle Linux:

```
yum install oozie-client
```

3. Update the default user profile to define a default value for OOZIE\_URL.

Typically this is done by adding a file in `/etc/profile.d` named `oozie.sh`. The value should be the http url of the Oozie server. Typically, `http://oozie.example.com:11000/oozie` for non-secure clusters or `https://oozie.example.com:11443/oozie` for secure clusters.

4. Install optional features: Oozie Web Console, Compression, and Drivers.

- a. Set up the Oozie lib extension directory:

```
cd /usr/hdp/current/oozie-server
```

- b. Add the Ext library to the Oozie application:

- For RHEL/CentOS/Oracle Linux:

```
yum install extjs-2.2-1
```

```
cp /usr/share/HDP-oozie/ext-2.2.zip /usr/hdp/current/oozie-client/libext/
```

- For SLES:

```
zypper install extjs-2.2-1
```

```
cp /usr/share/HDP-oozie/ext-2.2.zip /usr/hdp/current/oozie-client/libext/
```

- For Ubuntu and Debian:

```
apt-get install extjs
```

```
cp /usr/share/HDP-oozie/ext-2.2.zip /usr/hdp/current/oozie-client/libext/
```

- c. Add LZO JAR files:



### Note

If you do not have an LZO JAR file, you must enable LZO compression first. See [Install Compression Libraries](#).

```
ln /usr/hdp/current/hadoop-client/lib/hadoop-lzo-*.jar libext
```

d. Add PostgreSQL driver:

Copy your PostgreSQL JDBC driver jar to the libext directory:

```
cp /usr/share/java/postgresql-jdbc.jar /usr/hdp/current/oozie-client/libext/
```

5. Add database connector JAR files.

If you did not already create a lib extension directory, create one now:

```
cd /usr/hdp/current/oozie-client
```

For MySQL:

- Copy your mysql driver jar to libext directory.

```
yum install mysql-connector-java
```

```
ln /usr/share/java/mysql-connector-java.jar libext/
```

For Oracle

- Copy your oracle driver jar to the libext directory.

```
cp ojdbc6.jar /usr/hdp/current/oozie-client/libext/
```

For Derby:

- Copy your derby driver jar to the libext directory.

```
cp derby-10-10-1.1.jar /usr/hdp/current/oozie-client/libext/
```

6. Update `/etc/oozie/conf/oozie-env.sh` with your environment information.

Change the `OOZIE_BASE_URL` property to reflect your Oozie server hostname and port:

```
export OOZIE_BASE_URL="http://<your Oozie Server Hostname>:<your
OOZIE_HTTP_PORT>/oozie"
```

For secure clusters, also add the following two lines that specify the jks path and a password to match the system configuration:

```
export OOZIE_HTTPS_KEYSTORE_FILE=</etc/security/hadoop/server.jks>
export OOZIE_HTTPS_KEYSTORE_PASS=<changeit>
```

7. Create a WAR file by running the following command as root:

```
cd /usr/hdp/current/oozie-client
bin/oozie-setup.sh prepare-war
```

8. For secure clusters, add the "-secure" parameter to the above command.



### Note

If the create WAR command fails with the following error:



```
File/Dir does not exist: /usr/hdp/2.6.0.0-$BUILD/oozie-
server/conf/ssl/server.xml
```

```
find the path of the SSL directory that matches oozie/tomcat-deployment/
ssl: find / -name ssl
```

For example, if that SSL path is `/grid/0/hdp/2.6.0.0-$BUILD/oozie/tomcat-deployment/conf/ssl`, copy over that SSL directory to `usr/hdp/current/oozie-server/conf`:

```
cp -r /grid/0/hdp/2.6.0.0-$BUILD/oozie/tomcat-
deployment/conf/ssl /usr/hdp/current/oozie-server/conf/
```

Then run `bin/oozie-setup.sh prepare-war`.

## 12.2. Set Directories and Permissions

Create directories and configure ownership and permissions on the appropriate hosts as described below. If any of these directories already exist, delete and recreate them.

Hortonworks provides a set of configuration files that represent a working Oozie configuration. (See [Download Companion Files](#). You can use these files as a reference point, however, you need need to modify them to match your own cluster environment.

If you choose to use the provided configuration files to set up your Oozie environment, complete the following steps to set up Oozie directories and permissions:

1. Change the permissions on the config directory by entering the following commands:

```
chown root:oozie /etc/oozie
```

```
chmod 0750 /etc/oozie
```

2. Hortonworks recommends that you edit and source the bash script files included in the companion files.

Alternately, you can also copy the contents to your `~/.bash_profile` to set up these environment variables in your environment.

3. Run the following commands on your Oozie server:

```
mkdir -p $OOZIE_DATA;chown -R $OOZIE_USER:$HADOOP_GROUP
$OOZIE_DATA;chmod -R 755 $OOZIE_DATA;
```

```
mkdir -p $OOZIE_LOG_DIR;chown -R $OOZIE_USER:$HADOOP_GROUP
$OOZIE_LOG_DIR;chmod -R 755 $OOZIE_LOG_DIR;
```

```
mkdir -p $OOZIE_PID_DIR;chown -R $OOZIE_USER:$HADOOP_GROUP
$OOZIE_PID_DIR;chmod -R 755 $OOZIE_PID_DIR;
```

```
mkdir -p $OOZIE_TMP_DIR;chown -R $OOZIE_USER:$HADOOP_GROUP
$OOZIE_TMP_DIR;chmod -R 755 $OOZIE_TMP_DIR;
```

```
mkdir /etc/oozie/conf/action-confchown -R $OOZIE_USER:
$HADOOP_GROUP $OOZIE_TMP_DIR;chmod -R 755 $OOZIE_TMP_DIR;
```

where:

- \$OOZIE\_DATA is the directory to store the Oozie data. For example, /hadoop/db/oozie.
- \$OOZIE\_LOG\_DIR is the directory to store the Oozie logs. For example, /var/log/oozie.
- \$OOZIE\_PID\_DIR is the directory to store the Oozie process ID. For example, /var/run/oozie.
- \$OOZIE\_TMP\_DIR is the directory to store the Oozie temporary files. For example, /var/tmp/oozie.
- \$OOZIE\_USER is the user owning the Oozie services. For example, oozie.
- \$HADOOP\_GROUP is a common group shared by services. For example, hadoop.

## 12.3. Set Up the Oozie Configuration Files

Hortonworks provides a set of configuration files that represent a working Oozie configuration. (See [Download Companion Files](#). You can use these files as a reference point, however, you need to modify them to match your own cluster environment.

If you choose to use the provided configuration files to set up your Oozie environment, complete the following steps to set up Oozie configuration files:

1. Extract the Oozie configuration files to a temporary directory. The files are located in the `configuration_files/oozie` directory where you decompressed the companion files.
2. Add the following property to the `oozie-log4j.properties` file:

```
log4j.appender.oozie.layout.ConversionPattern=%d{ISO8601} %5p
%c{1}:%L - SERVER[${oozie.instance.id}] %m%n
```

where `${oozie.instance.id}` is automatically determined by Oozie.

3. If you have custom Oozie actions, you must define them in `/etc/oozie/conf/oozie-site.xml`.
  - Edit the `/etc/oozie/conf/oozie-site.xml` file and add the following properties:

```
<property>
<name>oozie.service.SchemaService.wf.ext.schemas</name>
<value>[Comma separated list of custom actions]</value>
</property>
```

For example, if you have added Spark Action, enter the following:

```
<property>
<name>oozie.service.SchemaService.wf.ext.schemas</name>
<value>spark-action-0.1.xsd</value>
</property>
```

- Oozie runs a periodic purge on the shared library directory. The purge can delete libraries that are needed by jobs that started before the installation. To minimize the chance of job failures, you should extend the `oozie.service.ShareLibService.purge.interval` and `oozie.service.ShareLibService.temp.sharelib.retention.days` settings.

Add the following content to the `oozie-site.xml` file:

```
<property>
<name>oozie.service.ShareLibService.purge.interval</name>
<value>1000</value>
<description>
How often, in days, Oozie should check for old ShareLibs and LauncherLibs
to purge from HDFS.
</description>
</property>

<property>
<name>oozie.service.ShareLibService.temp.sharelib.retention.days</name>
<value>1000</value>
<description>
ShareLib retention time in days.
</description>
</property>
```

- Add the following property for Spark action configuration:

```
<property>
<name>oozie.service.SparkConfigurationService.spark.configuration</name>
<value>*/etc/spark/conf/</value>
</property>
```

Addition of this property requires that you to restart the Oozie server.

4. Modify the configuration files, based on your environment and database type as described in the following sections.

### 12.3.1. For Derby

In the temporary directory, locate the following file and modify the properties to match your current cluster environment.

Modify the following properties in the `oozie-site.xml` file:

```
<property>
 <name>oozie.base.url</name>
 <value>http://$oozie.full.hostname:11000/oozie</value>
 <description>Enter your Oozie server hostname.</description>
```

```
</property>

<property>
 <name>oozie.service.StoreService.jdbc.url</name>
 <value>jdbc:derby:$OOZIE_DATA_DIR/$soozie.db.schema.name-db;create=true</value>
</property>

<property>
 <name>oozie.service.JPIService.jdbc.driver</name>
 <value>org.apache.derby.jdbc.EmbeddedDriver</value>
</property>

<property>
 <name>oozie.service.JPIService.jdbc.driver</name>
 <value>org.apache.derby.jdbc.EmbeddedDriver</value>
</property>

<property>
 <name>oozie.service.JPIService.jdbc.username</name>
 <value>$OOZIE_DBUSER</value>
</property>

<property>
 <name>oozie.service.JPIService.jdbc.password</name>
 <value>$OOZIE_DBPASSWD</value>
</property>

<property>
 <name>oozie.service.WorkflowAppService.system.libpath</name>
 <value>/user/$OOZIE_USER/share/lib</value>
</property>
```

## 12.3.2. For MySQL

### 1. Install and start MySQL 5.x.

(See "Metastore Database Requirements" and "Installing and Configuring MySQL" in Chapter 1 of this guide.)

### 2. Create the Oozie database and Oozie MySQL user.

For example, using the MySQL `mysql` command-line tool:

```
$ mysql -u root -p
Enter password: *****

mysql> create database oozie;
Query OK, 1 row affected (0.03 sec)

mysql> grant all privileges on oozie.* to 'oozie'@'localhost' identified by
'oozie';
Query OK, 0 rows affected (0.03 sec)

mysql> grant all privileges on oozie.* to 'oozie'@'%' identified by 'oozie';
Query OK, 0 rows affected (0.03 sec)

mysql> exit
```

Bye

- The parameter "identified by 'oozie'" sets the password for the oozie user to use "oozie". Choose a secure password for this account and add it to the `oozie-site.xml` file under `oozie.service.JPAservice.jdbc.password`.
- Configure Oozie to use MySQL.

```
<property>
 <name>oozie.service.JPAservice.jdbc.driver</name>
 <value>com.mysql.jdbc.Driver</value>
</property>

<property>
 <name>oozie.service.JPAservice.jdbc.url</name>
 <value>jdbc:mysql://localhost:3306/oozie</value>
</property>

<property>
 <name>oozie.service.JPAservice.jdbc.username</name>
 <value>oozie</value>
</property>

<property>
 <name>oozie.service.JPAservice.jdbc.password</name>
 <value>oozie</value>
</property>
```



### Note

In the JDBC URL property, replace **localhost** with the hostname where MySQL is running.

- Add the MySQL JDBC driver JAR to Oozie:

Copy or symlink the MySQL JDBC driver JAR into the `/var/lib/oozie/` directory.



### Note

You must manually download the MySQL JDBC driver JAR file.

## 12.3.3. For PostgreSQL

(See "Metastore Database Requirements" and "Installing and Configuring PostgreSQL" in Chapter 1 of this guide.)

- Create the Oozie user and Oozie database. For example, using the PostgreSQL `psql` command-line tool:

```
$ psql -U postgres
Password for user postgres: *****
postgres=# CREATE ROLE oozie LOGIN ENCRYPTED PASSWORD 'oozie'
NOSUPERUSER INHERIT CREATEDB NOCREATEROLE;
CREATE ROLE

postgres=# CREATE DATABASE "oozie" WITH OWNER = oozie
```

```
ENCODING = 'UTF8'
TABLESPACE = pg_default
LC_COLLATE = 'en_US.UTF8'
LC_CTYPE = 'en_US.UTF8'
CONNECTION LIMIT = -1;
CREATE DATABASE

postgres=# \q
```

2. Configure PostgreSQL to accept network connections for the oozie user. Edit the PostgreSQL data/pg\_hba.conf file as follows:

```
host oozie oozie 0.0.0.0/0 md5
```

3. Reload the PostgreSQL configuration.

```
$ sudo -u postgres pg_ctl reload -s -D /opt/PostgreSQL/8.4/data
```

4. Configure Oozie to use PostgreSQL.

Edit the oozie-site.xml file as follows:

```
...
<property>
 <name>oozie.service.JPIService.jdbc.driver</name>
 <value>org.postgresql.Driver</value>
</property>

<property>
 <name>oozie.service.JPIService.jdbc.url</name>
 <value>jdbc:postgresql://localhost:5432/oozie</value>
</property>

<property>
 <name>oozie.service.JPIService.jdbc.username</name>
 <value>oozie</value>
</property>

<property>
 <name>oozie.service.JPIService.jdbc.password</name>
 <value>oozie</value>
</property>
```



### Note

In the JDBC URL property, replace **localhost** with the hostname where PostgreSQL is running. For PostgreSQL it is unnecessary to download and install the JDBC driver separately because the driver is license-compatible and bundled with Oozie.

## 12.3.4. For Oracle

(See "Metastore Database Requirements" in Chapter 1 of this guide for supported versions of Oracle. For instructions on how to install the Oracle database, see your third-party documentation.)

1. Install and start Oracle 11g.

## 2. Create the Oozie Oracle user.

For example, using the Oracle SQL\*Plus command-line tool:

```
$ sqlplus system@localhost
Enter password: *****
SQL> create user oozie identified by oozie default tablespace users
temporary tablespace temp;
User created.

SQL> grant all privileges to oozie;
Grant succeeded.

SQL> exit
$
```

## 3. Create an Oracle database schema for Oozie to use:

- a. Set `oozie.service.JPAService.create.db.schema` to **true** and set `oozie.db.schema.name=oozie`.
- b. Edit the `oozie-site.xml` file as follows:

```
<property>
 <name>oozie.service.JPAService.jdbc.driver</name>
 <value>oracle.jdbc.driver.OracleDriver</value>
</property>

<property>
 <name>oozie.service.JPAService.jdbc.url</name>
 <value>jdbc:oracle:thin:@localhost:1521:oozie</value>
</property>

<property>
 <name>oozie.service.JPAService.jdbc.username</name>
 <value>oozie</value>
</property>

<property>
 <name>oozie.service.JPAService.jdbc.password</name>
 <value>oozie</value>
</property>
```



### Note

In the JDBC URL property, replace **localhost** with the hostname where Oracle is running and replace **oozie** with the TNS name of the Oracle database.

## 4. Add the Oracle JDBC driver JAR to Oozie. Copy or symlink the Oracle JDBC driver JAR in the `/var/lib/oozie/` directory:

```
ln -s ojdbc6.jar /usr/hdp/current/oozie-server/lib
```



### Note

You must manually download the Oracle JDBC driver JAR file.

5. Modify the following properties in `oozie-env.sh` to match the directories created:

```
export JAVA_HOME=/usr/java/default
export OOZIE_CONFIG=${OOZIE_CONFIG:-/usr/hdp/2.6.0.0-$BUILD/oozie/conf}
export OOZIE_DATA=${OOZIE_DATA:-/var/db/oozie}
export OOZIE_LOG=${OOZIE_LOG:-/var/log/oozie}
export CATALINA_BASE=${CATALINA_BASE:-/usr/hdp/2.6.0.0-$BUILD/oozie}
export CATALINA_TMPDIR=${CATALINA_TMPDIR:-/var/tmp/oozie}
export CATALINA_PID=${CATALINA_PID:-/var/run/oozie/oozie.pid}
export OOZIE_CATALINA_HOME=/usr/lib/bigtop-tomcat
export OOZIE_CLIENT_OPTS="${OOZIE_CLIENT_OPTS} -Doozie.connection.retry.count=5"
export CATALINA_OPTS="${CATALINA_OPTS} -Xmx2048m -XX:MaxPermSize=256m"
export JAVA_LIBRARY_PATH=/usr/lib/hadoop/lib/native/Linux-amd64-64
```

6. On your Oozie server, create the config directory, copy the configuration files, and set the permissions:

```
rm -r $OOZIE_CONF_DIR;
mkdir -p $OOZIE_CONF_DIR;
```

7. Copy all the config files to `$OOZIE_CONF_DIR` directory.

8. Set appropriate permissions:

```
chown -R $OOZIE_USER:$HADOOP_GROUP $OOZIE_CONF_DIR/./ ;
chmod -R 755 $OOZIE_CONF_DIR/./ ;
```

where:

- `$OOZIE_CONF_DIR` is the directory to store Oozie configuration files. For example, `/etc/oozie/conf`.
- `$OOZIE_DATA` is the directory to store the Oozie data. For example, `/var/db/oozie`.
- `$OOZIE_LOG_DIR` is the directory to store the Oozie logs. For example, `/var/log/oozie`.
- `$OOZIE_PID_DIR` is the directory to store the Oozie process ID. For example, `/var/run/oozie`.
- `$OOZIE_TMP_DIR` is the directory to store the Oozie temporary files. For example, `/var/tmp/oozie`.
- `$OOZIE_USER` is the user owning the Oozie services. For example, `oozie`.
- `$HADOOP_GROUP` is a common group shared by services. For example, `hadoop`.

## 12.4. Configure Your Database for Oozie

Most of the configuration steps for your database for Oozie were performed in the previous section. However, you still need to create the `sqlfile` to create the tables in the database and validate that the configuration and `jdbc` are correct.



1. Run the following command as oozie user:

```
/usr/hdp/current/oozie-server/bin/ooziedb.sh create -sqlfile /
tmp/oozie.sql -run
```

## 12.5. Set up the Sharelib

1. Run the following command as oozie user:

```
cd /tmp
tar xzf /usr/hdp/${hdp_version}/oozie/oozie-sharelib.tar.gz
hadoop fs -put share /user/oozie
```

2. Add the two zip files from spark-client python to spark share lib:

```
a. hdfs dfs -put /usr/hdp/current/spark-client/python/lib/py4j-0.9-src.zip /
user/oozie/share/lib/lib_<timestamp>/spark
```

```
b. hdfs dfs -put /usr/hdp/current/spark-client/python/lib/pyspark.zip /user/
oozie/share/lib/lib_<timestamp>/spark
```

- c. Update the oozie share lib:

```
oozie admin -oozie http://oozie_server:11000/oozie -sharelibupdate
```

## 12.6. Validate the Installation

1. Start the Oozie server:

```
su -l oozie -c "/usr/hdp/current/oozie-server/bin/oozied.sh
start"
```

where oozie is the \$OOZIE\_User.

2. Confirm that you can browse to the Oozie server:

```
http://{oozie.full.hostname}:11000/oozie
```

3. Access the Oozie server with the Oozie client:

```
oozie admin -oozie http://$oozie.full.hostname :11000/oozie -
status
```

The following message is returned if your installation is valid:

```
System mode: NORMAL
```

### Next Steps

For example workflow templates, download the companion files, and use `\oozie_workflows`.

See the Apache website for more information about [Apache Oozie](#).

## 12.7. Stop and Start Oozie

Use the `/usr/hdp/current/oozie-server/bin/oozied.sh` script with the `start` parameter to start the Oozie server.

Use the `/usr/hdp/current/oozie-server/bin/oozied.sh` script with the `stop` parameter to stop the Oozie server.

## 13. Installing Apache Ranger

Apache Ranger delivers a comprehensive approach to security for a Hadoop cluster. It provides central security policy administration across the core enterprise security requirements of authorization, auditing, and data protection.

This chapter describes the manual installation process for Apache Ranger and the Ranger plug-ins in a Linux Hadoop environment. It includes information about the following steps:

- [Installation Prerequisites \[122\]](#)
- [Installing Policy Manager \[122\]](#)
- [Installing UserSync \[128\]](#)
- [Installing Ranger Plug-ins \[137\]](#)
- [Verifying the Installation \[174\]](#)

For information about Apache Ranger security, refer to the [HDP Security Features](#) of the *Hadoop Security Guide*.

For information about installing Ranger using Ambari, see [Installing Ranger Using Ambari](#).

For information about installing Ranger KMS, see [Installing Ranger KMS](#).

### 13.1. Installation Prerequisites

Before beginning Ranger installation, make sure the following software is already installed:

- Solr 5.2 or above
- Refer to the [HDP Release Notes](#) for information regarding supported operating systems.
- Refer to the [HDP Release Notes](#) for information regarding supported JDKs.
- Refer to the [HDP Release Notes](#) for information regarding supported databases.

If the database server is not installed at the same host, Ranger services need to have access to the database server host.

- If you plan to setup Ranger authorization to use LDAP/AD, refer to the [Setting Up Hadoop Group Mapping for LDAP/AD](#) in the *Hadoop Security Guide*.

### 13.2. Installing Policy Manager

This section describes how to perform the following administrative tasks:

1. Configure and install the Ranger Policy Manager
2. Start the Policy Manager service

## 13.2.1. Install the Ranger Policy Manager

1. Make sure the HDP 2.6.0 resource-based service is added to your site's list of available repositories.

If it has not yet been added, add it now by performing the following steps:

- For RHEL6/Centos6/Oracle LINUX 6:

```
wget -nv https://archive.cloudera.com/p/HDP/2.x/2.6.0.3/centos6/hdp.repo -
O /etc/yum.repos.d/hdp.repo
```

- For Ubuntu 12/14:

```
apt-get update wget https://archive.cloudera.com/p/HDP/2.x/2.6.0.3/
ubuntu12/hdp.list -O /etc/apt/sources.list.d/hdp.list
```

- For Debian:

```
apt-get update wget https://archive.cloudera.com/p/HDP/2.x/2.6.0.3/
debian<version>/2.x/GA/2.6.0.3/hdp.list -O /etc/apt/sources.list.d/hdp.
list
```

2. Find the Ranger Policy Admin software:

- a. For RHEL/Centos/Oracle LINUX:

```
yum search ranger
```

- b. For Ubuntu 12/14, Debian:

```
aptitude search ranger
```

3. Install the Ranger Policy Admin software:

```
yum install ranger-admin
```

4. `apt-get install <package_name>`

In the Ranger Policy Administration installation directory, update the `install.properties` file:

- Go to the installation directory:

```
cd /usr/hdp/<version>/ranger-admin/
```

- Edit the following `install.properties` entries:

**Table 13.1. install.properties Entries**

Configuration Property	Default/Example Value	Required?
<b>Ranger Policy Database</b>		
<b>DB_FLAVOR</b> Specifies the type of database used (MYSQL,ORACLE,POSTGRES,MSSQL)	MYSQL (default)	Y
<b>SQL_CONNECTOR_JAR</b> Path to SQL connector jar of the DB Flavor selected. The value should be the	/usr/share/java/mysql-connector-java.jar (default)	Y

Configuration Property	Default/Example Value	Required?
absolute path including the jar name.	/usr/share/java/postgresql.jar /usr/share/java/sqljdbc4.jar /usr/share/java/ojdbc6.jar	
<b>db_root_user</b> database username who has privileges for creating database schemas and users	root (default)	Y
<b>db_root_password</b> database password for the "db_root_user"	rootPassW0Rd	Y
<b>db_host</b> Hostname of the Ranger policy database server	localhost	Y
<b>db_name</b> Ranger Policy database name	ranger (default)	Y
<b>db_user</b> db username used for performing all policy mgmt operation from policy admin tool	rangeradmin (default)	Y
<b>db_password</b> database password for the "db_user"	RangerAdminPassW0Rd	Y
<b>Ranger Audit</b>		
audit_solr_urls	http://<solr_host>:8886/solr/ranger_audits	Y
audit_solr_user		Y
audit_solr_password		Y
audit_solr_zookeepers		Only required if SolrCloud is used.
<b>Policy Admin Tool Config</b>		
<b>polycmgr_external_url</b> URL used within Policy Admin tool when a link to its own page is generated in the Policy Admin Tool website	<i>http://localhost:6080</i> (default) <i>http://myexternalhost.xasecure.net:6080N</i>	
<b>polycmgr_http_enabled</b> Enables/disables HTTP protocol for downloading policies by Ranger plug-ins	true (default)	Y
<b>unix_user</b> UNIX user who runs the Policy Admin Tool process	ranger (default)	Y
<b>unix_group</b> UNIX group associated with the UNIX user who runs the Policy Admin Tool process	ranger (default)	Y
<b>Policy Admin Tool Authentication</b>		
<b>authentication_method</b>  Authentication Method used to log in to the Policy Admin Tool.  NONE: only users created within the Policy Admin Tool may log in  UNIX: allows UNIX userid authentication using the UNIX authentication service (see below)  LDAP: allows Corporate LDAP authentication (see below)  ACTIVE_DIRECTORY: allows authentication using an Active Directory	none (default)	Y

Configuration Property	Default/Example Value	Required?
<b>UNIX Authentication Service</b>		
<b>remoteLoginEnabled</b> Flag to enable/disable remote Login via Unix Authentication Mode	true (default)	Y, if UNIX authentication_method is selected
<b>authServiceHostName</b> Server Name (or ip-addresss) where ranger-usersync module is running (along with Unix Authentication Service)	localhost (default) myunixhost.domain.com	Y, if UNIX authentication_method is selected
<b>authServicePort</b> Port Number where ranger-usersync module is running Unix Authentication Service	5151 (default)	Y, if UNIX authentication_method is selected
<b>LDAP Authentication</b>		
<b>xa_ldap_url</b> URL for the LDAP service	ldap://<ldapServer>:389	Y, if LDAP authentication_method is selected
<b>xa_ldap_userDNpattern</b> LDAP DN Pattern used to uniquely locate the login user	uid={0},ou=users,dc=xasecure,dc=net	Y, if LDAP authentication_method is selected
<b>xa_ldap_groupSearchBase</b> LDAP Base node location to get all groups associated with login user	ou=groups,dc=xasecure,dc=net	Y, if LDAP authentication_method is selected
<b>xa_ldap_groupSearchFilter</b> LDAP search filter used to retrieve groups for the login user	(member=uid={0},ou=users,dc=xasecure,dc=net)	Y, if LDAP authentication_method is selected
<b>xa_ldap_groupRoleAttribute</b> Attribute used to retrieve the group names from the group search filters	cn	Y, if LDAP authentication_method is selected
<b>Active Directory Authentication</b>		
<b>xa_ldap_ad_domain</b> Active Directory Domain Name used for AD login	xasecure.net	Y, if ACTIVE_DIRECTORY authentication_method is selected
<b>xa_ldap_ad_url</b> Active Directory LDAP URL for authentication of user	ldap://ad.xasecure.net:389	Y, if ACTIVE_DIRECTORY authentication_method is selected

5. If you are using an SSL-enabled, MySQL database for Ranger, add the following properties to `install.properties`:

```
db_ssl_enabled=false
db_ssl_required=false
db_ssl_verifyServerCertificate=false
javax_net_ssl_keyStore=
javax_net_ssl_keyStorePassword=
javax_net_ssl_trustStore=
javax_net_ssl_trustStorePassword=
```

6. If Ranger Admin is SSL-enabled, add the following Ranger Admin SSL properties to the `install.properties` file. These properties secure the Ranger SSL password in the `jceks` file.

```
policymgr_https_keystore_file=<SSL keystore file path used to configure Ranger in SSL>
policymgr_https_keystore_keyalias=rangeradmin
policymgr_https_keystore_password=<SSL password used to create keystore>
```

7. If Unix-Auth and User-Sync service is SSL-enabled, add the following Ranger Unix-Auth SSL properties to the `install.properties` file:

```
ranger_unixauth_keystore=keystore.jks
ranger_unixauth_keystore_password=password
ranger_unixauth_truststore=cacerts
ranger_unixauth_truststore_password=changeit
```

8. The `RANGER_PID_DIR_PATH` property introduces a custom PID path for the Ranger Admin Process. To configure this property to start and stop the Ranger Admin service, add the following property to `install.properties`. The default value is `/var/run/ranger`.

```
RANGER_PID_DIR_PATH=/var/run/ranger
```

9. Check the `JAVA_HOME` environment variable. If it has not yet been set, enter:

```
export JAVA_HOME=<path of installed jdk version folder>
```

## 13.2.2. Install the Ranger Policy Administration Service

To install the Ranger Policy Administration service, run the following commands:

```
cd /usr/hdp/<version>/ranger-admin
```

```
./setup.sh
```

## 13.2.3. Start the Ranger Policy Administration Service

To start the Ranger Policy Administration service, enter the following command:

```
service ranger-admin start
```

To verify that the service started, visit the external URL specified in `install.properties` in browser; for example:

```
http://<host_address>:6080/
```



### Note

The default user is "admin" with a password of "admin". After login, change the password for "admin".

## 13.2.4. Configuring the Ranger Policy Administration Authentication Mode

The Ranger service also enables you to configure the authentication method that the Ranger Policy Administration component uses to authenticate users. There are three different authentication methods supported with Ranger, which include:

- Active Directory (AD)
- LDAP

- UNIX

Depending on which authentication method you choose, you will need to modify the following sample values in the `install.properties` file:

#### Active Directory

- `authentication_method=ACTIVE_DIRECTORY`
- `xa_ldap_ad_domain= example.com`
- `xa_ldap_ad_url=ldap://127.0.0.1:389`
- `xa_ldap_ad_base_dn=DC=example,DC=com`
- `xa_ldap_ad_bind_dn=CN=Administrator,CN=Users,DC=example,DC=com`
- `xa_ldap_ad_bind_password=PassW0rd`
- `xa_ldap_ad_referral=ignore, follow or throw. Default is follow.`

#### LDAP

- `authentication_method=LDAP`
- `xa_ldap_url=LDAP server URL (e.g. ldap://127.0.0.1:389)`
- `xa_ldap_userDNpattern=uid={0},ou=users,dc=example,dc=com`
- `xa_ldap_groupSearchBase=dc=example,dc=com`
- `xa_ldap_groupSearchFilter=(member=cn={0},ou=users,dc=example,dc=com`
- `xa_ldap_groupRoleAttribute=cn`
- `xa_ldap_base_dn=dc=example,dc=com`
- `xa_ldap_bind_dn=cn=ldapadmin,ou=users,dc=example,dc=com`
- `xa_ldap_bind_password=PassW0rd`
- `xa_ldap_referral=ignore, follow, or throw. Default is follow.`
- `xa_ldap_userSearchFilter=(uid={0})` property at Ranger-admin side

#### UNIX

- `authentication_method=UNIX`
- `remoteLoginEnabled=true`
- `authServiceHostName=` an address of the host where the UNIX authentication service is running.
- `authServicePort=5151`



## 13.2.5. Configuring Ranger Policy Administration High Availability

If you would like to enable high availability for the Ranger Policy Administration component, you can configure the component by following the steps listed below.

1. Install the Ranger Admin component on the hosts you wish to use.



### Note

Make sure you use the same configuration and policy database settings for each host, otherwise, you will be unable to configure HA for the hosts.

2. Configure a load balancer to balance the loads among the various Ranger Admin instances and take note of the load balancer URL.



### Note

Describing the steps you need to follow in order to install and configure a load balancer is not in the scope of this book.

3. Update the Policy Manager external URL in all Ranger Admin clients (Ranger UserSync and Ranger plug-ins) to point to the load balancer URL.

## 13.3. Installing UserSync

In this section:

- [Using the LDAP Connection Check Tool \[128\]](#)
- [Install UserSync and Start the Service \[134\]](#)

### 13.3.1. Using the LDAP Connection Check Tool

The LDAP Connection Check tool is a command line tool that helps Ranger administrators configure LDAP properties for the UserSync module. The tool collects minimal input from the administrator about the LDAP/AD server and discovers various properties for users and groups in order to successfully pull only targeted Users and Groups from the LDAP/AD server. It provides options such as discovering/verifying UserSync-related properties as well as authentication properties, generating install properties for manual installation, etc. Once all of the required properties have been discovered and tested, these properties can be applied to the Ranger configuration during Ambari or non-Ambari cluster installation.

The LDAP Connection tool can be accessed in the `/usr/hdp/current/ranger-usersync/ldaptool` directory.

#### 13.3.1.1. LDAP Connection Check Tool Parameters

You can use the `./run.sh -h` command to list the LDAP Connection Check tool parameters:

```
cd /usr/hdp/current/ranger-usersync/ldaptool
./run.sh -h
usage: run.sh
 -noauth ignore authentication properties
 -d <arg> {all|users|groups}
 -h show help.
 -i <arg> Input file name
 -o <arg> Output directory
 -r <arg> {all|users|groups}
```

All these parameters are optional.

- If “-i” (for input file) is not specified, the tool will fall back to the CLI option for collecting values for mandatory properties.
- if “-o” (for output directory) is not specified, the tool will write all of the output files to the `/usr/hdp/current/ranger-usersync/ldaptool/output` directory.
- if “-noauth” (for ignoring authentication) is not specified, the tool will discovery and verify authentication-related properties.
- if “-d” (for discovering usersync properties) is not specified, the tool will default to discovering all of the usersync-related properties.
- if “-r” (for retrieving users and/or groups) is not specified, the tool will fallback to the “-d” option.

### 13.3.1.2. Input Properties

In order to discover the usersync and authentication related properties, the LDAP Connection Check tool collects some mandatory information as part of the input properties. These mandatory properties include:

- `ranger.usersync.ldap.url` (<ldap or ldaps>://<server ip/fqdn>:<port>)
- `ranger.usersync.ldap.binddn` (ldap user like AD user or ldap admin user)
- `ranger.usersync.ldap.bindpassword` (user password or ldap admin password)
- `ranger.usersync.ldap.user.searchbase` (Mandatory only for non AD environment)
- `ranger.usersync.ldap.user.searchfilter` (Mandatory only for non AD environment)
- `ranger.admin.auth.sampleuser` (Mandatory only for discovering authentication properties)
- `ranger.admin.auth.samplepassword` (Mandatory only for discovering authentication properties)

1. Modify the `input.properties` file provided as part of the tool installation and provide that file (with the complete path as the command line argument while running the tool).
2. Use the CLI to input the values for these mandatory properties.

The CLI option is provided to the user when the input file is not provided as the command line option (`-i <arg>`) while running the tool. Once the values are collected from the CLI,

these values are stored in the `input.properties` file (in the `conf` dir of the installation folder) for later use.

The following is the CLI provided by the tool when input file is not specified. The tool provides two options for collecting values for these mandatory properties:

```
Ldap url [ldap://ldap.example.com:389]:
Bind DN [cn=admin,ou=users,dc=example,dc=com]:
Bind Password:
User Search Base [ou=users,dc=example,dc=com]:
User Search Filter [cn=user1]:
Sample Authentication User [user1]:
Sample Authentication Password:
```



### Note

In order to use secure LDAP, the Java default truststore must be updated with the server's self signed certificate or the CA certificate for validating the server connection. The truststore should be updated before running the tool.

### 13.3.1.3. Discovery of UserSync Properties

Usersync-related properties are divided into two categories: User search related properties and group search related properties. This tool provides a `-d` option to discover user related and group related properties separately or all at once. The discover properties option is used as follows:

```
./run.sh -d <arg>
```

where `<arg>` can be

- `all`: discover all of the properties at once or
- `users`: discover only user search related properties or
- `groups`: discover only group search related properties

These properties are discovered based on the values provided in the input file for all of the mandatory properties.

The following are the user search related properties that are discovered using this tool:

#### 1. Basic properties:

- `ranger.usersync.ldap.user.objectclass`
- `ranger.usersync.ldap.user.groupnameattribute`
- `ranger.usersync.ldap.user.nameattribute`

#### 2. Advanced properties:

- `ranger.usersync.ldap.user.searchbase`
- `ranger.usersync.ldap.user.searchfilter`

Group search related properties that are discovered by this tool are as follows:

1. Basic properties:
  - ranger.usersync.group.searchenabled
  - ranger.usersync.group.objectclass
  - ranger.usersync.group.memberattributename
  - ranger.usersync.group.nameattribute
2. Advanced properties:
  - ranger.usersync.group.searchbase
  - ranger.usersync.group.searchfilter

Once all of the properties are discovered, the tool also retrieves the total count and details of first 20 users and/or groups and displays them in the output.

1. The value for the user search base is derived as the OU with max. no of users (from the first 20 users that are retrieved).
2. The value for the user search filter is derived as <user name attribute>=\*
3. The value for the group search base is derived as the OU with max. no of groups (from the first 20 retrieved groups).
4. The value for the group search filter is derived as <group name attribute>=\*

### 13.3.1.4. Discovery of Authentication Properties

The LDAP Connection Check tool provides a `-noauth` option to skip discovery of authentication properties. When this option is used, the tool will not suggest the values for authentication related properties.

```
./run.sh -noauth
```

If the LDAP server is of type active directory, the following properties are suggested:

- ranger.authentication.method
- ranger.ldap.ad.domain

If the LDAP server is not an active directory, the following properties are suggested:

- ranger.authentication.method
- ranger.ldap.user.dnpattern
- ranger.ldap.group.roleattribute
- ranger.ldap.group.searchbase
- ranger.ldap.group.searchfilter

These authentication properties can be discovered either by providing the values in the input file for only mandatory properties, or for all of the user and/or group related

properties. After discovering the authentication properties, the tool also validates those properties by authenticating the given user, and reports authentication success or failure in the output.

### 13.3.1.5. Retrieval of Users and Groups

Usersync-related properties are divided into two categories: User search related properties and group search related properties. This tool provides a `-d` option to discover user related and group related properties separately or all at once. The discover properties option is used as follows:

```
./run.sh -r <arg>
```

where `<arg>` can be

- `users` : retrieve the total count and details of the first 20 users and associated groups, given the user search related properties in the input file.
- `groups` : retrieve the total count and details of the first 20 groups and associated users, given the group search related properties in the input file.
- `all` : retrieve both users and groups, given all of the corresponding properties in the input file.

### 13.3.1.6. Output Directory Content

This tool generates three files in the output directory specified with the `-o` option, or by default to the `/usr/hdp/current/ranger-usersync/ldaptool/output` directory.

- `ambari.properties`
- `install.properties`
- `ldapConfigCheck.log`

All of the discovered properties (related to usersync and/or authentication) are written to both the `ambari.properties` and `install.properties` files with the corresponding property names.

All of the other information, such as any retrieved users/groups, total count, authentication result, etc. are written to the `ldapConfigCheck.log` file. This log file also contains any errors or warnings generated while running the tool.

### 13.3.1.7. Other UserSync Related Properties

Some of the other usersync-related properties that are used by the tool and left with default values are:

- `ranger.usersync.ldap.authentication.mechanism` - Default authentication mechanism used is "simple".
- `ranger.usersync.pagedresultsenabled` - Default is set to "true".
- `ranger.usersync.pagedresultssize` - Default value for this property is "500". This value can be tweaked depending on the bandwidth and resource availability in the deployment.

- `ranger.usersync.ldap.username.caseconversion` - Default value is set to "lower"
- `ranger.usersync.ldap.groupname.caseconversion` - Default value is set to "lower"
- `ranger.usersync.ldap.user.searchscope` - Default is set to "sub". This value can be set to either "base" or "one" depending on how the user search is to be performed.
- `ranger.usersync.group.searchscope` - Default is set to "sub". This value can be set to either "base" or "one" depending on how the group search is to be performed.

The following are the remaining usersync-related properties. These properties are not currently used by the tool and the values are left empty in the input file.

- `ranger.usersync.credstore.filename` - this property is unused as the tool supports only cleartext password.
- `ranger.usersync.ldap.bindalias` - this property is also not used by the tool.
- `ranger.usersync.ldap.searchBase` - This property is used as the user search base or group search base when they are not configured. Hence this value is left blank and not used by the tool.
- `ranger.usersync.group.usermapsyncenabled` - Mainly used for computing group memberships while retrieving users. Currently this value is set to "true", but is not used by the tool.

### 13.3.1.8. Assumptions

Some properties are assumed to have one or more values as follows:

- User name attribute : "sAMAccountName" , "uid" , "cn"
- User Object class value : "person" , "posixAccount"
- User group member attribute : "memberOf" , "ismemberOf"
- Group Object class : "group" , "groupOfNames" , "posixGroup"
- Group name attribute : "distinguishedName" , "cn"
- Group member attribute : "member" , "memberUid"

### 13.3.1.9. Sample input.properties File

```
Mandatory ldap configuration properties.
ranger.usersync.ldap.url=
ranger.usersync.ldap.binddn=
ranger.usersync.ldap.ldapbindpassword=

Mandatory only for openLdap
ranger.usersync.ldap.user.searchbase=
ranger.usersync.ldap.user.searchfilter=

For verifying authentication please provide sample username and password
ranger.admin.auth.sampleuser=
ranger.admin.auth.samplepassword=
```

```
Optional properties will be determined based on the above search
User attributes
ranger.usersync.ldap.user.nameattribute=
ranger.usersync.ldap.user.objectclass=
ranger.usersync.ldap.user.groupnameattribute=

Group attributes
ranger.usersync.group.searchenabled=false
ranger.usersync.group.memberattributename=
ranger.usersync.group.nameattribute=
ranger.usersync.group.objectclass=
ranger.usersync.group.searchbase=
ranger.usersync.group.searchfilter=

Other UserSync related attributes
ranger.usersync.ldap.authentication.mechanism=simple
ranger.usersync.pagedresultsenabled=true
ranger.usersync.pagedresultssize=500
ranger.usersync.ldap.username.caseconversion=lower
ranger.usersync.ldap.groupname.caseconversion=lower
ranger.usersync.ldap.user.searchscope=sub
ranger.usersync.group.searchscope=sub

ranger.usersync.credstore.filename=
ranger.usersync.ldap.bindalias=
ranger.usersync.ldap.searchBase=
ranger.usersync.group.usermapsyncenabled=false

Authentication properties
ranger.authentication.method=
ranger.ldap.ad.domain=
ranger.ldap.user.dnpattern=
ranger.ldap.group.roleattribute=
ranger.ldap.group.searchbase=
ranger.ldap.group.searchfilter=
```

## 13.3.2. Install UserSync and Start the Service



### Important

To ensure that LDAP/AD group level authorization is enforced in Hadoop, you should [set up Hadoop group mapping for LDAP/AD](#).

To install Ranger UserSync and start the service, do the following:

1. Find the Ranger UserSync software:

```
yum search usersync
```

or

```
yum list | grep usersync
```

2. Install Ranger UserSync:



### Note

Make sure the database on which Ranger will be installed is up and running.

```
yum install ranger_<version>-usersync.x86_64
```

3. At the Ranger UserSync installation directory, update the following properties in the `install.properties` file:

**Table 13.2. Properties to Update in the `install.properties` File**

Configuration Property Name	Default/Example Value	Required?
<b>Policy Admin Tool</b>		
<b>POLICY_MGR_URL</b> URL for policy admin	<code>http://policymanager.xasecure.net:6080</code>	Y
<b>User Group Source Information</b>		
<b>SYNC_SOURCE</b> Specifies where the user/group information is extracted to be put into Ranger database. unix - get user information from /etc/passwd file and gets group information from /etc/group file ldap - gets user information from LDAP service (see below for more information)	unix	N
<b>SYNC_INTERVAL</b> Specifies the interval (in minutes) between synchronization cycle. Note, the 2nd sync cycle will NOT start until the first sync cycle is COMPLETE.	5	N
<b>UNIX user/group Synchronization</b>		
<b>MIN_UNIX_USER_ID_TO_SYNC</b> Userid below this parameter values will not be synchronized to Ranger user database	300 (Unix default), 1000 (LDAP default)	Mandatory if SYNC_SOURCE is selected as unix
<b>LDAP user/group synchronization</b>		
<b>SYNC_LDAP_URL</b> URL of source ldap	<code>ldap://ldap.example.com:389</code>	Mandatory if SYNC_SOURCE is selected as ldap
<b>SYNC_LDAP_BIND_DN</b> ldap bind dn used to connect to ldap and query for users and groups	<code>cn=admin,ou=users,dc=hadoop,dc=apache,dc=org</code>	Mandatory if SYNC_SOURCE is selected as ldap
<b>SYNC_LDAP_BIND_PASSWORD</b> ldap bind password for the bind dn specified above	LdapAdminPassW0rd	Mandatory if SYNC_SOURCE is selected as ldap
<b>CRED_KEYSTORE_FILENAME</b> Location of the file where encrypted password is kept	<code>/usr/lib/xausersync/.jceks/xausersync.jceks (default) /etc/ranger/usersync/.jceks/xausersync.jceks</code>	Mandatory if SYNC_SOURCE is selected as ldap
<b>SYNC_LDAP_USER_SEARCH_BASE</b> Search base for users	<code>ou=users,dc=hadoop,dc=apache,dc=org</code>	Mandatory if SYNC_SOURCE is selected as ldap
<b>SYNC_LDAP_USER_SEARCH_SCOPE</b> Search scope for the users, only base, one, and sub are supported values	sub (default)	N
<b>SYNC_LDAP_USER_OBJECT_CLASS</b> objectclass to identify user entries	person (default)	N (defaults to person)
<b>SYNC_LDAP_USER_SEARCH_FILTER</b> Optional additional filter constraining the users selected for syncing	<code>(dept=eng)</code>	N (defaults to an empty string)
<b>SYNC_LDAP_USER_NAME_ATTRIBUTE</b> Attribute from user	cn (default)	N (defaults to cn)



Configuration Property Name	Default/Example Value	Required?
entry that would be treated as user name		
<b>SYNC_LDAP_USER_GROUP_NAME_ATTRIBUTE</b> attribute from user entry whose values would be treated as group values to be pushed into Policy Manager database. You can provide multiple attribute names separated by comma	memberof,ismemberof (default)	N (defaults to memberof, ismemberof)
<b>SYNC_LDAP_SEARCH_BASE</b>	Default is False.  dc=example,de=com	N
<b>SYNC_GROUP_SEARCH_ENABLED</b>	Default is False.  If set to True, and <b>SYNC_GROUP_USER_MAP_SYNC_ENABLED</b> is also set to True, you must set the following properties:  <pre> SYNC_GROUP_SEARCH_BASE=ou= People,dc=example,dc=com SYNC_GROUP_SEARCH_SCOPE=sub SYNC_GROUP_OBJECT_CLASS= groupofnames SYNC_LDAP_GROUP_SEARCH_FILTER= SYNC_GROUP_NAME_ATTRIBUTE=cn SYNC_GROUP_MEMBER_ATTRIBUTE_NAME= member SYNC_PAGED_RESULTS_ENABLED=true SYNC_PAGED_RESULTS_SIZE= 500RANGER_ SYNC_LDAP_REFERRAL=follow, ignore </pre>	N
<b>User Synchronization</b>		
<b>unix_user</b> UNIX User who runs the ranger-usersync process	ranger (default)	Y
<b>unix_group</b> UNIX group associated with Unix user who runs the ranger-usersync process	ranger (default)	Y
<b>SYNC_LDAP_USERNAME_CASE_CONVERSION</b> Convert all username to lower/upper case none - no conversation will be done. Kept as it is in the SYNC_SOURCE lower - convert it to lower case when saving it to ranger db upper - convert it to upper case when saving it to ranger db	lower (default)	N (defaults to lower)
<b>SYNC_LDAP_GROUPNAME_CASE_CONVERSION</b> Convert all username to lower/upper case none - no conversation will be done. Kept as it is in the SYNC_SOURCE lower - convert it to lower case when saving it to ranger db upper - convert it to upper case when saving it to ranger db	lower (default)	N (defaults to lower)
<b>logdir</b> Location of the log directory where the usersync logs are stored	logs (default)	Y

4. Add the following property to the `install.properties` file to set the base directory for the Ranger Usersync process:

```
ranger_base_dir=/etc/ranger
```

5. Add the following properties to the `install.properties` file to set SSL configurations for Ranger Usersync:

```
AUTH_SSL_ENABLED=false
AUTH_SSL_KEYSTORE_FILE=/etc/ranger/usersync/conf/cert/unixauthservice.jks
AUTH_SSL_KEYSTORE_PASSWORD=UnIx529p
AUTH_SSL_TRUSTSTORE_FILE=
AUTH_SSL_TRUSTSTORE_PASSWORD=
```

6. Add the following property to the `install.properties` file to configure the Ranger Usersync PID directory to start and stop the Ranger Usersync service:

```
USERSYNC_PID_DIR_PATH=/var/run/ranger
```

7. Set the Policy Manager URL to `http://<ranger-admin-host>:6080`
8. Check the `JAVA_HOME` environment variable. If `JAVA_HOME` has not yet been set, enter:

```
export JAVA_HOME=<path of installed jdk version folder>
```

9. Install the Ranger UserSync service:

```
cd /usr/hdp/<version>/ranger-usersync
```

```
./setup.sh
```

10. Start the Ranger UserSync service:

```
service ranger-usersync start
```

11. To verify that the service was successfully started, wait 6 hours for LDAP/AD to synchronize, then do the following:

- Go to

```
http://<ranger-admin-host>:6080
```

- Click the Users/Group tab. See if users and groups are synchronized.
- Add a UNIX/LDAP/AD user, then check for the presence of that user in the Ranger Admin tab.

## 13.4. Installing Ranger Plug-ins

The following sections describe how to install Ranger plug-ins.



### Note

To ensure that you are installing the HDP version of the plug-ins instead of the Apache version, make sure you enter the following commands when installing each plug-in:

- For CentOS and RHEL:

```
yum install ranger_ <version_number>
```

- For SLES:

```
zypper -n --no-gpg-checks install --auto-agree-with-licenses
ranger_ <version_number>
```

- For Debian/Ubuntu:

```
apt-get install <version_number>
```

- Set up the JAVA\_HOME environment variable to point to Java distribution on the installation machine.

```
export JAVA_HOME=location-of-java-home-on-the-machine
```

- Edit the `install.properties` file in the `ranger-tagsync-install` directory to support the operational environment.
- Keeping in mind the following two guidelines, edit the `install.properties` file in the `ranger-tagsync-install` directory to add Audit to solr properties:
  - You must configure the `XAAUDIT.SOLR.URL` property based on your Solr installation. See `http://<solr_host>:8886/solr/ranger_audits` for details.
  - You must configure the `XAAUDIT.SOLR.ZOOKEEPER` property to `NONE`, if you are using stand alone Solr. or `<zk1>:2181,<zk2>:2181/ranger_audits`, using the correct zookeeper URL, if you are using SolrCloud.

```
XAAUDIT.SOLR.ENABLE=true
XAAUDIT.SOLR.URL=http://<solr_host>:8886/solr/ranger_audits
XAAUDIT.SOLR.USER=NONE
XAAUDIT.SOLR.PASSWORD=NONE
XAAUDIT.SOLR.ZOOKEEPER=NONE
XAAUDIT.SOLR.FILE_SPOOL_DIR=/var/log/hadoop/hdfs/audit/solr/spool
```

### 13.4.1. Installing the Ranger HDFS Plug-in

The Ranger HDFS plug-in helps to centralize HDFS authorization policies.

This section describes how to create an HDFS resource-based service and install the HDFS plug-in.

#### Install the HDFS Plug-in

1. Create an HDFS resource-based service in the Ranger Policy Manager. To do this, complete the HDFS Create Service screen, as described in the [Configure an HDFS Service](#) section of the *Hadoop Security Guide*.

Make a note of the name you gave to this resource-based service; you will need to use it again during HDFS plug-in setup.

2. At all servers where NameNode is installed, install the HDFS plug-in by following the steps listed below:
  - a. Go to the home directory of the HDFS plug-in:

```
cd /usr/hdp/<version>/ranger-hdfs-plugin
```

- b. Edit the following HDFS-related properties in the install.properties file:

**Table 13.3. Properties to Edit in the install.properties File**

Configuration Property Name	Default/Example Value	Required?
<b>Policy Admin Tool</b>		
<b>POLICY_MGR_URL</b> URL for policy admin	http:// policymanager.xasecure.net:6080	Y
<b>REPOSITORY_NAME</b> The repository name used in Policy Admin Tool for defining policies	hadoopdev	Y
<b>Audit Database</b>		
<b>SQL_CONNECTOR_JAR</b> Path to SQL connector jar of the DB Flavor selected. The value should be the absolute path including the jar name.	/usr/share/java/mysql-connector-java.jar (default)  /usr/share/java/postgresql.jar  /usr/share/java/sqljdbc4.jar  /usr/share/java/ojdbc6.jar	Y
<b>HDFS Audit</b>		
<b>XAAUDIT.HDFS.IS_ENABLED</b> Flag to enable/disable hdfs audit logging. If the hdfs audit logging is turned off, it will not log any access control to hdfs		Y
<b>XAAUDIT.HDFS.DESTINATION_DIRECTORY</b> HDFS directory where the audit log will be stored	hdfs:// __REPLACE__NAME_NODE_HOST:8020/ (format) hdfs:// namenode.mycompany.com:8020/ ranger/audit/%app-type%/ %time:yyyyMMdd%	Y
<b>XAAUDIT.HDFS.LOCAL_BUFFER_DIRECTORY</b> Local directory where the audit log will be saved for intermediate storage	hdfs:// __REPLACE__NAME_NODE_HOST:8020/ (format) /var/log/%app-type%/ audit	Y
<b>XAAUDIT.HDFS.LOCAL_ARCHIVE_DIRECTORY</b> Local directory where the audit log will be archived after it is moved to hdfs	__REPLACE__LOG_DIR%app-type %/audit/archive (format) /var/log/ %app-type%/audit/archive	Y
<b>XAAUDIT.HDFS.DESTINATION_FILE</b> hdfs audit file name (format)	%hostname%-audit.log (default)	Y
<b>XAAUDIT.HDFS.DESTINATION_FLUSH_INTERVAL_SECONDS</b> hdfs audit log file writes are flushed to HDFS at regular flush interval	900	Y
<b>XAAUDIT.HDFS.DESTINATION_ROLLOVER_INTERVAL_SECONDS</b> hdfs audit log file is rotated to write to a new file at a rollover interval specified here	86400	Y

Configuration Property Name	Default/Example Value	Required?
<b>XAAUDIT.HDFS.DESTINATION_OPEN_RETRY_INTERVAL_SECONDS</b> hdfs audit log open() call is failed, it will be re-tried at this interval	60	Y
<b>XAAUDIT.HDFS.LOCAL_BUFFER_FILE</b> Local filename used to store in audit log (format)	%time:yyyyMMdd-HHmm.ss%.log (default)	Y
<b>XAAUDIT.HDFS.LOCAL_BUFFER_FLUSH_INTERVAL_SECONDS</b> Local audit log file writes are flushed to filesystem at regular flush interval	60	Y
<b>XAAUDIT.HDFS.LOCAL_BUFFER_ROLLOVER_INTERVAL_SECONDS</b> Local audit log file is rotated to write to a new file at a rollover interval specified here	600	Y
<b>XAAUDIT.HDFS.LOCAL_ARCHIVE_MAX_FILE_COUNT</b> The maximum number of local audit log files that will be kept in the archive directory	10	Y
<b>XAAUDIT.SOLR.ENABLE</b>	true	Y
<b>XAAUDIT.SOLR.URL</b>	http://<solr_host>:8886/solr/ranger_audits	Y
<b>SSL Information (https connectivity to Policy Admin Tool)</b>		
<b>SSL_KEYSTORE_FILE_PATH</b> Java Keystore Path where SSL key for the plug-in is stored. Is used only if SSL is enabled between Policy Admin Tool and Plugin; If SSL is not Enabled, leave the default value as it is - do not set as EMPTY if SSL not used	/etc/hadoop/conf/ranger-plugin-keystore.jks (default)	Only if SSL is enabled
<b>SSL_KEYSTORE_PASSWORD</b> Password associated with SSL Keystore. Is used only if SSL is enabled between Policy Admin Tool and Plugin; If SSL is not Enabled, leave the default value as it is - do not set as EMPTY if SSL not used	none (default)	Only if SSL is enabled
<b>SSL_TRUSTSTORE_FILE_PATH</b> Java Keystore Path where the trusted certificates are stored for verifying SSL connection to Policy Admin Tool. Is used only if SSL is enabled between Policy Admin Tool and Plugin; If SSL is not Enabled, leave the default value as it is - do not set as EMPTY if SSL not used	/etc/hadoop/conf/ranger-plugin-truststore.jks (default)	Only if SSL is enabled
<b>SSL_TRUSTSTORE_PASSWORD</b> Password associated with Truststore file. Is used only if SSL is enabled between Policy Admin Tool and Plugin; If SSL is not Enabled, leave the default value as it is - do not set as EMPTY if SSL not used	none (default)	Only if SSL is enabled

3. To enable the HDFS plug-in, run the following commands:

```
cd /usr/hdp/<version>/ranger-hdfs-plugin
```

```
./enable-hdfs-plugin.sh
```

4. To restart the service, issue the following commands:

```
su hdfs -c "/usr/hdp/current/hadoop-client/sbin/hadoop-daemon.sh stop namenode"
su hdfs -c "/usr/hdp/current/hadoop-client/sbin/hadoop-daemon.sh start namenode"
```

5. To confirm that installation and configuration are complete, go to the Audit Tab of the Ranger Admin Console and check Plugins. You should see HDFS listed there.

## 13.4.2. Installing the Ranger YARN Plug-in

This section describes how to install and enable the Ranger YARN plug-in.

1. The Ranger YARN plug-in is automatically installed when YARN is installed. You can verify this plug-in is present by using the following command:

```
rpm -qa | grep yarn-plugin
ranger_2_4_0_0_2950-yarn-plugin-0.5.0.2.6.0.0-2950.el6.x86_64
```

2. Navigate to `/usr/hdp/<version>/ranger-yarn-plugin`.

```
cd /usr/hdp/<version>/ranger-yarn-plugin
```

3. Edit the following entries in the `install.properties` file.

**Table 13.4. Properties to Edit in the `install.properties` File**

Configuration Property Name	Default/Example Value	Required?
<b>Policy Admin Tool</b>		
<b>POLICY_MGR_URL</b> URL for policy admin	http://<FQDN of ranger admin host>:6080	Y
<b>REPOSITORY_NAME</b> The repository name used in Policy Admin Tool for defining policies	yarndev	Y
<b>Audit Database</b>		
<b>SQL_CONNECTOR_JAR</b> Path to SQL connector jar of the DB Flavor selected. The value should be the absolute path including the jar name.	/usr/share/java/mysql-connector-java.jar (default) /usr/share/java/postgresql.jar /usr/share/java/sqljdbc4.jar /usr/share/java/ojdbc6.jar	Y
<b>XAAUDIT.DB.IS_ENABLED</b> Enable or disable database audit logging.	FALSE (default), TRUE	Y
<b>XAAUDIT.DB.FLAVOUR</b> Specifies the type of database used for audit logging (MYSQL,ORACLE)	MYSQL (default)	Y
<b>XAAUDIT.DB.HOSTNAME</b> Hostname of the audit database server	localhost	Y
<b>XAAUDIT.DB.DATABASE_NAME</b> Audit database name	ranger_audit	Y

Configuration Property Name	Default/Example Value	Required?
<b>XAAUDIT.DB.USER_NAME</b> Username used for performing audit log inserts (should be same username used in the ranger-admin installation process)	rangerlogger	Y
<b>XAAUDIT.DB.PASSWORD</b> Database password associated with the above database user - for db audit logging	rangerlogger	Y
<b>HDFS Audit</b>		
<b>XAAUDIT.HDFS.IS_ENABLED</b> Flag to enable/disable hdfs audit logging. If the hdfs audit logging is turned off, it will not log any access control to hdfs		Y
<b>XAAUDIT.HDFS.DESTINATION_DIRECTORY</b> HDFS directory where the audit log will be stored	hdfs:// __REPLACE__NAME_NODE_HOST:8020/ (format) hdfs:// namenode.mycompany.com:8020/ ranger/audit/%app-type%/ %time:yyyyMMdd%	Y
<b>XAAUDIT.HDFS.LOCAL_BUFFER_DIRECTORY</b> Local directory where the audit log will be saved for intermediate storage	hdfs:// __REPLACE__NAME_NODE_HOST:8020/ (format) /var/log/%app-type%/ audit	Y
<b>XAAUDIT.HDFS.LOCAL_ARCHIVE_DIRECTORY</b> Local directory where the audit log will be archived after it is moved to hdfs	__REPLACE__LOG_DIR%app-type %/audit/archive (format) /var/log/ %app-type%/audit/archive	Y
<b>XAAUDIT.HDFS.DESTINATION_FILE</b> hdfs audit file name (format)	%hostname%-audit.log (default)	Y
<b>XAAUDIT.HDFS.DESTINATION_FLUSH_INTERVAL_SECONDS</b> hdfs audit log file writes are flushed to HDFS at regular flush interval	900	Y
<b>XAAUDIT.HDFS.DESTINATION_ROLLOVER_INTERVAL_SECONDS</b> hdfs audit log file is rotated to write to a new file at a rollover interval specified here	86400	Y
<b>XAAUDIT.HDFS.DESTINATION_OPEN_RETRY_INTERVAL_SECONDS</b> hdfs audit log open() call is failed, it will be re-tried at this interval	60	Y
<b>XAAUDIT.HDFS.LOCAL_BUFFER_FILE</b> Local filename used to store in audit log (format)	%time:yyyyMMdd-HH:mm:ss%.log (default)	Y
<b>XAAUDIT.HDFS.LOCAL_BUFFER_FLUSH_INTERVAL_SECONDS</b> Local audit log file writes are flushed to filesystem at regular flush interval	60	Y
<b>XAAUDIT.HDFS.LOCAL_BUFFER_ROLLOVER_INTERVAL_SECONDS</b> Local audit log file is rotated to write to a new file at a rollover interval specified here	600	Y
<b>XAAUDIT.HDFS.LOCAL_ARCHIVE_MAX_FILE_COUNT</b> The maximum number of local audit log files that will be kept in the archive directory	10	Y

Configuration Property Name	Default/Example Value	Required?
<b>XAAUIDT.SOLR.ENABLE</b>	true	Y
<b>XAAUDIT.SOLR.URL</b>	http://<solr_host>:8886/solr/ranger_audits	Y
<b>SSL Information (https connectivity to Policy Admin Tool)</b>		
<b>SSL_KEYSTORE_FILE_PATH</b> Java Keystore Path where SSL key for the plug-in is stored. Is used only if SSL is enabled between Policy Admin Tool and Plugin; If SSL is not Enabled, leave the default value as it is - do not set as EMPTY if SSL not used	/etc/hadoop/conf/ranger-plugin-keystore.jks (default)	Only if SSL is enabled
<b>SSL_KEYSTORE_PASSWORD</b> Password associated with SSL Keystore. Is used only if SSL is enabled between Policy Admin Tool and Plugin; If SSL is not Enabled, leave the default value as it is - do not set as EMPTY if SSL not used	none (default)	Only if SSL is enabled
<b>SSL_TRUSTSTORE_FILE_PATH</b> Java Keystore Path where the trusted certificates are stored for verifying SSL connection to Policy Admin Tool. Is used only if SSL is enabled between Policy Admin Tool and Plugin; If SSL is not Enabled, leave the default value as it is - do not set as EMPTY if SSL not used	/etc/hadoop/conf/ranger-plugin-truststore.jks (default)	Only if SSL is enabled
<b>SSL_TRUSTSTORE_PASSWORD</b> Password associated with Truststore file. Is used only if SSL is enabled between Policy Admin Tool and Plugin; If SSL is not Enabled, leave the default value as it is - do not set as EMPTY if SSL not used	none (default)	Only if SSL is enabled

4. Enable the YARN plug-in by running the following commands:

```
export JAVA_HOME=/usr/lib/jvm/java-1.7.0-openjdk-amd64
```

or

```
export JAVA_HOME=/usr/lib/jvm/java-1.8.0-openjdk-amd64
```

```
./enable-yarn-plugin.sh
```

5. Make sure HADOOP\_YARN\_HOME and HADOOP\_LIBEXEC\_DIR are set.

```
export HADOOP_YARN_HOME=/usr/hdp/current/hadoop-yarn-nodemanager/
export HADOOP_LIBEXEC_DIR=/usr/hdp/current/hadoop-client/libexec/
```

6. Enter the following commands to stop/start the ResourceManager on all of your Resource Manager hosts.

```
su yarn -c "/usr/hdp/current/hadoop-yarn-resourcemanager/sbin/yarn-daemon.sh
stop resourcemanager"
su yarn -c "/usr/hdp/current/hadoop-yarn-resourcemanager/sbin/yarn-daemon.sh
start resourcemanager"
ps -ef | grep -i resourcemanager
```



7. Enter the following command to stop/start the NodeManager on all of your NodeManager hosts.

```
su yarn -c "/usr/hdp/current/hadoop-yarn-nodemanager/sbin/yarn-daemon.sh
stop nodemanager"
su yarn -c "/usr/hdp/current/hadoop-yarn-nodemanager/sbin/yarn-daemon.sh
start nodemanager"
ps -ef | grep -i nodemanager
```

8. Create the default repo for YARN with the proper configuration specifying the same resource-based service name as in step 3.
9. You can verify the plug-in is communicating to Ranger admin via the Audit/plugins tab.
10. **Optional:** If Wire Encryption is enabled after Ranger authorization is set up for YARN, follow these steps to update the resource manager URL in Ranger:
  - a. Login to Ranger Admin as an admin user.
  - b. Click 'Edit' for the YARN service. The service name is something like cl1\_yarn (where 'cl1' is the name of the cluster).
  - c. Update property 'YARN REST URL', with the https URL for the resource manager.
  - d. Click 'Save.'

### 13.4.3. Installing the Ranger Kafka Plug-in

This section describes how to install and enable the Ranger Kafka plug-in.

1. The Ranger Kafka plug-in is automatically installed when Kafka is installed. You can verify this plug-in is present by using the following command:

```
rpm -qa | grep kafka-plugin
ranger_2_4_0_0_2950-kafka-plugin-0.5.0.2.6.0-2950.el6.x86_64
```

2. Navigate to `/usr/hdp/<version>/ranger-kafka-plugin`.

```
cd /usr/hdp/<version>/ranger-kafka-plugin
```

3. Edit the following entries in the `install.properties` file.

**Table 13.5. Properties to Edit in the install.properties File**

Configuration Property Name	Default/Example Value	Required?
<b>Policy Admin Tool</b>		
<b>COMPONENT_INSTALL_DIR_NAME</b>	/usr/hdp/2.6.0.0-2950/kafka	Y
<b>POLICY_MGR_URL</b> URL for policy admin	http://<FQDN of ranger admin host>:6080	Y
<b>REPOSITORY_NAME</b> The repository name used in Policy Admin Tool for defining policies	kafkadev	Y
<b>Audit Database</b>		
<b>SQL_CONNECTOR_JAR</b> Path to SQL connector jar of the DB Flavor selected. The value should be the	/usr/share/java/mysql-connector-java.jar (default) /usr/share/java/postgresql.jar	Y

Configuration Property Name	Default/Example Value	Required?
absolute path including the jar name.	/usr/share/java/sqljdbc4.jar /usr/share/java/ojdbc6.jar	
<b>XAAUDIT.DB.IS_ENABLED</b> Enable or disable database audit logging.	FALSE (default), TRUE	Y
<b>XAAUDIT.DB.FLAVOUR</b> Specifies the type of database used for audit logging (MYSQL,ORACLE)	MYSQL (default)	Y
<b>XAAUDIT.DB.HOSTNAME</b> Hostname of the audit database server	localhost	Y
<b>XAAUDIT.DB.DATABASE_NAME</b> Audit database name	ranger_audit	Y
<b>XAAUDIT.DB.USER_NAME</b> Username used for performing audit log inserts (should be same username used in the ranger-admin installation process)	rangerlogger	Y
<b>XAAUDIT.DB.PASSWORD</b> Database password associated with the above database user - for db audit logging	rangerlogger	Y
<b>XAAUDIT.SOLR.ENABLE</b>	true	Y
<b>XAAUDIT.SOLR.URL</b>	http://<solr_host>:8886/solr/ranger_audits	Y
<b>HDFS Audit</b>		
<b>XAAUDIT.HDFS.IS_ENABLED</b> Flag to enable/disable hdfs audit logging. If the hdfs audit logging is turned off, it will not log any access events to hdfs		Y
<b>XAAUDIT.HDFS.DESTINATION_DIRECTORY</b> HDFS directory where the audit log will be stored	hdfs:// __REPLACE__NAME_NODE_HOST:8020/ (format) hdfs:// namenode.mycompany.com:8020/ ranger/audit/%app-type%/ %time:yyyyMMdd%	Y
<b>XAAUDIT.HDFS.LOCAL_BUFFER_DIRECTORY</b> Local directory where the audit log will be saved for intermediate storage	hdfs:// __REPLACE__NAME_NODE_HOST:8020/ (format) /var/log/%app-type%/ audit	Y
<b>XAAUDIT.HDFS.LOCAL_ARCHIVE_DIRECTORY</b> Local directory where the audit log will be archived after it is moved to hdfs	__REPLACE__LOG_DIR%app-type %/audit/archive (format) /var/log/ %app-type%/audit/archive	Y
<b>XAAUDIT.HDFS.DESTINATION_FILE</b> hdfs audit file name (format)	%hostname%-audit.log (default)	Y
<b>XAAUDIT.HDFS.DESTINATION_FLUSH_INTERVAL_SECONDS</b> hdfs audit log file writes are flushed to HDFS at regular flush interval	900	Y
<b>XAAUDIT.HDFS.DESTINATION_ROLLOVER_INTERVAL_SECONDS</b> hdfs audit log file is rotated to write to a new file at a rollover interval specified here	86400	Y
<b>XAAUDIT.HDFS.DESTINATION_OPEN_RETRY_INTERVAL_SECONDS</b>	60	Y

Configuration Property Name	Default/Example Value	Required?
hdfs audit log open() call is failed, it will be re-tried at this interval		
<b>XAAUDIT.HDFS.LOCAL_BUFFER_FILE</b> Local filename used to store in audit log (format)	%time:yyyyMMdd-HH:mm:ss%.log (default)	Y
<b>XAAUDIT.HDFS.LOCAL_BUFFER_FLUSH_INTERVAL_SECONDS</b> Local audit log file writes are flushed to filesystem at regular flush interval	60	Y
<b>XAAUDIT.HDFS.LOCAL_BUFFER_ROLLOVER_INTERVAL_SECONDS</b> Local audit log file is rotated to write to a new file at a rollover interval specified here	600	Y
<b>XAAUDIT.HDFS.LOCAL_ARCHIVE_MAX_FILE_COUNT</b> The maximum number of local audit log files that will be kept in the archive directory	10	Y
<b>SSL Information (https connectivity to Policy Admin Tool)</b>		
<b>SSL_KEYSTORE_FILE_PATH</b> Java Keystore Path where SSL key for the plug-in is stored. Is used only if SSL is enabled between Policy Admin Tool and Plugin; If SSL is not Enabled, leave the default value as it is - do not set as EMPTY if SSL not used	/etc/hadoop/conf/ranger-plugin-keystore.jks (default)	Only if SSL is enabled
<b>SSL_KEYSTORE_PASSWORD</b> Password associated with SSL Keystore. Is used only if SSL is enabled between Policy Admin Tool and Plugin; If SSL is not Enabled, leave the default value as it is - do not set as EMPTY if SSL not used	none (default)	Only if SSL is enabled
<b>SSL_TRUSTSTORE_FILE_PATH</b> Java Keystore Path where the trusted certificates are stored for verifying SSL connection to Policy Admin Tool. Is used only if SSL is enabled between Policy Admin Tool and Plugin; If SSL is not Enabled, leave the default value as it is - do not set as EMPTY if SSL not used	/etc/hadoop/conf/ranger-plugin-truststore.jks (default)	Only if SSL is enabled
<b>SSL_TRUSTSTORE_PASSWORD</b> Password associated with Truststore file. Is used only if SSL is enabled between Policy Admin Tool and Plugin; If SSL is not Enabled, leave the default value as it is - do not set as EMPTY if SSL not used	none (default)	Only if SSL is enabled

#### 4. Enable the Kafka plug-in by running the following commands:

```
export JAVA_HOME=/usr/lib/jvm/java-1.7.0-openjdk-amd64
./enable-kafka-plugin.sh
```

#### 5. Enter the following commands to stop/start the Kafka service.

```
su kafka -c "/usr/hdp/current/kafka-broker/bin/kafka stop"
su kafka -c "/usr/hdp/current/kafka-broker/bin/kafka start"
```

6. Create the default repo for Kafka with the proper configuration specifying the same resource-based service name as in step 3.
7. You can verify the plug-in is communicating to Ranger admin via the Audit/plugins tab.
8. If the plug-in is not able to communicate with Ranger admin, check the property `authorizer.class.name` in `/usr/hdp/2.6.0.0-2950/kafka/config/server.properties`. The value of the `authorizer.class.name` should be `org.apache.ranger.authorization.kafka.authorizer.RangerKafkaAuthorizer`.

### 13.4.4. Installing the Ranger HBase Plug-in

The Ranger HBase Plug-in integrates with HBase to enforce authorization policies.

This section describes how to install the HBase plug-in:

1. Create an HBase resource-based service
2. Install the HBase plug-in and configure related HBase properties
3. Enable the HBase plug-in
4. Restart HBase

#### Install the HBase Plug-in

1. Create an HBase resource-based service in the Ranger Policy Manager. To do this, complete the HBase Create Service screen, as described in the [Configure an HBase Service](#) section of the *Hadoop Security Guide*.

Make a note of the name you gave to this resource-based service; you will use it again during HBase plug-in setup.

2. At all servers where the HBase Master and RegionServers are installed, install and configure the HBase plug-in, as follows:
  - a. Go to the home directory of the HBase plug-in:

```
cd /usr/hdp/<version>/ranger-hbase-plugin
```

- b. Edit the following HBase-related properties in the `install.properties` file:

**Table 13.6. HBase Properties to Edit in the `install.properties` file**

Configuration Property Name	Default/Example Value	Required?
<b>Policy Admin Tool</b>		
<b>POLICY_MGR_URL</b> URL for policy admin	<code>http://policymanager.xasecure.net:6080</code>	Y
<b>REPOSITORY_NAME</b> The repository name used in Policy Admin Tool for defining policies	<code>hbasedev</code>	Y
<b>Audit Database</b>		
<b>SQL_CONNECTOR_JAR</b> Path to SQL connector jar of the DB Flavor selected. The value should be the absolute path including the jar name.	<code>/usr/share/java/mysql-connector-java.jar</code> (default) <code>/usr/share/java/postgresql.jar</code>	Y

Configuration Property Name	Default/Example Value	Required?
	/usr/share/java/sqljdbc4.jar /usr/share/java/ojdbc6.jar	
<b>XAAUDIT.DB.IS_ENABLED</b> Enable or disable database audit logging.  <i>Note:</i> If this property is set to FALSE, Ranger will not store audit logs in the audit DB, and audit logs will not be visible in the Ranger UI. If you would like to access audit logs from the UI, set this value to TRUE.	FALSE (default)	Y
<b>XAAUDIT.DB.FLAVOUR</b> Specifies the type of database used for audit logging (MYSQL,ORACLE)	MYSQL (default)	Y
<b>XAAUDIT.DB.HOSTNAME</b> Hostname of the audit database server	localhost	Y
<b>XAAUDIT.DB.DATABASE_NAME</b> Audit database name	ranger_audit	Y
<b>XAAUDIT.DB.USER_NAME</b> Username used for performing audit log inserts (should be same username used in the ranger-admin installation process)	rangerlogger	Y
<b>XAAUDIT.DB.PASSWORD</b> Database password associated with the above database user - for db audit logging	rangerlogger	Y
<b>HDFS Audit</b>		
<b>XAAUDIT.HDFS.IS_ENABLED</b> Flag to enable/disable hdfs audit logging. If the hdfs audit logging is turned off, it will not log any access control to hdfs	TRUE	Y
<b>XAAUDIT.HDFS.DESTINATION_DIRECTORY</b> HDFS directory where the audit log will be stored	<i>hdfs:// __REPLACE__NAME_NODE_HOST:8020/ ranger/audit/%app-type%/ %time:yyyyMMdd% (format) hdfs:// namenode.mycompany.com:8020/ ranger/audit/%app-type%/ %time:yyyyMMdd%</i>	Y
<b>XAAUDIT.HDFS.LOCAL_BUFFER_DIRECTORY</b> Local directory where the audit log will be saved for intermediate storage	<i>__REPLACE__LOG_DIR/%app-type %/audit (format) /var/tmp/%app- type%/audit</i>	Y
<b>XAAUDIT.HDFS.LOCAL_ARCHIVE_DIRECTORY</b> Local directory where the audit log will be archived after it is moved to hdfs	<i>__REPLACE__LOG_DIR/%app-type %/audit/archive (format) /var/ tmp/%app-type%/audit/archive</i>	Y
<b>XAAUDIT.HDFS.DESTINATION_FILE</b> HDFS audit file name (format)	%hostname%-audit.log (default)	Y
<b>XAAUDIT.HDFS.DESTINATION_FLUSH_INTERVAL_SECONDS</b> HDFS audit log file writes are flushed to HDFS at regular flush interval	900	Y

Configuration Property Name	Default/Example Value	Required?
<b>XAAUDIT.HDFS.DESTINATION_ROLLOVER_INTERVAL_SECONDS</b> HDFS audit log file is rotated to write to a new file at a rollover interval specified here	86400	Y
<b>XAAUDIT.HDFS.DESTINATION_OPEN_RETRY_INTERVAL_SECONDS</b> If HDFS audit log open() call fails, it will be re-tried at this interval	60	Y
<b>XAAUDIT.HDFS.LOCAL_BUFFER_FILE</b> Local filename used to store in audit log (format)	%time:yyyyMMdd-HH:mm:ss%.log (default)	Y
<b>XAAUDIT.HDFS.LOCAL_BUFFER_FLUSH_INTERVAL_SECONDS</b> Interval that local audit log file writes are flushed to filesystem	60	Y
<b>XAAUDIT.HDFS.LOCAL_BUFFER_ROLLOVER_INTERVAL_SECONDS</b> Interval that local audit log file is rolled over (rotated to write to a new file)	600	Y
<b>XAAUDIT.SOLR.ENABLE</b>	true	Y
<b>XAAUDIT.SOLR.URL</b>	http://<solr_host>:8886/solr/ranger_audits	Y
<b>XAAUDIT.HDFS.LOCAL_ARCHIVE_MAX_FILE_COUNT</b> The maximum number of local audit log files will be kept in the archive directory	10	Y
<b>SSL_KEYSTORE_FILE_PATH</b> Java Keystore Path where SSL key for the plug-in is stored. Used only if SSL is enabled between Policy Admin Tool and Plugin. If SSL is not enabled, leave the default value as it is (should not be set as EMPTY).	/etc/hbase/conf/ranger-plugin-keystore.jks (default)	Y, if SSL is enabled
<b>SSL_KEYSTORE_PASSWORD</b> Password associated with SSL Keystore. Used only if SSL is enabled between Policy Admin Tool and Plugin. If SSL is not Enabled, leave the default value as it is (should not be set as EMPTY).	myKeyFilePassword (default)	Y, if SSL is enabled
<b>SSL_TRUSTSTORE_FILE_PATH</b> Java Keystore Path where the trusted certificates are stored for verifying SSL connection to Policy Admin Tool. Used only if SSL is enabled between Policy Admin Tool and Plugin. If SSL is not enabled, leave the default value as it is (should not be set as EMPTY).	/etc/hbase/conf/ranger-plugin-truststore.jks (default)	Y, if SSL is enabled
<b>SSL_TRUSTSTORE_PASSWORD</b> Password associated with Truststore file. Used only if SSL is enabled between Policy Admin Tool and Plugin. If SSL is not Enabled, leave the default value as it is (should not be set as EMPTY).	changeit (default)	Y, if SSL is enabled
<b>HBase GRANT/REVOKE Commands</b>		

Configuration Property Name	Default/Example Value	Required?
<b>UPDATE_XAPOLICIES_ON_GRANT_REVOKE</b> Provide ability for XAAgent to update the policies based on the GRANT/REVOKE commands from the HBase client	TRUE (default)	Y

- To enable the HBase plug-in, enter the following commands:

```
cd /usr/hdp/<version>/ranger-hbase-plugin
```

```
./enable-hbase-plugin.sh
```

- Restart HBase.
- To confirm that the HBase plug-in installation and configuration are complete, go to the Audit Tab of the Ranger Admin Console and check Plugins. You should see HBase listed there.

## 13.4.5. Installing the Ranger Hive Plug-in

The Ranger Hive plug-in integrates with Hive to enforce authorization policies.



### Note

The Ranger plugin for Hive only needs to be set up for HiveServer2. For Hive clients, it is recommended that you protect data using HDFS policies in Ranger. Do not install or set up Ranger plugins on individual Hive client machines.

This section describes how to install the Ranger Hive plug-in:

- Create a Hive resource-based service .
- Install the Hive plug-in and configure related Hive properties.
- Enable the Hive plug-in.
- Restart Hive.

### Install the Hive Plug-in

- Create a Hive resource-based service. To create the Hive resource-based service, complete the Hive Create Service screen as described in the [Configure a Hive Service](#) section of the *Hadoop Security Guide*.

Make a note of the name you gave to this resource-based service; you will need to use it again during Hive plug-in setup.

- At the server where HiveServer2 is installed, install the Hive plug-in:

- Go to the home directory of the Hive plug-in:

```
cd /usr/hdp/<version>/ranger-hive-plugin
```

- Edit the following Hive-related properties in the install.properties file:

**Table 13.7. Hive-Related Properties to Edit in the install.properties File**

Configuration Property Name	Default/Example Value	Required?
<b>Policy Admin Tool</b>		
<b>POLICY_MGR_URL</b> URL for policy admin	<i>http:// policymanager.xasecure.net:6080</i>	Y
<b>REPOSITORY_NAME</b> The repository name used in Policy Admin Tool for defining policies	hivedev	Y
<b>Audit Database</b>		
<b>SQL_CONNECTOR_JAR</b> Path to SQL connector jar of the DB Flavor selected. The value should be the absolute path including the jar name.	<i>/usr/share/java/mysql-connector-java.jar (default)  /usr/share/java/postgresql.jar  /usr/share/java/sqljdbc4.jar  /usr/share/java/ojdbc6.jar</i>	Y
<b>XAAUDIT.DB.IS_ENABLED</b> Enable or disable database audit logging.  <i>Note: If this property is set to FALSE, Ranger will not store audit logs in the audit DB, and audit logs will not be visible in the Ranger UI. If you would like to access audit logs from the UI, set this value to TRUE.</i>	FALSE (default) TRUE	Y
<b>XAAUDIT.DB.FLAVOUR</b> Specifies the type of database used for audit logging (MYSQL,ORACLE)	MYSQL (default)	Y
<b>XAAUDIT.DB.HOSTNAME</b> Hostname of the audit database server	localhost	Y
<b>XAAUDIT.DB.DATABASE_NAME</b> Audit database name	ranger_audit	Y
<b>XAAUDIT.DB.USER_NAME</b> Username used for performing audit log inserts (should be same username used in the ranger-admin installation process)	rangerlogger	Y
<b>XAAUDIT.DB.PASSWORD</b> database password associated with the above database user - for db audit logging	rangerlogger	Y
<b>HDFS Audit</b>		
<b>XAAUDIT.HDFS.IS_ENABLED</b> Flag to enable/disable hdfs audit logging.If the hdfs audit logging is turned off, it will not log any access control to hdfs		Y
<b>XAAUDIT.HDFS.DESTINATION_DIRECTORY</b> HDFS directory where the audit log will be stored	<i>hdfs:// __REPLACE__NAME_NODE_HOST:8020/ ranger/audit/%app-type%/ %time:yyyyMMdd% (format)  hdfs:// namenode.mycompany.com:8020/ ranger/audit/%app-type%/ %time:yyyyMMdd%</i>	Y



Configuration Property Name	Default/Example Value	Required?
<b>XAAUDIT.HDFS.LOCAL_BUFFER_DIRECTORY</b> Local directory where the audit log will be saved for intermediate storage	__REPLACE__LOG_DIR/%app-type%/audit (format) /var/tmp/%app-type%/audit	Y
<b>XAAUDIT.HDFS.LOCAL_ARCHIVE_DIRECTORY</b> Local directory where the audit log will be archived after it is moved to hdfs	__REPLACE__LOG_DIR/%app-type%/audit (format) /var/tmp/%app-type%/audit/archive	Y
<b>XAAUDIT.HDFS.DESTINATION_FILE</b> hdfs audit file name (format)	%hostname%-audit.log (default)	Y
<b>XAAUDIT.HDFS.DESTINATION_FLUSH_INTERVAL_SECONDS</b> hdfs audit log file writes are flushed to HDFS at regular flush interval	900	Y
<b>XAAUDIT.HDFS.DESTINATION_ROLLOVER_INTERVAL_SECONDS</b> hdfs audit log file is rotated to write to a new file at a rollover interval specified here	86400	Y
<b>XAAUDIT.HDFS.DESTINATION_OPEN_RETRY_INTERVAL_SECONDS</b> If hdfs audit log open() call is failed, it will be re-tried at this interval	60	Y
<b>XAAUDIT.HDFS.LOCAL_BUFFER_FILE</b> Local filename used to store in audit log (format)	%time:yyyyMMdd-HHmm.ss%.log (default)	Y
<b>XAAUDIT.HDFS.LOCAL_BUFFER_FLUSH_INTERVAL_SECONDS</b> Local audit log file writes are flushed to filesystem at regular flush interval	60	Y
<b>XAAUDIT.HDFS.LOCAL_BUFFER_ROLLOVER_INTERVAL_SECONDS</b> Local audit log file is rotated to write to a new file at a rollover interval specified here	600	Y
<b>XAAUDIT.HDFS.LOCAL_ARCHIVE_MAX_FILE_COUNT</b> The maximum number of local audit log files that will be kept in the archive directory	10	Y
<b>XAAUDIT.SOLR.ENABLE</b>	true	Y
<b>XAAUDIT.SOLR.URL</b>	http://<solr_host>:8886/solr/ranger_audits	Y
<b>SSL Information (https connectivity to Policy Admin Tool)</b>		
<b>SSL_KEYSTORE_FILE_PATH</b> Java Keystore Path where SSL key for the plug-in is stored. Is used only if SSL is enabled between Policy Admin Tool and Plugin; If SSL is not Enabled, leave the default value as it is - do not set as EMPTY if SSL not used.	/etc/hive/conf/ranger-plugin-keystore.jks (default)	If SSL is enabled
<b>SSL_KEYSTORE_PASSWORD</b> Password associated with SSL Keystore. Is used only if SSL is enabled between Policy Admin Tool and Plugin; If SSL is not Enabled, leave the default value as it is - do not set as EMPTY if SSL not used.	none (default)	If SSL is enabled

Configuration Property Name	Default/Example Value	Required?
<b>SSL_TRUSTSTORE_FILE_PATH</b> Java Keystore Path where the trusted certificates are stored for verifying SSL connection to Policy Admin Tool. Is used only if SSL is enabled between Policy Admin Tool and Plugin; If SSL is not Enabled, leave the default value as it is - do not set as EMPTY if SSL not used.	<code>/etc/hive/conf/ranger-plugin-truststore.jks</code> (default)	If SSL is enabled
<b>SSL_TRUSTSTORE_PASSWORD</b> Password associated with Truststore file. Is used only if SSL is enabled between Policy Admin Tool and Plugin; If SSL is not Enabled, leave the default value as it is - do not set as EMPTY if SSL not used.	none (default)	If SSL is enabled
<b>Hive GRANT/REVOKE Command Handling</b>		
<b>UPDATE_XAPOLICIES_ON_GRANT_REVOKE</b> Provide ability for XAAgent to update the policies based on the grant/revoke commands from the Hive beeline client	TRUE (default)	Y

- To enable the Hive plug-in, enter the following commands:

```
cd /usr/hdp/<version>/ranger-hive-plugin
./enable-hive-plugin.sh
```

- Restart Hive.
- To confirm that the Hive plug-in installation and configuration are complete, go to the Audit Tab of the Ranger Admin Console and check Plugins. You should see Hive listed there.

## 13.4.6. Installing the Ranger Knox Plug-in

The Ranger Knox plug-in integrates with Knox to enforce authorization policies.

This section describes how to install the Knox plug-in:

- Create a Knox resource-based service.
- Install the Knox plug-in and configure related Hive properties.
- Enable the Knox plug-in.
- Restart Knox.

Instructions assume that Knox has already been installed, as described in "*Installing Knox*."

### Install the Knox Plug-in

- Create a Knox resource-based service. To do this, complete the Knox Create Service screen as described in the [Configure a Knox Service](#) section of the *Hadoop Security Guide*.

2. Set the URL to `https://knox_host:8443/gateway/admin/api/v1/topologies`, where `knox_host` is the full-qualified name of your Knox host machine.
3. Make a note of the name you gave to this resource-based service; you will need to use it again during Knox plug-in setup.
4. At all servers where Knox Gateway is installed, install the Knox plug-in:
  - a. Go to the home directory of the Knox plug-in:

```
cd /usr/hdp/<version>/ranger-knox-plugin
```

- b. Edit the following Knox-related properties in the `install.properties` file:

**Table 13.8. Knox-Related Properties to Edit in the `install.properties` File**

Configuration Property Name	Default/Example Value	Mandatory?
<b>Policy Admin Tool</b>		
<b>POLICY_MGR_URL</b> URL for policy admin	<code>http://policymanager.xasecure.net:6080</code>	Y
<b>REPOSITORY_NAME</b> The repository name used in Policy Admin Tool for defining policies	<code>knoxdev</code>	Y
<b>Knox Component Installation</b>		
<b>KNOX_HOME</b> Home directory where Knox software is installed	<code>/usr/hdp/current/knox</code>	Y
<b>Audit Database</b>		
<b>SQL_CONNECTOR_JAR</b> Path to SQL connector jar of the DB Flavor selected. The value should be the absolute path including the jar name.	<code>/usr/share/java/mysql-connector-java.jar</code>	Y
<b>XAAUDIT.DB.IS_ENABLED</b> Enable or disable database audit logging.  <i>Note: If this property is set to FALSE, Ranger will not store audit logs in the audit DB, and audit logs will not be visible in the Ranger UI. If you would like to access audit logs from the UI, set this value to TRUE.</i>	<code>true</code>	Y
<b>XAAUDIT.DB.FLAVOUR</b> Specifies the type of database used for audit logging (MYSQL,ORACLE)	<code>MYSQL</code>	Y
<b>XAAUDIT.DB.HOSTNAME</b> Hostname of the audit database server	<code>localhost</code>	Y
<b>XAAUDIT.DB.DATABASE_NAME</b> Audit database name	<code>ranger_audit</code>	Y
<b>XAAUDIT.DB.USER_NAME</b> Username used for performing audit log inserts (should be same username used in the ranger-admin installation process)	<code>rangerlogger</code>	Y
<b>XAAUDIT.DB.PASSWORD</b> database password associated with the	<code>rangerlogger</code>	Y

Configuration Property Name	Default/Example Value	Mandatory?
above database user - for db audit logging		
<b>HDFS Audit</b>		
<b>XAAUDIT.HDFS.IS_ENABLED</b> Flag to enable/disable hdfs audit logging. If the hdfs audit logging is turned off, it will not log any access control to hdfs.		Y
<b>XAAUDIT.HDFS.DESTINATION_DIRECTORY</b> HDFS directory where the audit log will be stored	<i>hdfs://namenode.mycompany.com:8020/ranger/audit/%app-type%/%time:yyyyMMdd%</i>	Y
<b>XAAUDIT.HDFS.LOCAL_BUFFER_DIRECTORY</b> Local directory where the audit log will be saved for intermediate storage	<i>/var/tmp/%app-type%/audit</i>	Y
<b>XAAUDIT.HDFS.LOCAL_ARCHIVE_DIRECTORY</b> Local directory where the audit log will be archived after it is moved to hdfs	<i>/var/tmp/%app-type%/audit/archive</i>	Y
<b>XAAUDIT.HDFS.DESTINATION_FILE</b> hdfs audit file name (format)	<i>%hostname%-audit.log</i>	Y
<b>XAAUDIT.HDFS.DESTINATION_FLUSH_INTERVAL_SECONDS</b> hdfs audit log file writes are flushed to HDFS at regular flush interval	900	Y
<b>XAAUDIT.HDFS.DESTINATION_ROLLOVER_INTERVAL_SECONDS</b> hdfs audit log file is rotated to write to a new file at a rollover interval specified here	86400	Y
<b>XAAUDIT.HDFS.DESTINATION_OPEN_RETRY_INTERVAL_SECONDS</b> If hdfs audit log open() call is failed, it will be re-tried at this interval	60	Y
<b>XAAUDIT.HDFS.LOCAL_BUFFER_FILE</b> Local filename used to store in audit log (format)	<i>%time:yyyyMMdd-HHmm.ss%.log</i>	Y
<b>XAAUDIT.HDFS.LOCAL_BUFFER_FLUSH_INTERVAL_SECONDS</b> Local audit log file writes are flushed to filesystem at regular flush interval	60	Y
<b>XAAUDIT.HDFS.LOCAL_BUFFER_ROLLOVER_INTERVAL_SECONDS</b> Local audit log file is rotated to write to a new file at a rollover interval specified here	600	Y
<b>XAAUDIT.HDFS.LOCAL_ARCHIVE_MAX_FILE_COUNT</b> The maximum number of local audit log files will be kept in the archive directory	10	Y
<b>XAAUDIT.SOLR.ENABLE</b>	true	Y
<b>XAAUDIT.SOLR.URL</b>	<i>http://&lt;solr_host&gt;:8886/solr/ranger_audits</i>	Y
<b>SSL (https connectivity to Policy Admin Tool)</b>		

Configuration Property Name	Default/Example Value	Mandatory?
<b>SSL_KEYSTORE_FILE_PATH</b> Java Keystore Path where SSL key for the plug-in is stored. Is used only if SSL is enabled between Policy Admin Tool and Plugin; If SSL is not Enabled, leave the default value as it is - do not set as EMPTY if SSL not used.	<i>/etc/knox/conf/ranger-plugin-keystore.jks</i>	If SSL is enabled
<b>SSL_KEYSTORE_PASSWORD</b> Password associated with SSL Keystore. Is used only if SSL is enabled between Policy Admin Tool and Plugin; If SSL is not Enabled, leave the default value as it is - do not set as EMPTY if SSL not used.	myKeyFilePassword	If SSL is enabled
<b>SSL_TRUSTSTORE_FILE_PATH</b> Java Keystore Path where the trusted certificates are stored for verifying SSL connection to Policy Admin Tool. Is used only if SSL is enabled between Policy Admin Tool and Plugin; If SSL is not Enabled, leave the default value as it is - do not set as EMPTY if SSL not used.	<i>/etc/knox/conf/ranger-plugin-truststore.jks</i>	If SSL is enabled
<b>SSL_TRUSTSTORE_PASSWORD</b> Password associated with Truststore file. Is used only if SSL is enabled between Policy Admin Tool and Plugin; If SSL is not Enabled, leave the default value as it is - do not set as EMPTY if SSL not used.	changeit	If SSL is enabled

5. To enable the Knox plug-in, enter the following commands:

```
cd /usr/hdp/<version>/ranger-knox-plugin
./enable-knox-plugin.sh
```

6. Restart the Knox Gateway:

```
su Knox -c "/usr/hdp/current/knox-server/bin/gateway.sh stop"
su Knox -c "/usr/hdp/current/knox-server/bin/gateway.sh start"
```

7. Optionally, add a new user by following these steps. This is required only if you want users to verify the communication between the Ranger Knox plug-in and Ranger admin.

a. Add the following information in the `usertest` block in the `/usr/hdp/current/knox-server/templates/users.ldif` file, assuming that Knox is using the demo LDAP. If Knox is configured with a different LDAP, you need to add the information in the `users.ldif` file at that location.

- # entry for sample user usertest
- dn: uid=usertest,ou=people,dc=hadoop,dc=apache,dc=org
- objectclass:top
- objectclass:person
- objectclass:organizationalPerson

- objectclass:inetOrgPerson
- cn: usertest
- sn: usertest
- uid: usertest
- userPassword:usertest-password

b. Restart ldap. Enter the following command:

```
./usr/hdp/current/knox-server/bin/ldap.sh stop / start
```

c. Verify in which topology the Knox plugin is enabled and then run the command accordingly. Typically, the topology is admin.

d. Issue the `curl` command to check policy enforcement for Knox. Typically, the *topology* in the command is admin.

```
curl -iku admin:admin-password -X GET 'https://<knox_host>:8443/gateway/<topology>/webhdfs/v1?op=LISTSTATUS'
```

e. Create a certificate for the test connection to be successful. Follow these steps to import a Knox SSL certificate in truststore used by Ranger admin:

i. Login to the machine running Knox.

ii. Export the Knox certificate:

```
cd $GATEWAY_HOME/data/security/keystores
keytool -exportcert -alias gateway-identity -keystore gateway.jks -file
knox.crt
```

Typically `$GATEWAY_HOME/data/security/keystores` is `/usr/hdp/current/knox-server/data/security/keystores` on a Linux machine.

iii. Copy `knox.crt` onto the machine running Ranger admin to a working directory, for example, `/etc/ranger/admin`.

iv. Replicate cacerts bundled with the JDK:

```
cd /etc/ranger/admin
cp <JDK_HOME>/jre/lib/security/cacerts cacertswithknox
```

v. Import the Knox certificate into the replicated new keystore.

```
keytool -import -trustcacerts -file <knox.crt
created above> -alias knox -keystore cacertswithknox
password: changeit
```

vi. Edit `/usr/hdp/current/ranger-admin/ews/ranger-admin-services.sh` and add the parameter `-Djavax.net.ssl.trustStore=<path to the cacertswithknox>` to the `JAVA_OPTS` parameter in the script.

vii. Restart Ranger Admin.

- To confirm that the Knox plug-in installation and configuration are complete, go to the Audit Tab of the Ranger Admin Console and check Plugins. You should see Knox listed there.

## 13.4.7. Installing the Ranger Storm Plug-in

The Ranger Storm plug-in integrates with Storm to enforce authorization policies.

This section describes how to perform the following administrative tasks: It assumes that Storm has already been installed, as described earlier in this guide.

- Create a Storm resource-based service.
- Install the Storm plug-in and configure related Storm properties.
- Enable the Storm plug-in.
- Restart Storm.

### Install the Storm Plug-in

- Create a Storm resource-based service, as described in the [Configure a Storm Service](#) section of the *Hadoop Security Guide*.

Make a note of the name you gave to this resource-based service; you will need to use it again during Storm plug-in setup.

- On the Nimbus server, install the Storm plug-in:

- Go to the home directory of the Storm plug-in:

```
cd /usr/hdp/<version>/ranger-storm-plugin
```

- Edit the following Storm-related properties in the `install.properties` file:

**Table 13.9. Storm-Related Properties to Edit in the `install.properties` file**

Configuration Property Name	Default/Example Value	Mandatory?
<b>Policy Admin Tool</b>		
<b>POLICY_MGR_URL</b> URL for policy admin	<code>http:// policymanager.xasecure.net:6080</code>	Y
<b>REPOSITORY_NAME</b> The repository name used in Policy Admin Tool for defining policies	<code>stormdev</code>	Y
<b>Audit Database</b>		
<b>SQL_CONNECTOR_JAR</b> Path to SQL connector jar of the DB Flavor selected. The value should be the absolute path including the jar name.	<code>/usr/share/java/mysql-connector- java.jar (default)</code> <code>/usr/share/java/postgresql.jar</code> <code>/usr/share/java/sqljdbc4.jar</code> <code>/usr/share/java/ojdbc6.jar</code>	Y
<b>XAAUDIT.DB.IS_ENABLED</b> Enable or disable database audit logging.	<code>false (default) true</code>	Y

Configuration Property Name	Default/Example Value	Mandatory?
<b>Note:</b> If this property is set to FALSE, Ranger will not store audit logs in the audit DB, and audit logs will not be visible in the Ranger UI. If you would like to access audit logs from the UI, set this value to TRUE.		
<b>XAAUDIT.DB.FLAVOUR</b> Specifies the type of database used for audit logging (MYSQL,ORACLE, PostgreSQL 8.4.2, SQL Server 2012)	MYSQL (default)	Y
<b>XAAUDIT.DB.HOSTNAME</b> Hostname of the audit database server	localhost	Y
<b>XAAUDIT.DB.DATABASE_NAME</b> Audit database name	ranger_audit	Y
<b>XAAUDIT.DB.USER_NAME</b> Username used for performing audit log inserts (should be same username used in the ranger-admin installation process)	rangerlogger	Y
<b>XAAUDIT.DB.PASSWORD</b> Database password associated with the above database user - for db audit logging	rangerlogger	Y
<b>HDFS Audit</b>		
<b>XAAUDIT.HDFS.IS_ENABLED</b> Flag to enable/disable hdfs audit logging. If the hdfs audit logging is turned off, it will not log any access control to hdfs.	false	Y
<b>XAAUDIT.HDFS.DESTINATION_DIRECTORY</b> HDFS directory where the audit log will be stored	<i>hdfs:// __REPLACE__NAME_NODE_HOST:8020/ ranger/audit/%app-type%/ %te:yyyyMMdd% (format) hdfs:// namenode.mycompany.com:8020/ ranger/audit/%app-type%/ %time:yyyyMMdd%</i>	Y
<b>XAAUDIT.HDFS.LOCAL_BUFFER_DIRECTORY</b> Local directory where the audit log will be saved for intermediate storage	<i>__REPLACE__LOG_DIR/%app-type %/audit (format) /var/log/%app- type%/audit</i>	Y
<b>XAAUDIT.HDFS.LOCAL_ARCHIVE_DIRECTORY</b> Local directory where the audit log will be archived after it is moved to hdfs	<i>__REPLACE__LOG_DIR/%app-type %/audit/archive (format) /var/log/ %app-type%/audit/archive</i>	Y
<b>XAAUDIT.HDFS.DESTINATION_FILE</b> hdfs audit file name (format)	%hostname%-audit.log (default)	Y
<b>XAAUDIT.HDFS.DESTINATION_FLUSH_INTERVAL_SECONDS</b> hdfs audit log file writes are flushed to HDFS at regular flush interval	900 (default)	Y
<b>XAAUDIT.HDFS.DESTINATION_ROLLOVER_INTERVAL_SECONDS</b> hdfs audit log file is rotated to write to a new file at a rollover interval specified here	86400 (default)	Y



Configuration Property Name	Default/Example Value	Mandatory?
<b>XAAUDIT.HDFS.DESTINATION_OPEN_RETRY_INTERVAL_SECONDS</b> If hdfs audit log open() call is failed, it will be re-tried at this interval	60 (default)	Y
<b>XAAUDIT.HDFS.LOCAL_BUFFER_FILE</b> Local filename used to store in audit log (format)	%time:yyyyMMdd-HHmm.ss%.log (default)	Y
<b>XAAUDIT.HDFS.LOCAL_BUFFER_FLUSH_INTERVAL_SECONDS</b> Local audit log file writes are flushed to filesystem at regular flush interval	60 (default)	Y
<b>XAAUDIT.HDFS.LOCAL_BUFFER_ROLLOVER_INTERVAL_SECONDS</b> Local audit log file is rotated to write to a new file at a rollover interval specified here	600 (default)	Y
<b>XAAUDIT.HDFS.LOCAL_ARCHIVE_MAX_FILE_COUNT</b> The maximum number of local audit log files will be kept in the archive directory	10 (default)	Y
<b>XAAUDIT.SOLR.ENABLE</b>	true	Y
<b>XAAUDIT.SOLR.URL</b>	http://<solr_host>:8886/solr/ranger_audits	Y
<b>SSL Information (https connectivity to policy Admin Tool)</b>		
<b>SSL_KEYSTORE_FILE_PATH</b> Java Keystore Path where SSL key for the plug-in is stored. Is used only if SSL is enabled between Policy Admin Tool and Plugin; If SSL is not Enabled, leave the default value as it is - do not set as EMPTY if SSL not used.	/etc/storm/conf/ranger-plugin-keystore.jks (default)	If SSL is enabled
<b>SSL_KEYSTORE_PASSWORD</b> Password associated with SSL Keystore. Is used only if SSL is enabled between Policy Admin Tool and Plugin; If SSL is not Enabled, leave the default value as it is - do not set as EMPTY if SSL not used.	myKeyFilePassword (default)	If SSL is enabled
<b>SSL_TRUSTSTORE_FILE_PATH</b> Java Keystore Path where the trusted certificates are stored for verifying SSL connection to Policy Admin Tool. Is used only if SSL is enabled between Policy Admin Tool and Plugin; If SSL is not Enabled, leave the default value as it is - do not set as EMPTY if SSL not used.	/etc/storm/conf/ranger-plugin-truststore.jks (default)	If SSL is enabled
<b>SSL_TRUSTSTORE_PASSWORD</b> Password associated with Truststore file. Is used only if SSL is enabled between Policy Admin Tool and Plugin; If SSL is not Enabled, leave the default value as it is - do not set as EMPTY if SSL not used.	changeit (default)	If SSL is enabled

3. Enable the Storm plug-in by entering the following commands:

```
cd /usr/hdp/<version>/ranger-storm-plugin
```

```
./enable-storm-plugin.sh
```

4. Restart Storm.
5. To confirm that the Storm plug-in installation and configuration are complete, go to the Audit Tab of the Ranger Admin Console and check Plugins. You should see Storm listed there.

## 13.5. Installing Ranger in a Kerberized Environment

This section focuses specifically on installing Ranger in a kerberized environment.



### Important

The steps in this section apply only to manual installation of Ranger services and plug-ins in a kerberized environment.

### 13.5.1. Creating Keytab and Principals

#### 13.5.1.1. Before You Begin

Perform the following initial checks before starting your installation:

1. Login as user `ranger`.

If user `ranger` is not found, create it using the `useradd` command, for example, `su - ranger`.

2. Use the `kinit` command to check for HTTP principal:

```
kinit -kt <HTTP keytab path> HTTP/<FQDN_OF_Ranger_Admin_Cluster>@<REALM>
```

After running the `kinit` command, there should not be any errors. You can use the `klist` command to verify that your `kinit` command was successful.

3. Use the `kdestroy` command to destroy your active Kerberos authorization tickets by overwriting and deleting the credentials cache that contains them:

```
kdestroy
```

#### 13.5.1.2. Prepare Ranger Admin

Follow these instructions to prepare Ranger admin:

1. Create `rangeradmin/<FQDN_of_Ranger_Admin>@<REALM>`:

```
> kadmin.local
> addprinc -randkey rangeradmin/<FQDN_of_Ranger_Admin>
```

```
> xst -k /etc/security/keytabs/rangeradmin.keytab rangeradmin/
<FQDN_of_Ranger_Admin>@<REALM>
> exit
```

2. Verify that `rangeradmin` created principal:

```
> kinit -kt /etc/security/keytabs/rangeradmin.keytab rangeradmin/
<FQDN_of_Ranger_Admin>@<REALM>
```

After using the `kinit` command, there should not be any errors. You can use the `klist` command to verify that your `kinit` command was successful.

3. Use the `kdestroy` command to destroy your active Kerberos authorization tickets by overwriting and deleting the credentials cache that contains them:

```
kdestroy
```

### 13.5.1.3. Prepare Ranger Lookup

Follow these instructions to prepare Ranger lookup:

1. Create `rangerlookup/<FQDN_of_Ranger_Admin>@<REALM>`:

```
> kadmin.local
> addprinc -randkey rangerlookup/<FQDN_of_Ranger_Admin>
> xst -k /etc/security/keytabs/rangerlookup.keytab rangerlookup/
<FQDN_of_Ranger_Admin>@<REALM>
> exit
```

2. Verify that `rangerlookup` created principal:

```
> kinit -kt /etc/security/keytabs/rangerlookup.keytab rangerlookup/
<FQDN_of_Ranger_Admin>@<REALM>
```

After using the `kinit` command, there should not be any errors. You can use the `klist` command to verify that your `kinit` command was successful.

3. Use the `kdestroy` command to destroy your active Kerberos authorization tickets by overwriting and deleting the credentials cache that contains them:

```
kdestroy
```

### 13.5.1.4. Prepare Ranger Usersync

Follow these instructions to prepare Ranger usersync:

1. Create `rangersync/<FQDN_of_Ranger_Admin>@<REALM>`:

```
> kadmin.local
> addprinc -randkey rangersync/<FQDN_of_Ranger_Usersync>
> xst -k /etc/security/keytabs/rangerusersync.keytab
> exit
```

2. Verify that `rangersync` created principal:

```
> kinit -kt /etc/security/keytabs/rangersync.keytab rangersync/
<FQDN_of_Ranger_usersync>@<REALM>
```

After using the **kinit** command, there should not be any errors. You can use the **klist** command to verify that your kinit command was successful.

3. Use the **kdestroy** command to destroy your active Kerberos authorization tickets by overwriting and deleting the credentials cache that contains them:

```
kdestroy
```

### 13.5.1.5. Prepare Ranger Tagsync

Follow these instructions to prepare Ranger usersync:

1. Create `rangertagsync/<FQDN>@<REALM>`:

```
> kadmin.local
>addprinc -randkey rangertagsync/<FQDN_of_Ranger_tagsync>
> xst -k /etc/security/keytabs/rangertagsync.keytab rangertagsync/
<FQDN>@<REALM>
> exit
```

2. Verify that `rangertagsync` created principal:

```
> kinit -kt /etc/security/keytabs/rangertagsync.keytab rangertagsync/
<FQDN_of_Ranger_tagsync>@<REALM>
```

After using the **kinit** command, there should not be any errors. You can use the **klist** command to verify that your kinit command was successful.

3. Use the **kdestroy** command to destroy your active Kerberos authorization tickets by overwriting and deleting the credentials cache that contains them:

```
kdestroy
```

4. Change the keytab permission to read-only and assign it to user `ranger`.

## 13.5.2. Installing Ranger Services

### 13.5.2.1. Prerequisites

Before you install Ranger services, you must complete the following tasks:

- Install JDK7 or higher.
- Install the latest version of your database and its respective connector jar.

### 13.5.2.2. Install Ranger Admin

Follow these steps to install Ranger Admin:

1. Untar the `ranger-<version>-admin.tar.gz` file:

```
tar xzf ranger-<version>-admin.tar.gz
```

2. Change directory to `ranger-<version>-admin`.

```
cd ranger-<version>-admin
```

3. Edit the `install.properties` file.

Enter the appropriate values for each of the following properties:

**Table 13.10. install.properties Property Values**

Property	Value
<code>db_root_use</code>	
<code>db_root_password</code>	
<code>db_host</code>	
<code>db_name</code>	
<code>db_user</code>	
<code>db_password</code>	
<code>polycmgr_external_url</code>	<code>http://&lt;FQDN_OF_Ranger_Admin_Cluster&gt;:6080</code>
<code>authentication_method</code>	UNIX, LDAP, or AD
<code>spnego_principal</code>	<code>HTTP/&lt;FQDN_OF_Ranger_Admin_Cluster&gt;@&lt;REALM&gt;</code>
<code>spnego_keytab</code>	<code>&lt;HTTP keytab path&gt;</code>
<code>token_value</code>	30
<code>cookie_domain</code>	<code>&lt;FQDN_OF_Ranger_Admin_Cluster&gt;</code>
<code>cookie_path</code>	/
<code>admin_principal</code>	<code>rangeradmin/ &lt;FQDN_OF_Ranger_Admin_Cluster&gt;@&lt;REALM&gt;</code>
<code>admin_keytab</code>	<code>&lt;rangeradmin keytab path&gt;</code>
<code>lookup_principal</code>	<code>rangerlookup/ &lt;FQDN_OF_Ranger_Admin_Cluster&gt;@&lt;REALM&gt;</code>
<code>lookup_keytab</code>	<code>&lt;rangerlookup_keytab_path&gt;</code>
<code>hadoop_conf</code>	<code>/etc/hadoop/conf</code>



### Note

If the Kerberos server and admin are on different hosts, copy the keytab to admin host and assign permission to user `ranger`:

- `scp` the `rangeradmin` keytab file to the respective path of another host.
- **`chown ranger <rangeradmin_keytab_path>`**
- **`chmod 400 <rangeradmin_keytab_path>`**

4. Run `setup`.

```
./setup.sh
```

5. Start the Ranger admin server.

```
./ranger-admin-services.sh start
```

### 13.5.2.3. Install Ranger Usersync

Follow these steps to install Ranger Usersync:

1. Untar the `ranger-<version>-usersync.tar.gz` file:

```
tar xzf ranger-<version>-usersync.tar.gz
```

2. Change directory to `ranger-<version>-usersync`.

```
cd ranger-<version>-usersync
```

3. Edit the `install.properties` file.

Enter the appropriate values for each of the following properties:

**Table 13.11. install.properties Property Values**

Property	Value
POLICY_MGR_URL	http://<FQDN_OF_Ranger_Admin_Cluster>:6080
usersync_principal	rangerusersync/<FQDN>@<REALM>
usersync_keytab	<rangerusersync keytab path>
hadoop_conf	/etc/hadoop/conf



#### Note

If the Kerberos server and usersync are on different hosts, copy the keytab on usersync host and assign permission to user `ranger`:

- `scp` the `rangerusersync` keytab file to the respective path of another host
- `chown ranger <rangerusersync_keytab_path>`
- `chmod 400 <rangerusersync_keytab_path>`

4. Run setup.

```
./setup.sh
```

5. Start the Ranger usersync server.

```
./ranger-usersync-services.sh start
```

### 13.5.2.4. Install Ranger Tagsync

Follow these steps to install Ranger Tagsync:

1. Untar the `ranger-<version>-tagsync.tar.gz` file:

```
tar xzf ranger-<version>-tagsync.tar.gz
```

2. Change directory to `ranger-<version>-tagsync`.

```
cd ranger-<version>-tagsync
```

3. Edit the `install.properties` file.

Enter the appropriate values for each of the following properties:

**Table 13.12. install.properties Property Values**

Property	Value
TAGADMIN_ENDPOINT	http://<FQDN_OF_Ranger_Admin_Cluster>:6080
tagsync_principal	rangertagsync/<FQDN>@<REALM>
tagsync_keytab	<rangertagsync keytab path>
hadoop_conf	/etc/hadoop/conf
TAG_SOURCE	, file



### Note

If the Kerberos server and tagsync are on different hosts, copy the keytab on admin host and assign permission to user `ranger`:

- `scp` the `rangertagsync` keytab file to the respective path of another host.
- `chown ranger <rangertagsync_keytab_path>`
- `chmod 400 <rangertagsync_keytab_path>`

#### 4. Run setup.

```
./setup.sh
```

#### 5. Start the Ranger tagsync server.

```
./ranger-tagsyn-services.sh start
```

## 13.5.2.5. Install Ranger KMS

Follow these steps to install Ranger KMS:

#### 1. Untar the `ranger-<version>-SNAPSHOT-kms.tar.gz` file:

```
tar xzf ranger-<version>-SNAPSHOT-kms.tar.gz
```

#### 2. Change directory to `ranger-<version>-SNAPSHOT-kms`.

```
cd ranger-<version>-SNAPSHOT-kms
```

#### 3. Edit the `install.properties` file.

Enter the appropriate values for each of the following properties:

**Table 13.13. install.properties Property Values**

Property	Value
KMS_MASTER_KEY_PASSWD	<Master_Key_Password>
kms_principal	rangerkms/<FQDN_of_ranger_kms_host>@<REALM>
kms_keytab	<ranger_kms_keytab_path>
hadoop_conf	<hadoop_core-site.xml_path>

Property	Value
POLICY_MGR_URL	http://<FQDN_of_ranger_admin_host>:6080



## Note

If the Kerberos server and tagsync are on different hosts, copy the keytab on Ranger KMS host and assign permission to user `kms`:

- `scp` the `rangerkms` keytab file to the respective path of another host.
- `chown ranger <rangerkms_keytab_path>`
- `chmod 400 <rangerkms_keytab_path>`

### 4. Run setup.

```
export JAVA_HOME=<JAVA_path>
./setup.sh
```

### 5. Perform other setup required for a kerberized cluster such as creating keytabs, and adding a proxy user. ???ADD REFERENCE HERE???

### 6. Start the Ranger KMS server.

```
./ranger-kms start
```

## 13.5.3. Manually Installing and Enabling the Ranger Plug-ins

### 13.5.3.1. Install and Enable Ranger HDFS Plug-in

#### 1. Extract your build at the appropriate place.

Copy `ranger-<version>-SNAPSHOT-hdfs-plugin.tar.gz` to `NameNode_host` in directory `/usr/hdp/<hdp-version>/`.

#### 2. Change directory to `/usr/hdp/<hdp-version>/`.

#### 3. Untar `ranger-<version>-SNAPSHOT-SNAPSHOT-hdfs-plugin.tar.gz`.

#### 4. Change directories to `ranger-<version>-SNAPSHOT-hdfs-plugin`.

#### 5. Edit the `install.properties` file.

Enter the appropriate values for each of the following properties:

**Table 13.14. `install.properties` Property Values**

Property	Values
POLICY_MGR_URL	http://<FQDN_of_ranger_admin_host>:6080
REPOSITORY_NAME	hadoopdev

Additionally, for the Audit info, Solr/HDFS options are available.



## 6. Enable the HDFS plug-in:

```
export JAVA_HOME=/usr/lib/jvm/java-1.7.0-openjdk.x86_64
./enable-hdfs-plugin.sh
```

## 7. Stop and start the namenode:

```
su hdfs -c "/usr/hdp/current/hadoop-client/sbin/hadoop-daemon.sh stop
namenode"
su hdfs -c "/usr/hdp/current/hadoop-client/sbin/hadoop-daemon.sh start
namenode"
```

## 8. Create the default repo for HDFS with proper configuration.

In the custom repo configuration, set the component user to `hdfs` for each of the following properties:

- `policy.download.auth.users` or `policy.grantrevoke.auth.users`
- `tag.download.auth.users`

9. Use the `Audit->plugins` tab to verify that the HDFS plug-in is communicating with Ranger admin.

### 13.5.3.2. Install and Enable Ranger Hive Plug-in

## 1. Extract your build at the appropriate place.

Copy `ranger-<version>-SNAPSHOT-hive-plugin.tar.gz` to `hiveServer2` host in directory `/usr/hdp/<hdp-version>/`.

2. Change directory to `/usr/hdp/<hdp-version>`.3. Untar `ranger-<version>-SNAPSHOT-SNAPSHOT-hive-plugin.tar.gz`.4. Change directories to `ranger-<version>-SNAPSHOT-hive-plugin`.5. Edit the `install.properties` file.

Enter the appropriate values for each of the following properties:

**Table 13.15. install.properties Property Values**

Property	Values
POLICY_MGR_URL	http://<FQDN_of_ranger_admin_host>:6080
REPOSITORY_NAME	hivedev

Additionally, for the Audit info, Solr/HDFS options are available.

## 6. Enable the Hive plug-in:

```
export JAVA_HOME=/usr/lib/jvm/java-1.7.0-openjdk.x86_64
```

```
./enable-hive-plugin.sh
```

#### 7. Stop and start hiveserver2:

```
ps -aux | grep hive | grep -i hiveserver2 | awk '{print $1,$2}' | grep hive
| awk '{print $2}' |
 xargs kill >/dev/null 2>&1
su hive -c "nohup /usr/hdp/current/hive-server2/bin/hiveserver2 -hiveconf
hive.metastore.uris=""
-hiveconf hive.log.dir=/var/log/hive -hiveconf hive.log.file=
hiveserver2.log >/var/log/hive/hiveserver2.out 2>
/var/log/hive/hiveserver2err.log &"
```

#### 8. Create the default repo for Hive with proper configuration.

In the custom repo configuration, set the component user to `hive` for each of the following properties:

- `policy.grantrevoke.auth.users`
- `tag.download.auth.users`

#### 9. Use the `Audit->plugins` tab to verify that the Hive plug-in is communicating with Ranger admin.

### 13.5.3.3. Install and Enable Ranger HBase Plug-in

#### 1. Extract your build at the appropriate place.

Copy `ranger-<version>-SNAPSHOT-hbase-plugin.tar.gz` to `Active_Hbasemaster` host in directory `/usr/hdp/<hdp-version>/`.

#### 2. Change directory to `/usr/hdp/<hdp-version>`.

#### 3. Untar `ranger-<version>-SNAPSHOT-SNAPSHOT-hbase-plugin.tar.gz`.

#### 4. Change directories to `ranger-<version>-SNAPSHOT-hbase-plugin`.

#### 5. Edit the `install.properties` file.

Enter the appropriate values for each of the following properties:

**Table 13.16. install.properties Property Values**

Property	Values
POLICY_MGR_URL	http://<FQDN_of_ranger_admin_host>:6080
REPOSITORY_NAME	hbasedev

Additionally, for the Audit info, Solr/HDFS options are available.

#### 6. Enable the HBase plug-in:

```
export JAVA_HOME=/usr/lib/jvm/java-1.7.0-openjdk.x86_64
```

```
./enable-hbase-plugin.sh
```

### 7. Stop and start hbase:

```
su hbase -c "/usr/hdp/current/hbase-master/bin/hbase-daemon.sh stop
regionserver; sleep 25"
su hbase -c "/usr/hdp/current/hbase-regionserver/bin/hbase-daemon.sh stop
master"
su hbase -c "/usr/hdp/current/hbase-master/bin/hbase-daemon.sh start master;
sleep 25"
su hbase -c "/usr/hdp/current/hbase-regionserver/bin/hbase-daemon.sh start
regionserver"
```

### 8. Create the default repo for HBase with proper configuration.

In the custom repo configuration, add the component user to hbase for each of the following properties:

- policy.grantrevoke.auth.users
- tag.download.auth.users

### 9. Use the Audit->plugins tab to verify that the HBase plug-in is communicating with Ranger admin.

## 13.5.3.4. Install and Enable Ranger YARN Plug-in

### 1. Extract your build at the appropriate place.

Copy `ranger-<version>-SNAPSHOT-yarn-plugin.tar.gz` to Active\_Hbasemaster host in directory `/usr/hdp/<hdp-version>/`.

### 2. Change directory to `/usr/hdp/<hdp-version>`.

### 3. Untar `ranger-<version>-SNAPSHOT-SNAPSHOT-yarn-plugin.tar.gz`.

### 4. Change directories to `ranger-<version>-SNAPSHOT-yarn-plugin`.

### 5. Edit the `install.properties` file.

Enter the appropriate values for each of the following properties:

**Table 13.17. install.properties Property Values**

Property	Values
POLICY_MGR_URL	http://<FQDN_of_ranger_admin_host>:6080
REPOSITORY_NAME	yarndev

Additionally, for the Audit info, Solr/HDFS options are available.

### 6. Enable the YARN plug-in:

```
export JAVA_HOME=/usr/lib/jvm/java-1.7.0-openjdk.x86_64
./enable-yarn-plugin.sh
```

## 7. Stop and start the ResourceManager and the NodeManager:

First, stop and start the ResourceManager on all of your ResourceManager hosts:

```
su yarn -c "/usr/hdp/current/hadoop-yarn-resourcemanager/sbin/yarn-daemon.sh
stop resourcemanager"
su yarn -c "/usr/hdp/current/hadoop-yarn-resourcemanager/sbin/yarn-daemon.sh
start resourcemanager"
ps -ef | grep -i resourcemanager
```

Next, stop and start the NodeManager on all your NodeManager hosts:

```
su yarn -c "/usr/hdp/current/hadoop-yarn-nodemanager/sbin/yarn-daemon.sh
stop nodemanager"
su yarn -c "/usr/hdp/current/hadoop-yarn-nodemanager/sbin/yarn-daemon.sh
start nodemanager"
ps -ef | grep -i nodemanager
```

## 8. Create the default repo for YARN with proper configuration.

In the custom repo configuration, add the component user to `yarn` for each of the following properties:

- `policy.grantrevoke.auth.users` or `policy.download.auth.users`
- `tag.download.auth.users`

## 9. Use the Audit->plugins tab to verify that the YARN plug-in is communicating with Ranger admin.

### 13.5.3.5. Install and Enable Ranger Knox Plug-in

#### 1. Extract your build at the appropriate place.

Copy `ranger-<version>-SNAPSHOT-knox-plugin.tar.gz` to Active\_ResourceManager host in directory `/usr/hdp/<hdp-version>/`.

#### 2. Change directory to `/usr/hdp/<hdp-version>`.

#### 3. Untar `ranger-<version>-SNAPSHOT-SNAPSHOT-knox-plugin.tar.gz`.

#### 4. Change directories to `ranger-<version>-SNAPSHOT-knox-plugin`.

#### 5. Edit the `install.properties` file.

Enter the appropriate values for each of the following properties:

**Table 13.18. install.properties Property Values**

Property	Values
POLICY_MGR_URL	http://<FQDN_of_ranger_admin_host>:6080
KNOX_HOME	/usr/hdp/<version>/knox/
REPOSITORY_NAME	knoxdev

Additionally, for the Audit info, Solr/HDFS options are available.

#### 6. Enable the Knox plug-in:

```
export JAVA_HOME=/usr/lib/jvm/java-1.7.0-openjdk.x86_64
./enable-knox-plugin.sh
```



#### Note

In the HA environment, the Knox plug-in must be enabled on all Knox instances.

#### 7. Stop and start the Knox gateway:

```
su Knox -c "/usr/hdp/current/knox-server/bin/gateway.sh stop"
su Knox -c "/usr/hdp/current/knox-server/bin/gateway.sh start"
```

#### 8. Create the default repo for Knox with proper configuration.

In the custom repo configuration, add the component user `knox` for each of the following properties:

- `policy.grantrevoke.auth.users` or `policy.download.auth.users`
- `tag.download.auth.users`

#### 9. Use the `Audit->plugins` tab to verify that the Knox plug-in is communicating with Ranger admin.

10 For your test connection to be successful, follow the additional step "Trusting Self Signed Knox Certificate." (?? THIS LINK DOES NOT WORK??)

### 13.5.3.6. Install and Enable Ranger Storm Plug-in

#### 1. Extract your build at the appropriate place.

Copy `ranger-<version>-SNAPSHOT-storm-plugin.tar.gz` to `Active_Resourcemanager host` in directory `/usr/hdp/<hdp-version>/.`

#### 2. Change directory to `/usr/hdp/<hdp-version>/.`

#### 3. Untar `ranger-<version>-SNAPSHOT-SNAPSHOT-storm-plugin.tar.gz`.

#### 4. Change directories to `ranger-<version>-SNAPSHOT-storm-plugin`.

#### 5. Edit the `install.properties` file.

Enter the appropriate values for each of the following properties:

**Table 13.19. install.properties Property Values**

Property	Values
<code>POLICY_MGR_URL</code>	<code>http://&lt;FQDN_of_ranger_admin_host&gt;:6080</code>

Property	Values
REPOSITORY_NAME	stormdev

Additionally, for the Audit info, Solr/HDFS options are available.

#### 6. Enable the Storm plug-in:

```
export JAVA_HOME=/usr/lib/jvm/java-1.7.0-openjdk.x86_64
./enable-storm-plugin.sh
```

#### 7. Stop and start Storm:

???Need this info???

#### 8. Create the default repo for Storm with proper configuration.

In the custom repo configuration, add the component user `storm` for each of the following properties:

- `policy.grantrevoke.auth.users` or `policy.download.auth.users`
- `tag.download.auth.users`

#### 9. Use the `Audit->plugins` tab to verify that the Storm plug-in is communicating with Ranger admin.

### 13.5.3.7. Install and Enable Ranger Kafka Plug-in

#### 1. Extract your build at the appropriate place.

Copy `ranger-<version>-SNAPSHOT-kafka-plugin.tar.gz` to `Active_Resourcemanager host` in directory `/usr/hdp/<hdp-version>/`.

#### 2. Change directory to `/usr/hdp/<hdp-version>`.

#### 3. Untar `ranger-<version>-SNAPSHOT-SNAPSHOT-kafka-plugin.tar.gz`.

#### 4. Change directories to `ranger-<version>-SNAPSHOT-kafka-plugin`.

#### 5. Edit the `install.properties` file.

Enter the appropriate values for each of the following properties:

**Table 13.20. install.properties Property Values**

Property	Values
COMPONENT_INSTALL_DIR_NAME	<code>/usr/hdp/&lt;hdp-version&gt;/kafka</code>
POLICY_MGR_URL	<code>http://&lt;FQDN_of_ranger_admin_host&gt;:6080</code>
REPOSITORY_NAME	<code>kafkadev</code>

Additionally, for the Audit info, Solr/HDFS options are available.

#### 6. Enable the Kafka plug-in:

```
export JAVA_HOME=/usr/lib/jvm/java-1.7.0-openjdk.x86_64
./enable-kafka-plugin.sh
```



### Note

In the HA environment, the Knox plug-in must be enabled on all Knox instances.

#### 7. Stop and start the Kafka gateway:

```
su kafka -c "/usr/hdp/current/kafka-broker/bin/kafka stop"
su kafka -c "/usr/hdp/current/kafka-broker/bin/kafka start"
```

#### 8. Create the default repo for Kafka with proper configuration.

In the custom repo configuration, add the component user `kafka` for each of the following properties:

- `policy.grantrevoke.auth.users` or `policy.download.auth.users`
- `tag.download.auth.users`

#### 9. Use the `Audit->plugins` tab to verify that the Kafka plug-in is communicating with Ranger admin.



### Note

If the Kafka plugin is unable to communicate with Ranger admin, check that the `authorizer.class.name` property in file `/usr/hdp/<hdp-version>/kafka/config/server.properties`, is set to `org.apache.ranger.authorization.kafka.authorizer.RangerKafkaAuthorizer`.

## 13.6. Verifying the Installation

To verify that installation was successful, perform the following checks:

- Check whether the Database `RANGER_ADMIN_DB_NAME` is present in the MySQL server running on `RANGER_ADMIN_DB_HOST`
- Check whether the Database `RANGER_AUDIT_DB_NAME` is present in the MySQL server running on `RANGER_AUDIT_DB_HOST`
- Check whether the “ranger-admin” service is installed in `services.msc` (Windows only)
- Check whether the “ranger-usersync” service is installed in `services.msc` (Windows only)
- If you plan to use the Ranger Administration Console with the UserSync feature, check whether both services start
- Go to the Ranger administration console host URL and make sure you can log in using the default user credentials

## 14. Installing Hue

Hue is a Web UI for Hadoop.

Hue supports the following features:

- Beeswax to execute Hive queries
- File Browser to access HDFS
- HCatalog application for Hive metadata and table management
- Pig application to execute Pig queries
- Job Designer to create MapReduce/Streaming/Java jobs
- Oozie application to submit and schedule workflows
- JobBrowser for view MapReduce jobs

This chapter describes the basics of installing, configuring, and validating Hue.

1. [Before You Begin \[175\]](#)
2. [Configure HDP to Support Hue \[176\]](#)
3. [Install the Hue Packages \[186\]](#)
4. [Configure Hue to Communicate with the Hadoop Components \[187\]](#)
5. [Configure Hue for Databases \[190\]](#)
6. [Start, Stop, and Restart Hue \[193\]](#)
7. [Validate the Hue Installation \[193\]](#)

### 14.1. Before You Begin

Before you begin your Hadoop installation, you must meet the following requirements.

Note: Hue can only connect to one Hadoop cluster.

1. Ensure that you are using an operating system that supports Hue.

The following 64-bit operating systems support Hue:

- CentOS 6
- Oracle Linux 6
- Red Hat Enterprise Linux (RHEL) 6



- SUSE Linux Enterprise Server (SLES) 11, SP3/SP4, and SLES 12 SP 1
2. Ensure that you are using a browser that can access Hue.

While Hue only runs on Linux, you can access Hue using browsers that run on Linux, Windows, or Mac.

See [Browser Requirements](#) for a complete list of browsers that work with Hue.

3. Ensure that you are using database that supports Hue.

Refer to [HDP Database Requirements](#) for a complete list of supported databases.

4. Ensure that you have Python 2.6.6 or higher installed.
5. Ensure that you have at least core Hadoop on your system. See [Configure the Remote Repositories](#) for more information.
6. Ensure that the HDP repositories are available:

```
yum list hue hue-*
```

The output should list at least one Hue package, similar to the following:

```
hue.x86_64 <version>
hue-beeswax.x86_64 <version>
hue-common.x86_64 <version>
hue-hcatalog.x86_64 <version>
hue-oozie.x86_64 <version>
hue-pig.x86_64 <version>
hue-server.x86_64 <version>
```

If yum responds with `Error: No matching package to list`, yum cannot locate a matching RPM. This can happen if the repository hosting the HDP RPMs is unavailable, or has been disabled. If this occurs, follow the instructions at [Configure the Remote Repositories](#) to configure private repository before proceeding.

## 14.2. Configure HDP to Support Hue

For Hue to communicate properly with HDP components, some minor configuration changes of your HDP cluster are required.

Complete the instructions in this section using Ambari. Do not edit the configuration files directly.

Use Ambari to start and stop the services.

1. Use the `admin` account, login to the Ambari Web UI at <http://localhost.com:8080> or <http://127.0.0.1:8080>.
2. Stop the namenode.
  - a. Select `Hosts` on the Navigation Header.



- b. Select the FQDN.

In this example, `sandbox.hortonworks.com` is the FQDN.

Name	IP Address	Rack	Cores	RAM	Disk Usage	Load Avg	Versions	Components
Any	Any	Any	Any	Any	Any	Any	Filter Y	Filter Y
<a href="#">sandbox.hortonworks.com</a>	10.0.2.15	/default-rack	2 (2)	7.69GB			HDP-2.4.0.0-169	44 Components

Show: 10 | 1 - 1 of 1

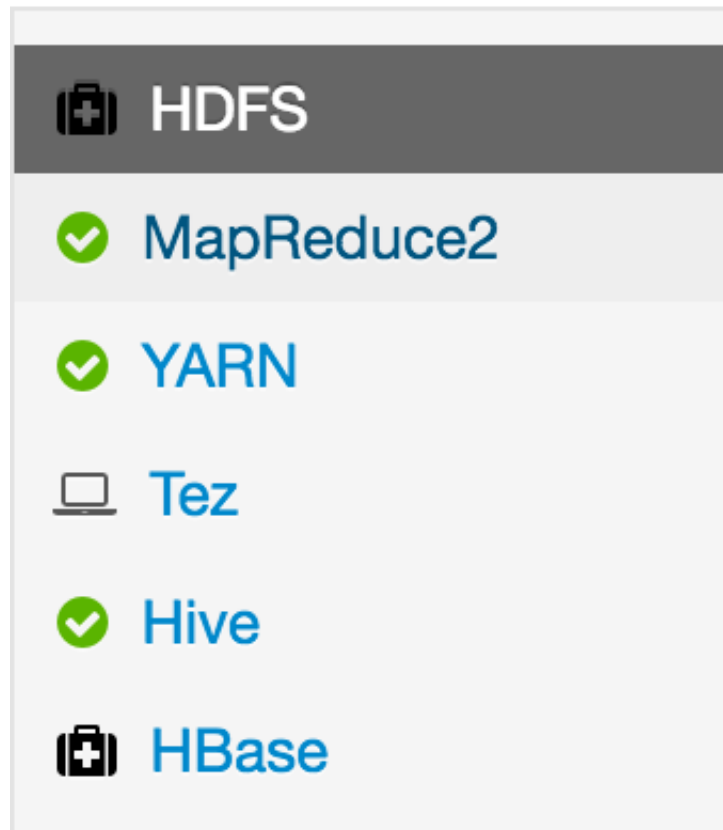
- c. Scroll down to NameNode and click on Started to reveal the drop down menu. Select Stop from the drop down menu to stop the Namenode.

✓ HiveServer2 / <a href="#">Hive</a>	Started
⚠ Kafka Broker / <a href="#">Kafka</a> 🛡️	Stopped
⚠ Knox Gateway / <a href="#">Knox</a> 🛡️	Stopped
⚠ Metrics Collector / <a href="#">Ambari Metrics</a> 🛡️	Stopped
✓ MySQL Server / <a href="#">Hive</a>	Started
✓ NameNode / <a href="#">HDFS</a> 🛡️	Started
⚠ Nimbus / <a href="#">Storm</a> 🛡️	Restart Stop Turn Off Maintenance Mode Rebalance HDFS
✓ Oozie Server / <a href="#">Oozie</a>	Started
✓ Ranger Admin / <a href="#">Ranger</a>	Started
✓ Ranger Usersync / <a href="#">Ranger</a>	Started
✓ ResourceManager / <a href="#">YARN</a>	Started

- d. Click OK to confirm.

### 3. Modify `hdfs-site` settings.

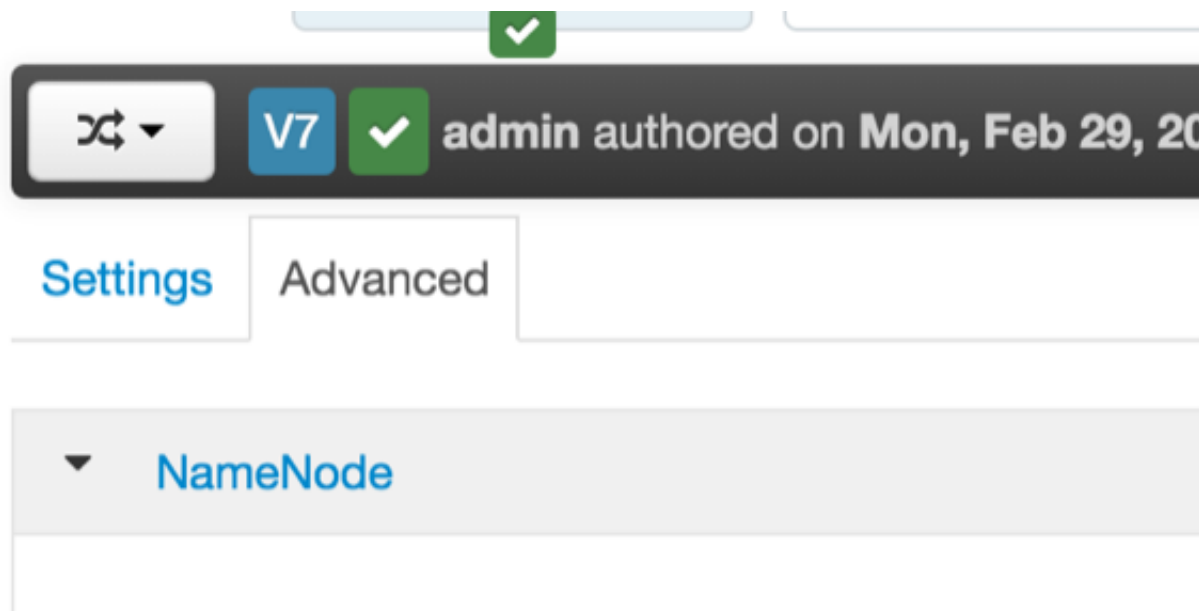
- a. Click on HDFS from the Services menu on the left side of the screen.



b. Click the `Configs` tab.



Click `Advanced`.

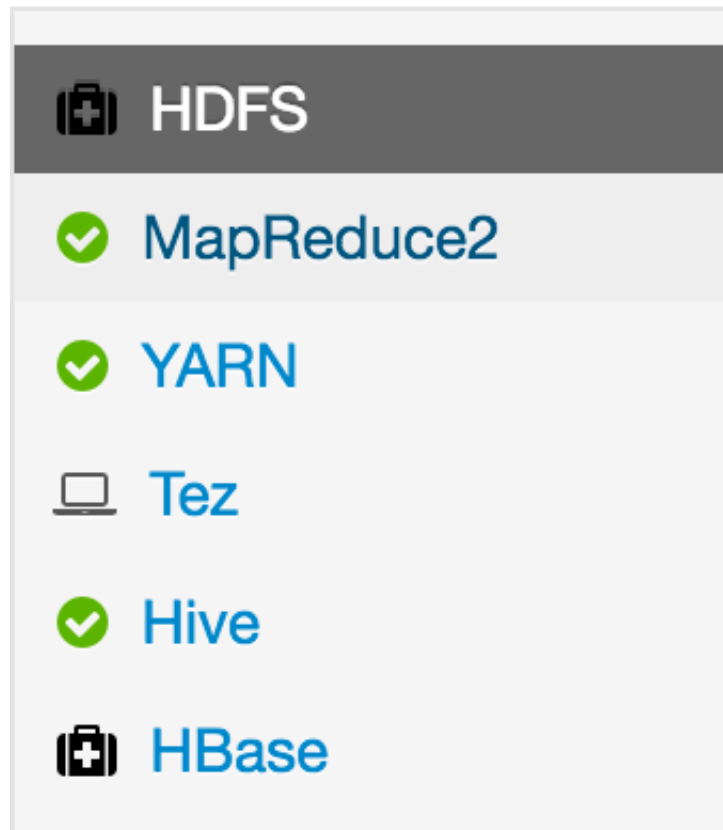


- c. Scroll down to the `General` settings. Ensure that the `WebHDFS enabled` checkbox is checked.



4. Modify the `core-site` settings.

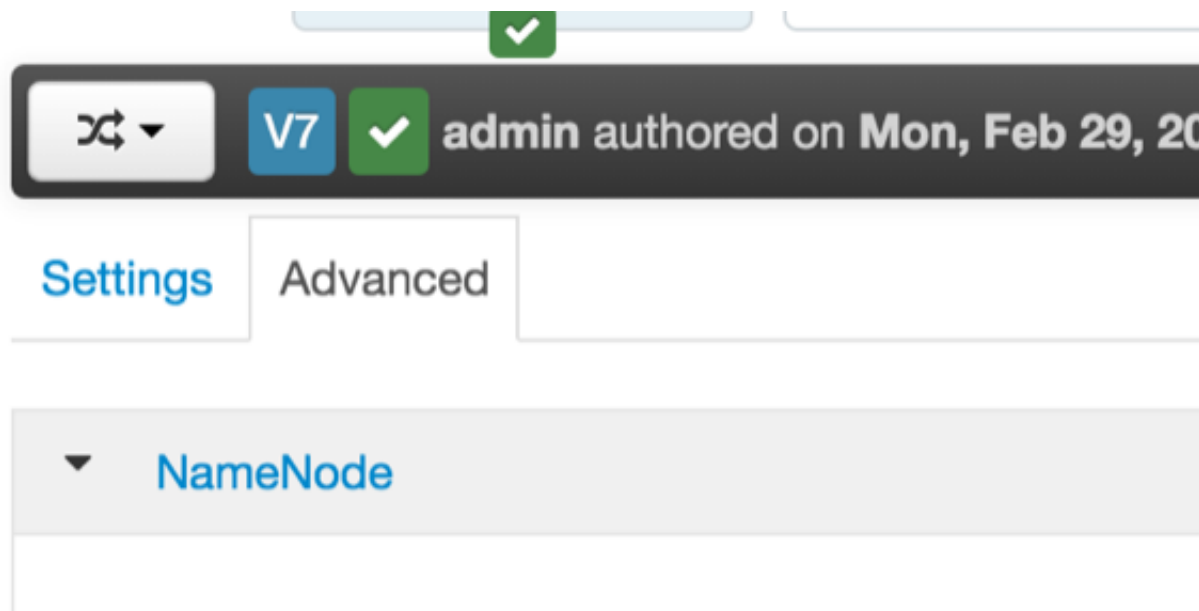
- a. Click on `HDFS` from the `Services` menu on the left side of the screen.



b. Click the `Configs` tab.



Click `Advanced`.



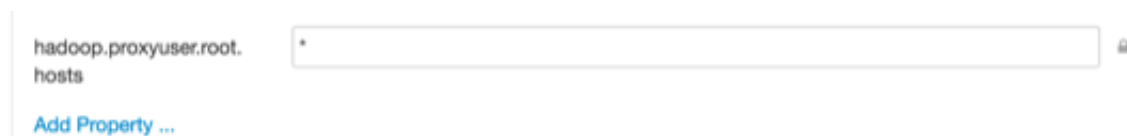
- c. Scroll down to Custom core-site settings.



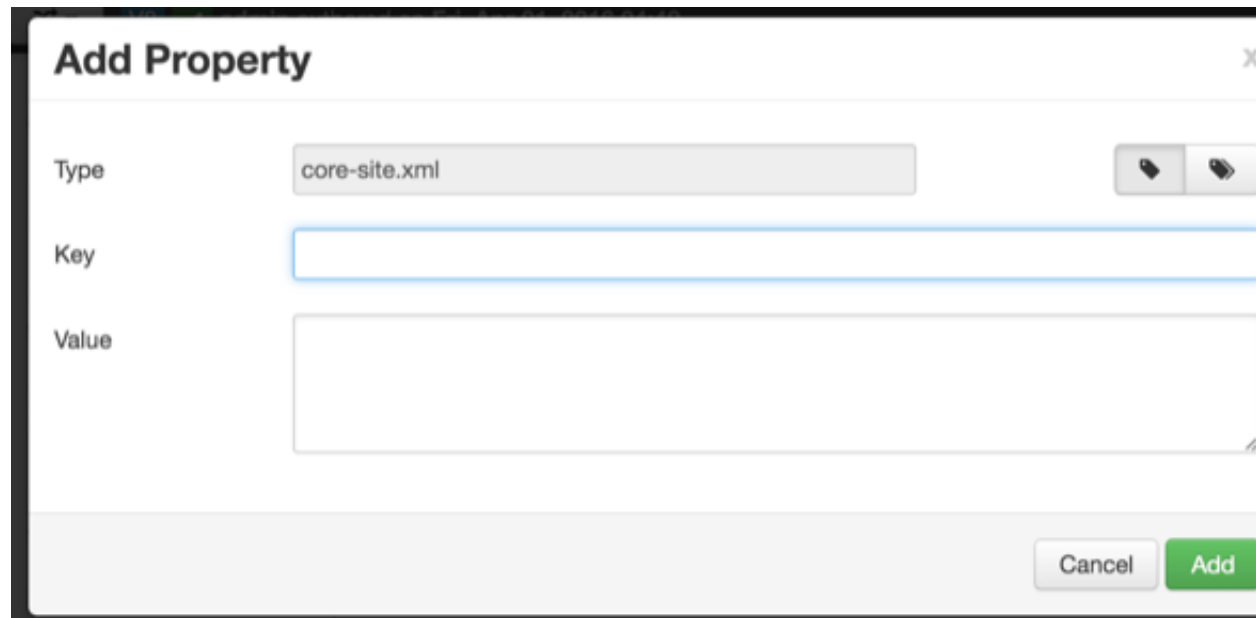
- d. Ensure the `hadoop.proxyuser.hue.groups` and `hadoop.proxyuser.hue.hosts` properties and their respective values are set.



- e. If they are not, add them, by clicking on Add Property ....



- f. Set the Key as the setting name (for example, `hadoop.proxyuser.hue.hosts`) and the Value as *value*, for example, `*`. Click Add.



**Add Property**

Type

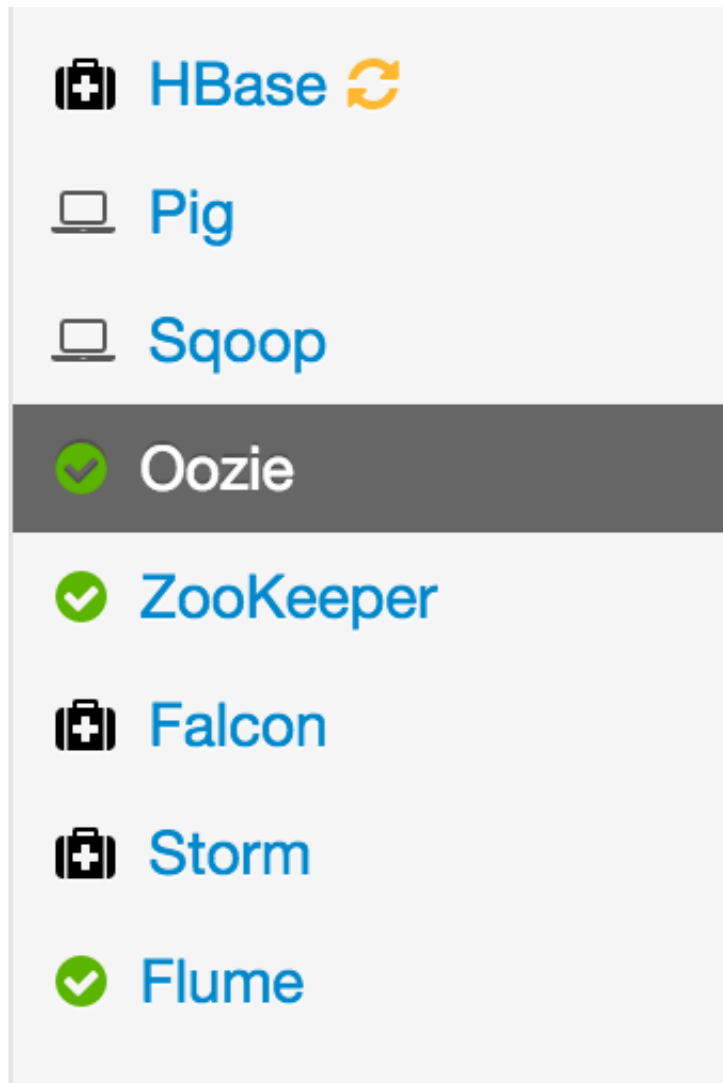
Key

Value

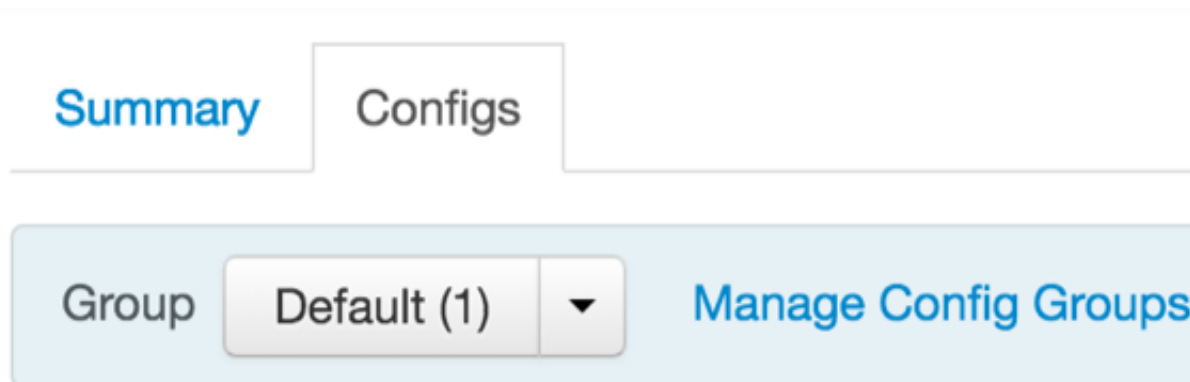
Cancel Add

5. Modify `oozie-site` settings

- a. From the `Services` menu, click `Oozie`.



b. Click Configs.



c. Scroll down to Custom oozie-site.

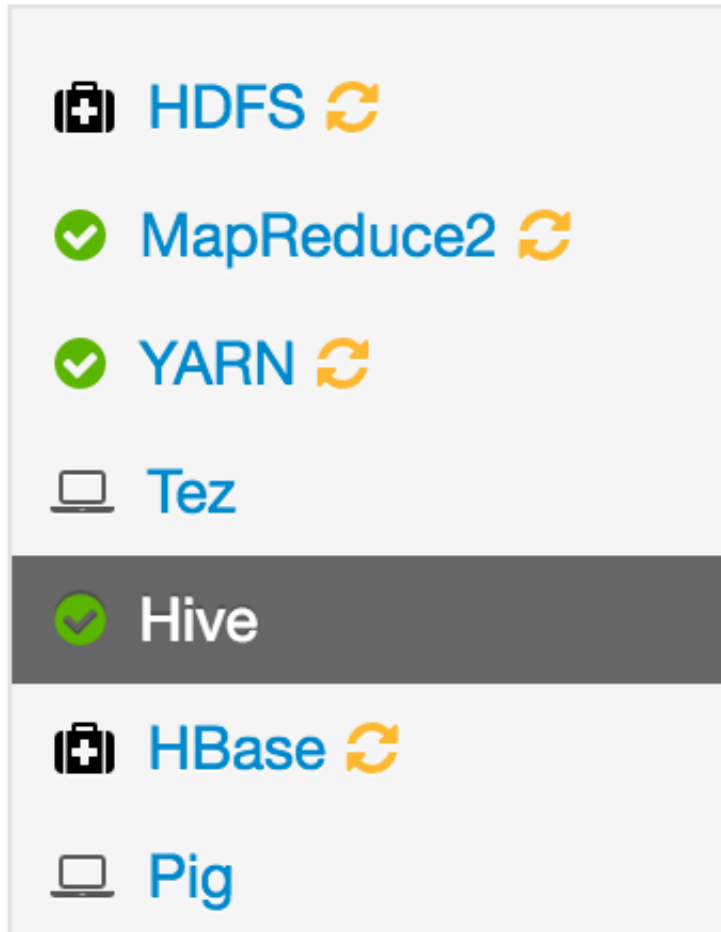




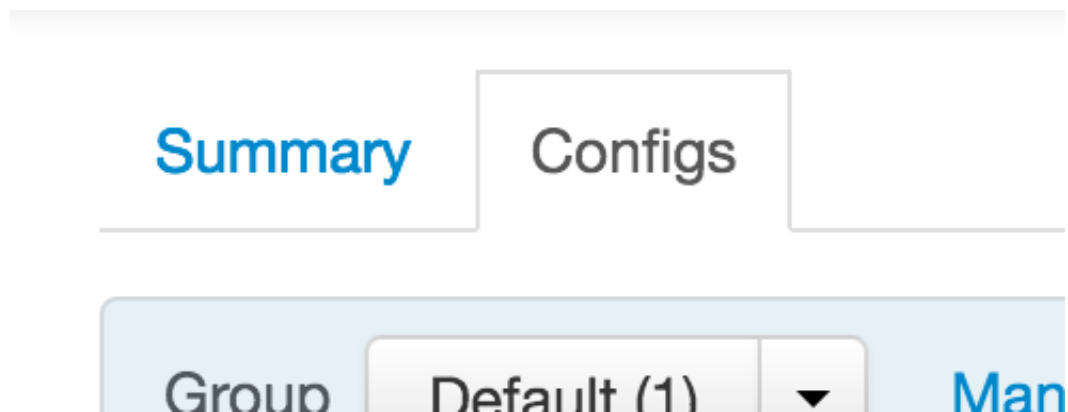
- d. Ensure that the `oozie.service.ProxyUserService.proxyuser.hue.groups` and the `oozie.service.ProxyUserService.proxyuser.hue.hosts` properties are present.



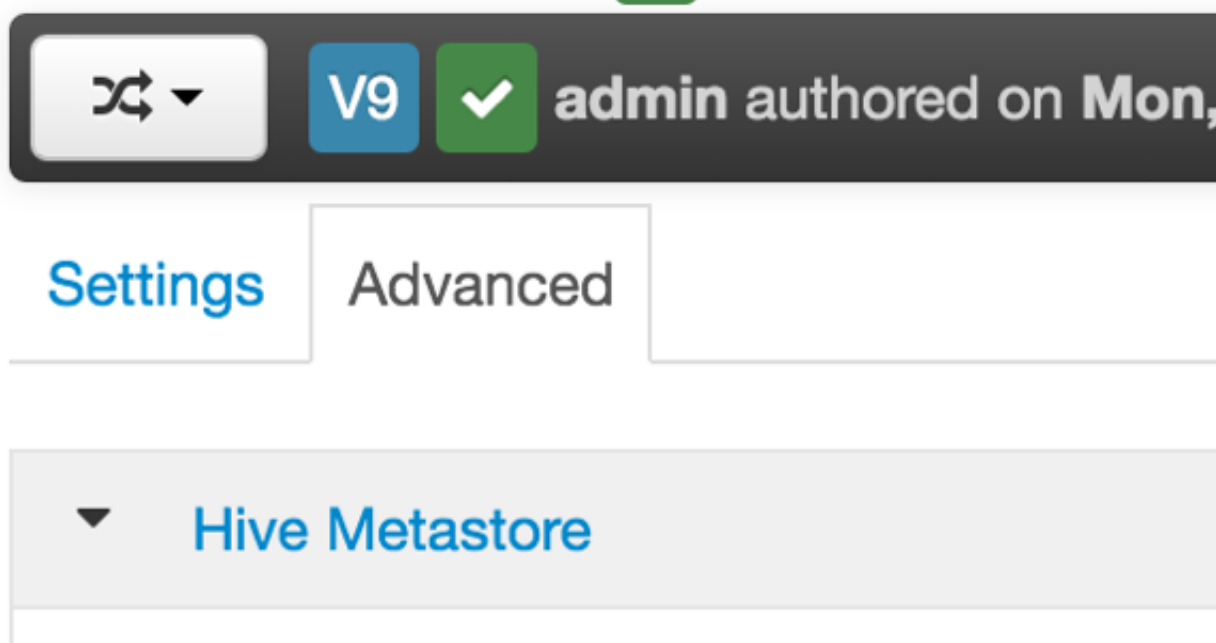
- e. If they are not present, add them by clicking on Add Property ....
6. Modify `hive-site` settings.
- a. From the Services menu click on Hive.



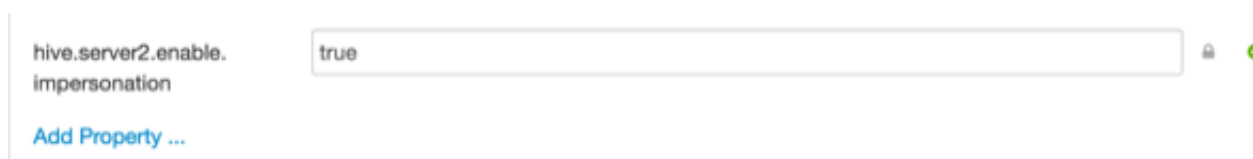
b. Click the Configs tab.



c. Click Advanced.



- d. Ensure the `hive.server2.enable.doAs` property is present.



- e. If the `hive.server2.enable.doAs` property is not present, click on Add Property ... and add it.

## 14.3. Install the Hue Packages

Hue server installation assumes the installation of the following sets of packages: `hue`, `hue-common`, `hue-server`, `hue-beeswax`, `hue-oozie`, `hue-pig`, and `.`

By default, the hue meta-package installs the package and all Hue applications as its dependencies.

Follow these steps to install the Hue packages:

1. Stop all of the services in your cluster.  
For more information, see [Stopping HDP Services](#) in the *HDP Reference Guide*.
2. Choose a Hue Server host machine in your cluster on which to deploy your Hue server.
  - You can deploy Hue on any host in your cluster.
  - If your corporate firewall policies allow, you can also use a remote host machine as your Hue server.

- For evaluation or small cluster sizes, use the master install machine for HDP as your Hue server.
3. Configure the firewall to ensure that all ports are open.
    - Verify that the host machines within your cluster can connect to each other over TCP.
    - The machines outside your cluster must be able to open TCP port 8000 on the Hue Server (or the configured Hue web HTTP port) to interact with the system.
  4. Install Hue.
    - If you are running CentOS 6, RHEL 6, or Oracle Linux 6, run this command on all Hue Server host machines:

```
yum install hue
```
    - If you are running SLES 11, SP3/SP4, or SLES 12 SP 1, run this command on all Hue server host machines:

```
zypper install hue
```

## 14.4. Configure Hue to Communicate with the Hadoop Components

### 14.4.1. Configure the Web Server

These configuration variables are in the `[desktop]` section of the `/etc/hue/conf/hue.ini` configuration file.

#### 1. Specify the Hue HTTP Address.

Use the following options to change the IP address and port of the existing Web Server for Hue (by default, CherryPy).

```
Webserver listens on this address and port
http_host=0.0.0.0
http_port=8000
```

The default setting is port 8000 on all configured IP addresses.

#### 2. Specify the Secret Key.

To ensure that your session cookies are secure, enter a series of random characters (30 to 60 characters is recommended) as shown in the example below:

```
secret_key=jfE93j;2[290-eiw.KEiwN2s3['d;/ .q[eIW^y#e+=Iei*@Mn<qW5o
```

#### 3. Configure authentication.

- By default, the first user who logs in to Hue can choose any username and password and gets the administrator privileges.
- This user can create other user and administrator accounts.

- User information is stored in the Django database in the Django backend.

#### 4. (Optional) Configure Hue for SSL.

- Configure Hue to use your private key.

Add the following to the `/etc/hue/conf/hue.ini` file:

```
ssl_certificate=$PATH_To_CERTIFICATE
ssl_private_key=$PATH_To_KEY
ssl_cipher_list="DEFAULT:!aNULL:!eNULL:!LOW:!EXPORT:!SSLv2" (default)
```



### Note

To upload files using the Hue File Browser over HTTPS, you must have a proper SSL Certificate. Ideally, you should have an appropriate key signed by a Certificate Authority.

For test purposes, you can create a self-signed key using the `openssl` command on your system:

- Create a key:

```
openssl genrsa 1024 > host.key
```

- Create a self-signed certificate:

```
openssl req -new -x509 -nodes -sha1 -key host.key > host.cert
```

## 14.4.2. Configure Hadoop

These configuration variables are in the `[hadoop]` section of the `/etc/hue/conf/hue.ini` configuration file:

#### 1. Configure an HDFS cluster.

Hue only supports one HDFS cluster. Ensure that you define the HDFS cluster under the `[hadoop][hdfs_clusters][[default]]` subsection of the `/etc/hue/config/hue.ini` configuration file.

Use the following variables to configure the HDFS cluster:

Variable	Description	Default/Example Value
<code>fs_defaultfs</code>	This is equivalent to <code>fs.defaultFS</code> ( <code>fs.default.name</code> ) in the Hadoop configuration.	<code>hdfs://fqdn.namenode.host:8020</code>
<code>webhdfs_url</code>	WebHDFS URL.	The default value is the HTTP port on the NameNode. Example: <code>http://fqdn.namenode.host:50070/webhdfs/v1</code>

#### 2. Configure a YARN (MR2) Cluster.

Hue supports only one YARN cluster.

Ensure that you define the YARN cluster under the `[hadoop][yarn_clusters][[default]]` sub-section of the `/etc/hue/config/hue.ini` configuration file.

For more information regarding how to configure Hue with a NameNode HA cluster see [Deploy Hue with a ResourceManager HA Cluster](#) in the *High Availability for Hadoop Guide*.

Use the following variables to configure a YARN cluster:

Variable	Description	Default/Example Value
<code>submit_to</code>	Set this property to true. Hue submits jobs to this YARN cluster. Note that JobBrowser is not able to show MR2 jobs.	true
<code>resourcemanager_api_url</code>	The URL of the ResourceManager API.	<code>http://fqdn.resourcemanager.host:8088</code>
<code>proxy_api_url</code>	The URL of the ProxyServer API.	<code>http://fqdn.resourcemanager.host:8088</code>
<code>history_server_api_url</code>	The URL of the HistoryServer API.	<code>http://fqdn.historyserver.host:19888</code>
<code>node_manager_api_url</code>	The URL of the NodeManager API.	<code>http://fqdn.resourcemanager.host:8042</code>

### 3. Configure Beeswax

In the `[beeswax]` section of the of the `/etc/hue/config/hue.ini` configuration file, you can specify the following values:

Variable	Description	Default/Example Value
<code>hive_server_host</code>	Host where Hive server Thrift daemon is running. If Kerberos security is enabled, use fully-qualified domain name (FQDN).	
<code>hive_server_port</code>	Port on which HiveServer2 Thrift server runs.	10000
<code>hive_conf_dir</code>	Hive configuration directory where <code>hive-site.xml</code> is located.	<code>/etc/hive/conf</code>
<code>server_conn_timeout</code>	Timeout in seconds for Thrift calls to HiveServer2.	120



### Important

Depending on your environment and the Hive queries you run, queries might fail with an internal error processing query message.

Look for an error message `java.lang.OutOfMemoryError`:

GC overhead limit exceeded in the `beeswax_server.out` log file. To increase the heap size to avoid this out of memory error, modify the `hadoop-env.sh` file and change the value of `HADOOP_CLIENT_OPTS`.

### 4. Configure HiverServer2 over SSL (Optional)

Make the following changes to the `/etc/hue/conf/hue.ini` configuration file to configure Hue to communicate with HiverServer2 over SSL:

```
[[ssl]]
SSL communication enabled for this server.
enabled=falsePath to Certificate Authority certificates.
cacerts=/etc/hue/cacerts.pemPath to the public certificate file.
cert=/etc/hue/cert.pemChoose whether Hue should validate certificates
received from the server.
validate=true
```

### 5. Configure JobDesigner and Oozie

In the `[liboozie]` section of the `/etc/hue/conf/hue.ini` configuration file, specify the `oozie_url`, the URL of the Oozie service as specified by the `OOZIE_URL` environment variable for Oozie.

### 6. Configure WebHCat

In the `[hcatalog]` section of the `/etc/hue/conf/hue.ini` configuration file, set `templeton_url`, to the hostname or IP of the WebHCat server. An example could be `http://hostname:50111/templeton/v1/`.

## 14.5. Configure Hue for Databases

By default, Hue uses an embedded database, SQLite 3.6.20. If you are using SQLite 3.6.20, there is no need to configure Hue for databases.

Alternatively, you can configure Hue to use any of the following external databases:

- [Using Hue with Oracle \[190\]](#)
- [Using Hue with MySQL \[191\]](#)
- [Using Hue with PostgreSQL \[192\]](#)

### 14.5.1. Using Hue with Oracle

To set up Hue to use an Oracle database:

1. Create a new user in Oracle and grant privileges to manage this database using the Oracle database admin utility:

```
sqlplus sys/root as sysdba
CREATE USER $HUEUSER IDENTIFIED BY $HUEPASSWORD default tablespace "USERS"
temporary tablespace "TEMP";
GRANT CREATE TABLE, CREATE SEQUENCE, CREATE PROCEDURE, CREATE TRIGGER,
CREATE SESSION,
UNLIMITED TABLESPACE TO $HUEUSER;
```

Where `$HUEUSER` is the Hue user name and `$HUEPASSWORD` is the Hue user password.

2. Open the `/etc/hue/conf/hue.ini` file and edit the `[[database]]` section (modify for your Oracle setup).

```
[[database]]
```

```
engine=oracle
host=$DATABASEIPADDRESSORHOSTNAME
port=$PORT
user=$HUEUSER
password=$HUEPASSWORD
name=$DBNAME
```

3. Install the Oracle instant clients and configure `cx_Oracle`.
  - a. Download and extract the `instantclient-basic-linux` and `instantclient-sdk-linux` Oracle clients from the [Oracle download site](#).
  - b. Set your `ORACLE_HOME` environment variable to point to the newly downloaded client libraries.
  - c. Set your `LD_LIBRARY_PATH` environment variable to include `ORACLE_HOME`.
  - d. Create a symbolic link for library expected by `cx_Oracle`:

```
ln -sf libclntsh.so.11.1 libclntsh.so
```

- e. Install the `cx_Oracle` python module.
- f. Confirm that the `python-setuptools` are present on the Hue node, for example:

```
rpm -qa | grep python-setuptools
```

If the `python-setuptools` are not present, install them, using the following command:

```
yum install python-setuptools
```

- g. Install the `cx_Oracle` module:

```
/usr/lib/hue/build/env/bin/pip install cx_Oracle
```

- h. Upgrade Django south:

```
/usr/lib/hue/build/env/bin/pip install south --upgrade
```

4. Synchronize Hue with the external database to create the schema and load the data:

```
cd /usr/lib/hue
source build/env/bin/activate
hue syncdb --noinput
hue migrate
deactivate
```

5. Populate `/usr/lib64` with Oracle instant-client library files.
6. Copy the `*.so.*` files from oracle `instantclient` directory path to `/usr/lib64`.

## 14.5.2. Using Hue with MySQL

To set up Hue to use a MySQL database:

1. Create a new user in MySQL, and grant privileges to it to manage the database using the MySQL database admin utility:



```
mysql -u root -p
CREATE USER $HUEUSER IDENTIFIED BY '$HUEPASSWORD';
GRANT ALL PRIVILEGES on *.* to '$HUEUSER'@'localhost' WITH GRANT OPTION;
GRANT ALL on $HUEUSER.* to '$HUEUSER'@'localhost' IDENTIFIED BY
$HUEPASSWORD;
FLUSH PRIVILEGES;
```

2. Create the MySQL database for Hue:

```
mysql -u root -p
CREATE DATABASE $DBNAME;
```

3. Open the `/etc/hue/conf/hue.ini` file and edit the `[[database]]` section:

```
[[database]]
engine=mysql
host=$DATABASEIPADDRESSORHOSTNAME
port=$PORT
user=$HUEUSER
password=$HUEPASSWORD
name=$DBNAME
```

4. Synchronize Hue with the external database to create the schema and load the data.

```
cd /usr/lib/hue
source build/env/bin/activate
hue syncdb --noinput
hue migrate
deactivate
```

### 14.5.3. Using Hue with PostgreSQL

To set up Hue to use a PostgreSQL database:

1. Create a database in PostgreSQL using the PostgreSQL database admin utility.

```
sudo -u postgres psql
CREATE DATABASE $DBNAME;
```

2. Exit the database admin utility.

```
\q <enter>
```

3. Create the Hue user.

```
sudo -u postgres psql -d $DBNAME
CREATE USER $HUEUSER WITH PASSWORD '$HUEPASSWORD';
```

where `$HUEUSER` is the Hue user name and `$HUEPASSWORD` is the Hue user password.

4. Open the `/etc/hue/conf/hue.ini` file. Edit the `[[database]]` section (modify for your PostgreSQL setup).

```
[[database]]
engine=postgresql_psycopg2
host=$DATABASEIPADDRESSORHOSTNAME
port=$PORT
user=$HUEUSER
password=$HUEPASSWORD
name=$DBNAME
```

5. Install the PostgreSQL database adapter for Python (psycopg2).

For RHEL/CentOS/Oracle Linux:

```
yum install python-devel -y
yum install postgresql-devel -y
cd /usr/lib/hue
source build/env/bin/activate
pip install psycopg2
```

6. Synchronize Hue with the external database to create the schema and load the data:

```
cd /usr/lib/hue
source build/env/bin/activate
hue syncdb --noinput
hue migrate
deactivate
```

## 14.6. Start, Stop, and Restart Hue

Use the following commands to start, stop, and restart hue.

1. To start Hue, run the following command on the Hue server:

```
/etc/init.d/hue start
```

2. To stop Hue, run the following command on the Hue server:

```
/etc/init.d/hue stop
```

3. If you make changes to `/etc/hue/conf/hue.ini` you need to restart Hue.

To restart Hue, run the following command on the Hue server:

```
/etc/init.d/hue restart
```

## 14.7. Validate the Hue Installation

Ensure that Hue is properly installed.

1. To view the current configuration of your Hue Server, select **About > Configuration** or **[http://hue.server:8000/dump\\_config](http://hue.server:8000/dump_config)**.
1. Also to make sure that Hue Server was configured properly, select **About > Check** for misconfiguration or **[http://hue.server:8000/debug/check\\_config](http://hue.server:8000/debug/check_config)**. If there was any potential misconfiguration detected, then you need to fix this and to restart Hue.

# 15. Installing Apache Sqoop

This section describes installing and testing Apache Sqoop, a component that provides a mechanism for moving data between HDFS and external structured datastores.

Use the following instructions to deploy Apache Sqoop:

- [Install the Sqoop Package \[194\]](#)
- [Set Up the Sqoop Configuration \[195\]](#)
- [Validate the Sqoop Installation \[195\]](#)

## 15.1. Install the Sqoop Package

### Prerequisites

1. You must have at least core Hadoop on your system. See [Configure the Remote Repositories](#) for more information.
2. Verify the HDP repositories are available:

```
yum list sqoop
```

The output should list at least one Sqoop package similar to the following:

```
sqoop.noarch <version>
```

If yum responds with "Error: No matching package to list" as shown below, yum cannot locate a matching RPM. This can happen if the repository hosting the HDP RPMs is unavailable, or has been disabled. Follow the instructions at [Configure the Remote Repositories](#) to configure private repository before proceeding.

```
Error: No matching package to list.
```

### Installation

On all nodes where you plan to use the Sqoop client, install the following RPMs or packages:

- For RHEL/CentOS/Oracle Linux:

```
yum install sqoop
```

- For SLES:

```
zypper install sqoop
```

- For Ubuntu:

```
apt-get install sqoop
```

## 15.2. Set Up the Sqoop Configuration

This section describes how to set up and edit the deployment configuration files for Sqoop. Hortonworks provides a set of configuration files that represent a working Sqoop configuration. (See [Download Companion Files](#). You can use these files as a reference point, however, you need to modify them to match your own cluster environment. If you choose to use the provided configuration files to set up your Sqoop environment, complete the following steps to set up the Sqoop configuration files:

1. Extract the Sqoop configuration files to a temporary directory. The files are located in the `configuration_files/sqoop` directory where you decompressed the companion files.
2. Modify the configuration files.

In the temporary directory, locate the following files and modify the properties based on your environment.

Also in `sqoop-env.sh`, make the following changes:

- `export HADOOP_HOME=${HADOOP_HOME:-/usr/hdp/current/hadoop-client}`
- `export HBASE_HOME=${HBASE_HOME:-/usr/hdp/current/hbase-client}`
- `export HIVE_HOME=${HIVE_HOME:-/usr/hdp/current/hive-server2}`
- `export ZOO_CFG_DIR=${ZOO_CFG_DIR:-/etc/zookeeper/conf}`
- Copy all the configuration files to the Sqoop configuration directory, such as `/etc/sqoop/conf`.
- Add the following entry to `/usr/bin/sqoop`:

```
export HIVE_HOME=${HIVE_HOME:-/usr/hdp/<version>/hive-server2}
where <version> is the same HDP version as the other entries in /usr/bin/sqoop
```

## 15.3. Validate the Sqoop Installation

Run the following command. You should see the Sqoop version information displayed.

```
sqoop version | grep 'Sqoop [0-9].*'
```

# 16. Installing Apache Mahout

Install Apache Mahout on the server on which it is to run, either the Hadoop master node or your client host. Because Mahout consists of client software, there is no need to install it on every node in your cluster.

- [Install Mahout \[196\]](#)
- [Validate Mahout \[196\]](#)

## 16.1. Install Mahout

To install the Mahout package, use the following command:

- RHEL/CentOS/Oracle Linux:

```
yum install mahout
```

- For SLES:

```
zypper install mahout
```

- For Ubuntu and Debian:

```
apt-get install mahout
```

## 16.2. Validate Mahout

To validate Mahout:

1. Create a test user named "testuser" on the client host, the Linux cluster, and in HDFS, then log in to the client host as user.

```
hdfs dfs -put /tmp/sample-test.txt /user/testuser
```

2. Export the required environment variables for Mahout:

```
export JAVA_HOME=<your jdk home install location here>
export HADOOP_HOME=/usr/hdp/current/hadoop-client
export MAHOUT_HOME=/usr/hdp/current/mahout-client
export PATH="$PATH":$HADOOP_HOME/bin:$MAHOUT_HOME/bin
export CLASSPATH="$CLASSPATH":$MAHOUT_HOME
```

3. Upload a few megabytes of natural-language plain text to the client host as /tmp/sample-test.txt.
4. Transfer the sample-test.txt file to a subdirectory of the testuser's HDFS home directory.

```
hdfs dfs -mkdir /user/testuser/testdata
hdfs dfs -put /tmp/sample-test.txt /user/testuser/testdata
```

5. Create a mahout test output directory:

```
hdfs dfs -mkdir /user/testuser/mahouttest
```

6. Use the following command to instruct Mahout to convert the plain text file `sample-test.txt` into a sequence file that is in the output directory `mahouttest`:

```
mahout seqdirectory --input /user/testuser/testdata --output /
user/ testuser/mahouttest -ow --charset utf-8
```

# 17. Installing and Configuring Apache Flume

You can manually install and configure Apache Flume to work with the Hortonworks Data Platform (HDP). In a Hadoop environment, Flume is most often used as a log aggregator, collecting log data from many diverse sources and moving them to a centralized data store. Flume can also function as a general-purpose event queue manager.

Use the following links to install and configure Flume for HDP:

- [Installing Flume \[198\]](#)
- [Configuring Flume \[200\]](#)
- [Starting Flume \[202\]](#)

For additional information regarding Flume, see [Apache Flume Component Guide](#).

## 17.1. Installing Flume

Flume is included in the HDP repository, but it is not installed automatically as part of the standard HDP installation process. Hortonworks recommends that administrators not install Flume agents on any node in a Hadoop cluster. The following image depicts a sample topology with six Flume agents:

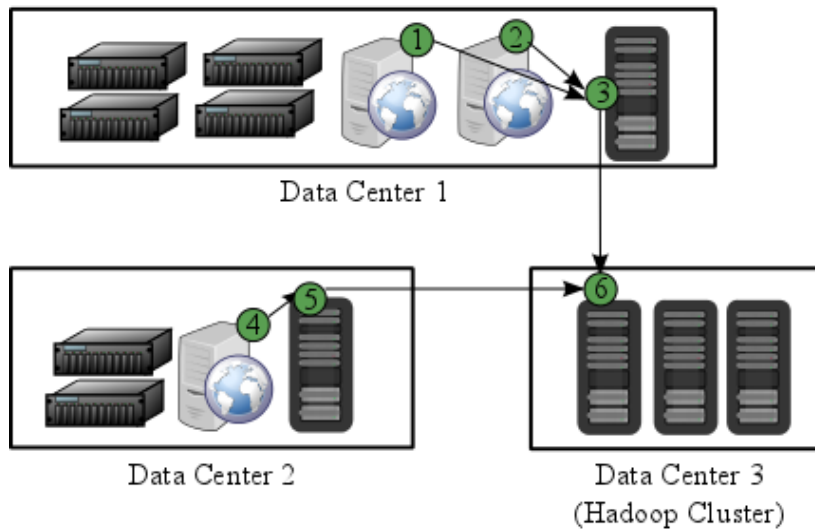
- Agents 1, 2, and 4 installed on web servers in Data Centers 1 and 2.
- Agents 3 and 5 installed on separate hosts in Data Centers 1 and 2 to collect and forward server data in Avro format.
- Agent 6 installed on a separate host on the same network as the Hadoop cluster in Data Center 3 to write all Avro-formatted data to HDFS



### Note

It is possible to run multiple Flume agents on the same host. The sample topology represents only one potential data flow.

● = Flume Agent(s)



### Note

Hortonworks recommends that administrators use a separate configuration file for each Flume agent. In the diagram above, agents 1, 2, and 4 may have identical configuration files with matching Flume sources, channels, sinks. This is also true of agents 3 and 5. While it is possible to use one large configuration file that specifies all the Flume components needed by all the agents, this is not typical of most production deployments. See [Configuring Flume](#) for more information about configuring Flume agents.

For additional information regarding Flume, see [Apache Flume Component Guide](#).

### Prerequisites

1. You must have at least core Hadoop on your system. See [Configuring the Remote Repositories](#) for more information.
2. Verify the HDP repositories are available:

```
yum list flume
```

The output should list at least one Flume package similar to the following:

```
flume.noarch 1.5.2.2.2.6.0-2800.e16 HDP-2.6
```

If yum responds with "Error: No matching package to list" as shown below, yum cannot locate a matching RPM. This can happen if the repository hosting the HDP RPMs is unavailable, or has been disabled. Follow the instructions at [Configuring the Remote Repositories](#) to configure private repository before proceeding.

```
Error: No matching package to list.
```

3. You must have set up your `JAVA_HOME` environment variable per your operating system. See [JDK Requirements](#) for instructions on installing JDK.



```
export JAVA_HOME=/path/to/java
```

4. The following Flume components have HDP component dependencies. You cannot use these Flume components if the dependencies are not installed.

**Table 17.1. Flume 1.5.2 Dependencies**

Flume Component	HDP Component Dependencies
HDFS Sink	Hadoop 2.5
HBase Sink	HBase 0.98.0
Hive Sink	Hive 0.13.0, HCatalog 0.13.0, and Hadoop 2.5

### Installation

Verify the HDP repositories are available for your Flume installation by entering `yum list flume`. See Prerequisites for more information.

To install Flume from a terminal window, type:

- For RHEL or CentOS:

```
yum install flume
```

```
yum install flume-agent #This installs init scripts
```

- For SLES:

```
zypper install flume
```

```
zypper install flume-agent #This installs init scripts
```

- For Ubuntu and Debian:

```
apt-get install flume
```

```
apt-get install flume-agent #This installs init scripts
```

The main Flume files are located in `/usr/hdp/current/flume-server`. The main configuration files are located in `/etc/flume/conf`.

## 17.2. Configuring Flume

To configure a Flume agent, edit the following three configuration files:

- `flume.conf`
- `flume-env.sh`
- `log4j.properties`

### `flume.conf`

Configure each Flume agent by defining properties in a configuration file at `/etc/flume/conf/flume.conf`. The init scripts installed by the `flume-agent` package read the

contents of this file when starting a Flume agent on any host. At a minimum, the Flume configuration file must specify the required [sources](#), [channels](#), and [sinks](#) for your Flume topology.

For example, the following sample Flume configuration file defines a [Netcat source](#), a [Memory channel](#) and a [Logger sink](#). This configuration lets a user generate events and subsequently logs them to the console.

```
example.conf: A single-node Flume configuration

Name the components on this agent
a1.sources = r1
a1.sinks = k1
a1.channels = c1

Describe/configure the source
a1.sources.r1.type = netcat
a1.sources.r1.bind = localhost
a1.sources.r1.port = 44444

Describe the sink
a1.sinks.k1.type = logger

Use a channel that buffers events in memory
a1.channels.c1.type = memory
a1.channels.c1.capacity = 1000
a1.channels.c1.transactionCapacity = 100

Bind the source and sink to the channel
a1.sources.r1.channels = c1
a1.sinks.k1.channel = c1
```

This configuration defines a single agent named a1. a1 has a source that listens for data on port 44444, a channel that buffers event data in memory, and a sink that logs event data to the console. The configuration file names the various components, and describes their types and configuration parameters. A given configuration file might define several named agents.

See the [Apache Flume Component Guide](#) for a complete list of all available Flume components.

To see what configuration properties you can adjust, a template for this file is installed in the configuration directory at `/etc/flume/conf/flume.conf.properties.template`.

A second template file exists for setting environment variables automatically at startup:

```
/etc/flume/conf/flume-env.sh.template.
```



### Note

If you use an [HDFS sink](#), be sure to specify a target folder in HDFS.

### flume-env.sh

Set environment options for a Flume agent in `/etc/flume/conf/flume-env.sh`:

- To enable JMX monitoring, add the following properties to the JAVA\_OPTS property:

```
JAVA_OPTS="-Dcom.sun.management.jmxremote
-Dcom.sun.management.jmxremote.port=4159
-Dcom.sun.management.jmxremote.authenticate=false
-Dcom.sun.management.jmxremote.ssl=false"
```

- To customize the heap size, add the following properties to the JAVA\_OPTS property:

```
JAVA_OPTS=" -Xms100m -Xmx4000m"
```

### log4j.properties

Set the log directory for log4j in `/etc/flume/conf/log4j.properties`:

```
flume.log.dir=/var/log/flume
```

## 17.3. Starting Flume

There are two options for starting Flume.

- To start Flume directly, run the following command on the Flume host:

```
/usr/hdp/current/flume-server/bin/flume-ng agent -c /etc/flume/
conf -f /etc/flume/conf/ flume.conf -n agent
```

- To start Flume as a service, run the following command on the Flume host:

```
service flume-agent start
```

# 18. Installing and Configuring Apache Storm

This section describes how to install and configure Apache Storm, a distributed, fault-tolerant, and high-performance real time computation tool used to stream data into Hadoop.

To install Apache Storm, complete the following instructions.

1. [Install the Storm Package \[203\]](#)
2. [Configure Storm \[204\]](#)
3. [Configure a Process Controller \[204\]](#)
4. [\(Optional\) Configure Kerberos Authentication for Storm \[206\]](#)
5. [\(Optional\) Configuring Authorization for Storm \[209\]](#)
6. [Validate the Installation \[211\]](#)

## 18.1. Install the Storm Package

**Prerequisite:** Storm requires version 2.6 or higher of the default system Python interpreter.

1. To install the Storm RPMs, run the following command on each client cluster node and gateway node:

- For RHEL/CentOS/Oracle Linux:

```
yum install storm
```

- For SLES:

```
zypper install storm
```

- For Ubuntu and Debian:

```
apt-get install storm
```



### Important

Ubuntu and Debian users must manually create the `/etc/storm/conf` directory and the `storm.yaml` file that resides there.

2. Run the following command to create the `conf` directory:

```
sudo mkdir -p /etc/storm/conf
```

3. Run the following command to create the `storm.yaml` file:

```
sudo touch /etc/storm/conf/storm.yaml
```

## 18.2. Configure Storm

In Storm 1.0, Java package naming moved from `backtype.storm` to `org.apache.storm`.

If you intend to run any topologies that used to run previous versions of Storm in Storm 1.0, you can do so by using one of two options:

- You can rebuild the topology by renaming the imports of the `backtype.storm` package to `org.apache` in all of your topology code.

or

- You can add config `Client.jartransformer.class = org.apache.storm.hack.StormShadeTransformer` to `storm.yaml`.

Either of these configurations allows the storm jar to transform all of the `backtype.storm` imports in your topology to `org.apache.storm`.

Use the following procedure to configure Storm:

1. Add the following properties to the `/etc/storm/conf/storm.yaml` file, substituting your own list of hostnames and ports:

```
storm.zookeeper.servers: [<zookeeper-servers>]
nimbus.seeds: [<nimbus-hostnames>]
storm.local.dir: $STORM_LOCAL_DIR
logviewer.port: 8081
```

where:

`<zookeeper-servers>` is a comma-separated list of ZooKeeper servers.

`<nimbus-hostnames>` is a comma-separated list of hosts where the Storm Nimbus server is started.

`$STORM_LOCAL_DIR` should be `/storm/local`, and it must exist on all Storm nodes.

For example:

```
storm.zookeeper.servers: ["host1:port1", "host2:port2", "host3:port3"]
nimbus.seeds: ["host1:port1", "host2:port2"]
storm.local.dir: /mnt/storm
logviewer.port: 8081
```

2. Run the following commands:

```
chown -R storm:storm $STORM_LOCAL_DIR
```

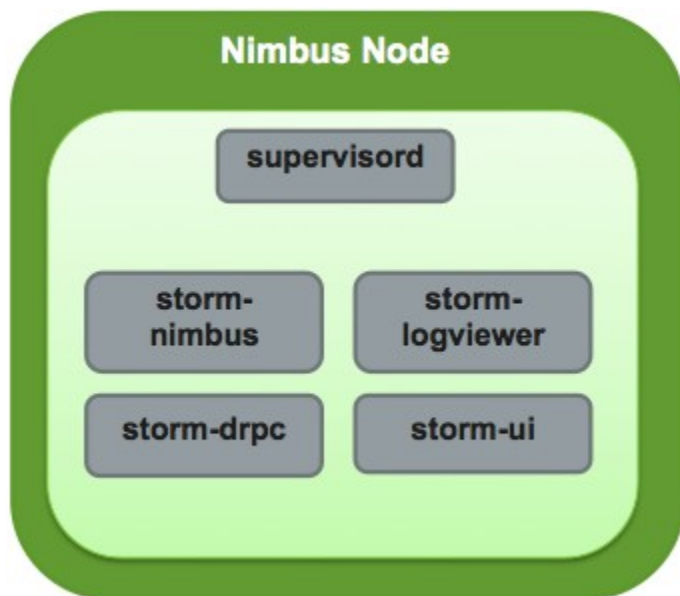
```
chmod -R 755 $STORM_LOCAL_DIR
```

## 18.3. Configure a Process Controller

Storm administrators should install and configure a process controller to monitor and run Apache Storm under supervision. Storm is a fail-fast application, meaning that it is designed to fail under certain circumstances, such as a runtime exception or a break in network

connectivity. Without a watchdog process, these events can quickly take down an entire Storm cluster in production. A watchdog process prevents this by monitoring for failed Storm processes and restarting them when necessary.

This section describes how to configure supervisor to manage the Storm processes, but administrators may use another process controller of their choice, such as monitor daemontools.



Add the following stanzas to the `/etc/supervisord.conf` to configure Supervisor to start and stop all of the Storm daemons:

```
...
[program:storm-nimbus]
command=storm nimbus
directory=/home/storm
autorestart=true
user=storm

[program:storm-supervisor]
command=storm supervisor
directory=/home/storm
autorestart=true
user=storm

[program:storm-ui]
command=storm ui
directory=/home/storm
autorestart=true
user=storm

[program:storm-logviewer]
command=storm logviewer
autorestart=true
user=storm

[program:storm-drpc]
command=storm drpc
```

```
directory=/home/storm
autorestart=true
user=storm
```

## 18.4. (Optional) Configure Kerberos Authentication for Storm

Storm supports authentication using several models. This topic describes how to configure your Storm installation to use Kerberos authentication. At a high level, administrators must perform the tasks in this section.

### Create Keytabs and Principals for Storm Daemons

Storm requires a principal and keytab when using Kerberos for authentication. A principal name in a given realm consists of a primary name and an instance name, the FQDN of the host that runs the service, in this case Storm. As services do not log in with a password to acquire their tickets, the authentication credentials for the service principal are stored in a keytab file, which is extracted from the Kerberos database and stored locally with the service principal on the service component host. First, create the principal using mandatory naming conventions. Then, create the keytab file with information from the new principal and copy the keytab to the keytab directory on the appropriate Storm host.



### Note

Principals can be created either on the Kerberos Key Distribution Center (KDC) host or over the network using an "admin" principal. The following instructions assume you are using the KDC machine and using the `kadmin.local` command line administration utility. Using `kadmin.local` on the KDC machine allows you to create principals without needing to create a separate "admin" principal before you start.

Perform the following procedure on the host that runs KDC:

1. Create a principal for the Nimbus server and the Storm DRPC daemon:

```
sudo kadmin.local -q 'addprinc storm/
<STORM_HOSTNAME>@STORM.EXAMPLE.COM'
```

2. Create a keytab for the Nimbus server and the Storm DRPC daemon:

```
sudo kadmin.local -q "ktadd -k /tmp/storm.keytab storm/
<STORM_HOSTNAME>@STORM.EXAMPLE.COM"
```

3. Copy the keytab to the Nimbus node and the node that runs the Storm DRPC daemon.
4. Run the following command to create a principal for the Storm UI daemon, the Storm Logviewer daemon, and the nodes running the process controller, such as Supervisor. A process controller is used to start and stop the Storm daemons.

```
sudo kadmin.local -q 'addprinc storm@STORM.EXAMPLE.COM'
```

5. Create a keytab for the Storm UI daemon, the Storm Logviewer daemon, and Supervisor:

```
sudo kadmin.local -q "ktadd -k /tmp/storm.keytab
storm@STORM.EXAMPLE.COM"
```

6. Copy the keytab to the cluster nodes running the Storm UI daemon, the Storm Logviewer daemon, and Supervisor.

### Update the jaas.conf Configuration File

Both Storm and ZooKeeper use Java Authentication and Authorization Services (JAAS), an implementation of the Pluggable Authentication Model (PAM), to authenticate users. Administrators must update the `jaas.conf` configuration file with the keytab and principal information from the last step. The file must appear on all Storm nodes, the Nimbus node, the Storm DRPC node, and all Gateway nodes. However, different cluster nodes require different stanzas, as indicated in the following table:

**Table 18.1. Required jaas.conf Sections for Cluster Nodes**

Cluster Node	Required Sections in jaas.conf
Storm	StormClient
Nimbus	StormServer, Client
DRPC	StormServer
Supervisor	StormClient, Client
Gateway	StormClient (different structure than used on Storm and Supervisor nodes)
ZooKeeper	Server



### Note

JAAS ignores unnecessary sections in `jaas.conf`. Administrators can put all sections in all copies of the file to simplify the process of updating it. However, the `StormClient` stanza for the Gateway nodes uses a different structure than the `StormClient` stanza on other cluster nodes. In addition, the `StormServer` stanza for the Nimbus node requires additional lines, as does the `zoo.cfg` configuration file for the ZooKeeper nodes.

The following example `jaas.conf` file contains all sections and includes information about the keytabs and principals generated in the previous step.

```
StormServer {
com.sun.security.auth.module.Krb5LoginModule required
useKeyTab=true
keyTab="/keytabs/storm.keytab"
storeKey=true
useTicketCache=false
principal="storm/storm.example.com@STORM.EXAMPLE.COM";
};

StormClient {
com.sun.security.auth.module.Krb5LoginModule required
useKeyTab=true
keyTab="/keytabs/storm.keytab"
storeKey=true
useTicketCache=false
serviceName="storm"
```



```
principal="storm@STORM.EXAMPLE.COM";
};

Client {
com.sun.security.auth.module.Krb5LoginModule required
useKeyTab=true
keyTab="/keytabs/storm.keytab"
storeKey=true
useTicketCache=false
serviceName="zookeeper"
principal="storm@STORM.EXAMPLE.COM";
};
```

The StormServer section for the Nimbus node must have the following additional lines:

```
StormServer {
com.sun.security.auth.module.Krb5LoginModule required
useKeyTab=true
keyTab="/keytabs/storm.keytab"
storeKey=true
useTicketCache=false
principal="storm/storm.example.com@STORM.EXAMPLE.COM";
};
```

The StormClient stanza for the Gateway nodes must have the following structure:

```
StormClient {
com.sun.security.auth.module.Krb5LoginModule required
doNotPrompt=false
useTicketCache=true
serviceName="$nimbus_user";
};
```

The Server stanza for the ZooKeeper nodes must have the following structure:

```
Server {
com.sun.security.auth.module.Krb5LoginModule required
useKeyTab=true
keyTab="/keytabs/zk.keytab"
storeKey=true
useTicketCache=false
serviceName="zookeeper"
principal="zookeeper/zk1.example.com@STORM.EXAMPLE.COM";
};
```

In addition, add the following `childopts` lines to the stanzas for the nimbus, ui, and supervisor processes:

```
nimbus.childopts: "-Xmx1024m -Djava.security.auth.login.config=/path/to/jaas.conf"
ui.childopts: "-Xmx768m -Djava.security.auth.login.config=/path/to/jaas.conf"
supervisor.childopts: "-Xmx256m -Djava.security.auth.login.config=/path/to/jaas.conf"
```



### Note

When starting ZooKeeper, include the following command-line option so that ZooKeeper can find `jaas.conf`:

```
-Djava.security.auth.login.config=/jaas/zk_jaas.conf
```

## Update the storm.yaml Configuration File

To enable authentication with Kerberos, add the following lines to the `storm.yaml` configuration file:

```
storm.thrift.transport:
"org.apache.storm.security.auth.kerberos.KerberosSaslTransportPlugin"
java.security.auth.login.config: "/path/to/jaas.conf"
nimbus.authorizer: "org.apache.storm.security.auth.authorizer.
SimpleACLAuthorizer"
storm.principal.tolocal: "org.apache.storm.security.auth.
KerberosPrincipalToLocal"
storm.zookeeper.superACL: "sasl:storm"
"nimbus.admins: - "storm"
nimbus.supervisor.users: - "storm"
nimbus.childopts: "-Xmx1024m -Djavax.net.debug=ssl -Dsun.security.krb5.debug=
true
-Djava.security.auth.login.config=/vagrant/storm_jaas.conf
-Djava.security.krb5.realm=EXAMPLE.COM -Djava.security.krb5.kdc=kdc.example.
com"
ui.childopts: "-Xmx768m -Djavax.net.debug=ssl -Dsun.security.krb5.debug=true
-Djava.security.auth.login.config=/vagrant/storm_jaas.conf
-Djava.security.krb5.realm=EXAMPLE.COM -Djava.security.krb5.kdc=kdc.example.
com"
supervisor.childopts: "-Xmx256m -Djavax.net.debug=ssl -Dsun.security.krb5.
debug=true
-Djava.security.auth.login.config=/vagrant/storm_jaas.conf
-Djava.security.krb5.realm=EXAMPLE.COM -Djava.security.krb5.kdc=example.host1.
com"
ui.filter: "org.apache.hadoop.security.authentication.server.
AuthenticationFilter"
ui.filter.params: "type": "kerberos" "kerberos.principal":
"HTTP/nimbus.example.com" "kerberos.keytab":
"/vagrant/keytabs/http.keytab" "kerberos.name.rules":
"RULE:[2:$1@$0]([jt]t@.*EXAMPLE.COM)s/.*/$MAPRED_USER/
RULE:[2:$1@$0]([nd]n@.*EXAMPLE.COM)s/.*/$HDFS_USER/DEFAULT"
```

## 18.5. (Optional) Configuring Authorization for Storm

Apache Storm supports authorization using Pluggable Authentication Modules, or PAM, with secure Hadoop clusters. Currently, Storm supports the following authorizers:

**Table 18.2. Supported Authorizers**

Authorizer	Description
org.apache.storm.security.auth.authorizer.SimpleACLAuthorizer	Default authorizer for the Nimbus node and all Storm nodes except DRPC.
org.apache.storm.security.auth.authorizer.DRPCSimpleACLAuthorizer	Default authorizer for Storm DRPC nodes.
com.xasecure.authorization.storm.authorizer.XaSecureStormAuthorizer	Default authorizer for centralized authorization with Apache Ranger.

To enable authorization, perform the following steps:

1. Configure `storm.yaml` for Nimbus and Storm nodes.

2. Configure `worker-launcher.cfg` for worker-launcher.
3. Configure the Storm multi-tenant job scheduler.

### Configure `storm.yaml` for Nimbus and Storm Nodes

When authorization is enabled, Storm prevents users from seeing topologies run by other users in the Storm UI. To do this, Storm must run each topology as the operating system user who submitted it rather than the user that runs Storm, typically `storm`, which is created during installation.

Use the following procedure to configure supervisor to run Storm topologies as the user who submits the topology, rather than as the `storm` user:

1. Verify that a headless user exists for supervisor, such as `supervisor`, on each Storm cluster node.
2. Create a headless operating system group, such as `supervisor`, on each Storm cluster node.
3. Set the following configuration properties in the `storm.yaml` configuration file for each node in the Storm cluster:

**Table 18.3. `storm.yaml` Configuration File Properties**

Configuration Property	Description
<code>supervisor.run.worker.as.user</code>	Set to true to run topologies as the user who submits them.
<code>topology.auto-credentials</code>	Set to a list of Java plugins that pack and unpack user credentials for Storm workers. This should be set to <code>org.apache.storm.security.auth.kerberos.AutoTGT</code> .
<code>drpc.authorizer</code>	Set to <code>org.apache.storm.security.auth.authorizer.DRPCSimpleACLAuthorizer</code> to enable authorizer for Storm DRPC node.
<code>nimbus.authorizer:</code>	Set to <code>org.apache.storm.security.auth.authorizer.SimpleACLAuthorizer</code> to enable authorizer for Storm nimbus node.
<code>storm.principal.tolocal:</code>	Set to <code>org.apache.storm.security.auth.KerberosPrincipalToLocal</code> to enable transforming kerberos principal to local user names.
<code>storm.zookeeper.superACL:</code>	Set to <code>sasl:storm</code> to set the acls on zookeeper nodes so only user <code>storm</code> can modify those nodes.

4. Change the owner of `worker-launcher.cfg` to root and verify that only root has write permissions on the file.
5. Change the permissions for the worker-launcher executable to 6550.
6. Verify that all Hadoop configuration files are in the CLASSPATH for the Nimbus server.
7. Verify that the nimbus operating system user has superuser privileges and can receive delegation tokens on behalf of users submitting topologies.
8. Restart the Nimbus server.

### Configure `worker-launcher.cfg`

**Table 18.4. worker-launcher.cfg File Configuration Properties**

Configuration Property	Description
storm.worker-launcher.group	Set this to the headless OS group that you created earlier.
min.user.id	Set this to the first user ID on the cluster node.

**Configure the Storm Multi-tenant Scheduler**

The goal of the multi-tenant scheduler is to both isolate topologies from one another and to limit the resources that an individual user can use on the cluster. Add the following configuration property to `multitenant-scheduler.yaml` and place it in the same directory with `storm.yaml`.

**Table 18.5. multitenant-scheduler.yaml Configuration File Properties**

Configuration Property	Description
multitenant.scheduler.user.pools	Specifies the maximum number of nodes a user may use to run topologies.

The following example limits users evans and derek to ten nodes each for all their topologies:

```
multitenant.scheduler.user.pools: "evans": 10 "derek": 10
```

**Note**

The multi-tenant scheduler relies on Storm authentication to distinguish between individual Storm users. Verify that Storm authentication is already enabled.

## 18.6. Validate the Installation

Validate the Apache Storm installation to verify a successful installation and configuration.

**Important**

You must start ZooKeeper before starting Storm.

1. Run the following command to start the Storm daemons:

- RHEL/CentOS/Oracle Linux

```
etc/init.d/supervisor start
```

- SLES

```
etc/init.d/supervisor start
```

- Ubuntu or Debian

```
etc/init.d/supervisor start
```

2. Run the following command to view the status of the Storm daemons:

- RHEL/CentOS/Oracle Linux

```
/usr/bin/supervisorctl status
```

- SLES

```
/usr/bin/supervisorctl status
```

- Ubuntu

```
service supervisor status
```

You should see output similar to the following:

```
storm-drpc RUNNING pid 3368, uptime 0:31:31
storm-logviewer RUNNING pid 3365, uptime 0:31:31
storm-nimbus RUNNING pid 3370, uptime 0:31:31
storm-supervisor RUNNING pid 8765, uptime 0:00:12
storm-ui RUNNING pid 3369, uptime 0:31:31
```

3. Point your browser to the following URL:

```
http://<storm-ui-server>:8080
```

You should see the Storm UI web page:

## Storm UI

### Cluster Summary

Version	Nimbus uptime	Supervisors	Used slots	Free slots	Total slots	Executors	Tasks
0.9.0.1	34m 15s	0	0	0	0	0	0

### Topology summary

Name	Id	Status	Uptime	Num workers	Num executors	Num tasks
WordCount	WordCount-2-1391628483	ACTIVE	21d 6h 5m 24s	0	0	0

### Supervisor summary

Id	Host	Uptime	Slots	Used slots
----	------	--------	-------	------------

### Nimbus Configuration

Key	Value
dev.zookeeper.path	/tmp/dev-storm-zookeeper
drpc.childopts	-Xmx768m
drpc.invocations.port	3773
drpc.port	3772
drpc.queue.size	128
drpc.request.timeout.secs	600
drpc.servers	["localhost"]
drpc.worker.threads	64

4. Run the following command to run the WordCount sample topology:

```
storm jar /usr/hdp/current/storm-client/contrib/storm-starter/storm-starter-
topologies-*.jar org.apache.storm.starter.WordCountTopology wordcount
```

```
storm jar /usr/hdf/current/storm-client/contrib/storm-starter/storm-starter-
topologies-*.jar org.apache.storm.starter.WordCountTopology wordcount
```

# 19. Installing and Configuring Apache Spark

This section describes how to install and configure Apache Spark for HDP. If you are installing and configuring Apache Spark 2, see [Installing and Configuring Apache Spark 2](#).

- [Spark Prerequisites \[214\]](#)
- [Installing Spark \[214\]](#)
- [Configuring Spark \[215\]](#)
- [\(Optional\) Starting the Spark Thrift Server \[218\]](#)
- [\(Optional\) Configuring Dynamic Resource Allocation \[219\]](#)
- [\(Optional\) Installing and Configuring Livy \[219\]](#)
- [Validating Spark \[224\]](#)

For more information about Spark on HDP (including how to install Spark using Ambari), see the [Spark Component Guide](#).

## 19.1. Spark Prerequisites

Before installing Spark, make sure your cluster meets the following prerequisites.

**Table 19.1. Prerequisites for running Spark 1.6**

Prerequisite	Description
Cluster Stack Version	• HDP 2.4.0 or later
(Optional) Ambari Version	• Ambari 2.2.1 or later
Software dependencies	<ul style="list-style-type: none"> <li>• Spark requires HDFS and YARN</li> <li>• PySpark and associated libraries require Python version 2.7 or later, or Python version 3.4 or later, installed on all nodes.</li> </ul>



### Note

When you install HDP 2.6.0, Spark 1.6.3 is installed.

## 19.2. Installing Spark

When you install Spark, the following directories are created:

- `/usr/hdp/current/spark-client` for submitting Spark jobs
- `/usr/hdp/current/spark-history` for launching Spark master processes, such as the Spark History Server

- `/usr/hdp/current/spark-thriftserver` for the Spark Thrift Server

To install Spark:

1. Search for Spark in the HDP repo:

- For RHEL or CentOS:

```
yum search spark
```

- For SLES:

```
zypper install spark
```

- For Ubuntu and Debian:

```
apt-cache spark
```

This shows all the versions of Spark available. For example:

```
spark_<version>_<build>-master.noarch : Server for Spark master
spark_<version>_<build>-python.noarch : Python client for Spark
spark_<version>_<build>-worker.noarch : Server for Spark worker
spark_<version>_<build>.noarch : Lightning-Fast Cluster Computing
```

2. Install the version corresponding to the HDP version you currently have installed.

- For RHEL or CentOS:

```
yum install spark_<version>-master spark_<version>-python
```

- For SLES:

```
zypper install spark_<version>-master spark_<version>-python
```

- For Ubuntu and Debian:

```
apt-get install spark_<version>-master spark_<version>-python
```

3. Before you launch the Spark Shell or Thrift Server, make sure that you set `$JAVA_HOME`:

```
export JAVA_HOME=<path to JDK 1.8>
```

4. Change owner of `/var/log/spark` to `spark:hadoop`.

```
chown spark:hadoop /var/log/spark
```

## 19.3. Configuring Spark

To configure Spark, edit the following configuration files on all nodes that run Spark jobs. These configuration files reside in the Spark client conf directory `/usr/hdp/current/spark-client/conf` on each node.

- If you plan to use Hive with Spark, `hive-site.xml`



- `spark-env.sh`
- `spark-defaults.conf`
- `spark-thrift-sparkconf.conf`



### Note

Note: the following instructions are for a non-Kerberized cluster.

### hive-site.xml

If you plan to use Hive with Spark, create a `hive-site.xml` file in the Spark client `SPARK_HOME/conf` directory. (Note: if you installed the Spark tech preview you can skip this step.)

Edit the file so that it contains only the `hive.metastore.uris` property. Make sure that the `hostname` points to the URI where the Hive Metastore is running.



### Important

`hive-site.xml` contains a number of properties that are not relevant to or supported by the Spark thrift server. Ensure that your Spark `hive-site.xml` file contains only the following configuration property.

For example:

```
<property>
 <name>hive.metastore.uris</name>
 <value>thrift://c6401.ambari.apache.org:9083</value>
 <description>URI for client contact metastore server</description>
</property>
```

### spark-env.sh

Create a `spark-env.sh` file in the Spark client `/conf` directory, and make sure the file has the following entries:

```
Location where log files are stored (default: ${SPARK_HOME}/logs)
This can be any directory where the spark user has R/W access
export SPARK_LOG_DIR=/var/log/spark

Location of the pid file (default: /tmp)
This can be any directory where the spark user has R/W access
export SPARK_PID_DIR=/var/run/spark
```

These settings are required for starting Spark services (for example, the History Service and the Thrift server). The user who starts Spark services needs to have read and write permissions to the log file and PID directory. By default these files are in the `$SPARK_HOME` directory, typically owned by root in RMP installation.

We recommend that you set `HADOOP_CONF_DIR` to the appropriate directory; for example:

```
set HADOOP_CONF_DIR=/etc/hadoop/conf
```

This minimizes the amount of work you need to do to set up environment variables before running Spark applications.

### spark-defaults.conf

Edit the `spark-defaults.conf` file in the Spark client `/conf` directory.

- Make sure the following values are specified, including hostname and port. For example:

```
spark.yarn.historyServer.address c6401.ambari.apache.org:18080
spark.history.ui.port 18080
spark.eventLog.dir hdfs:///spark-history
spark.eventLog.enabled true
spark.history.fs.logDirectory hdfs:///spark-history
```

- Delete the `spark.yarn.services` property, if specified in the file.

If you submit jobs programmatically in a way that `spark-env.sh` is not executed during the submit step, or if you wish to specify a different cluster version than the version installed on the client, set the following two additional property values:

```
spark.driver.extraJavaOptions -Dhdp.version=<HDP-version>
spark.yarn.am.extraJavaOptions -Dhdp.version=<HDP-version>
```

For example:

```
spark.driver.extraJavaOptions -Dhdp.version=2.6.0.0-3475
spark.yarn.am.extraJavaOptions -Dhdp.version=2.6.0.0-3475
```

### spark-thrift-sparkconf.conf

Add the following properties and values to the `spark-thrift-sparkconf.conf` file:

```
spark.eventLog.dir hdfs:///spark-history
spark.eventLog.enabled true
spark.history.fs.logDirectory hdfs:///spark-history
```

### Create a spark User

To use the Spark History Service, run Hive queries as the `spark` user, or run Spark jobs; the associated user must have sufficient HDFS access. One way of ensuring this is to add the user to the `hdfs` group.

The following example creates a `spark` user:

- Create the `spark` user on all nodes. Add it to the `hdfs` group.

```
useradd spark This command is only required for tarball spark installs, not rpm-based
installs.
```

```
usermod -a -G hdfs spark
```

- Create the `spark` user directory under `/user/spark`:

```
sudo su $HDFS_USER
```

```
hdfs dfs -mkdir -p /user/spark
```

```
hdfs dfs -chown spark:spark /user/spark
```

```
hdfs dfs -chmod -R 755 /user/spark
```

### Create an HDFS Directory

As the `hdfs` service user, create an HDFS directory called `spark-history` with `user:spark`, `user group:hadoop`, and `permissions = 777`:

```
hdfs dfs -mkdir /spark-history
hdfs dfs -chown -R spark:hadoop /spark-history
hdfs dfs -chmod -R 777 /spark-history
```

## 19.4. (Optional) Starting the Spark Thrift Server

To enable and start the Spark Thrift Server:

1. From `SPARK_HOME`, start the Spark SQL Thrift Server. Specify the port value of the Thrift Server (the default is 10015). For example:

```
su spark
```

```
./sbin/start-thriftserver.sh --master yarn-client --executor-memory 512m --hiveconf hive.server2.thrift.port=10015
```

2. Use this port when you connect via Beeline.

### Kerberos Considerations

If you are installing the Spark Thrift Server on a Kerberos-secured cluster, the following instructions apply:

- The Spark Thrift Server must run in the same host as `HiveServer2`, so that it can access the `hiveserver2` keytab.
- Edit permissions in `/var/run/spark` and `/var/log/spark` to specify read/write permissions to the Hive service account.
- Use the Hive service account to start the `thriftserver` process.



### Note

We recommend that you run the Spark Thrift Server as user `hive` instead of user `spark` (this supersedes recommendations in previous releases). This ensures that the Spark Thrift Server can access Hive keytabs, the Hive metastore, and data in HDFS that is stored under user `hive`.



### Important

When the Spark Thrift Server runs queries as user `hive`, all data accessible to user `hive` is accessible to the user submitting the query. For a more secure configuration, use a different service account for the Spark Thrift Server. Provide appropriate access to the Hive keytabs and the Hive metastore.

For Spark jobs that are not submitted through the Thrift Server, the user submitting the job must have access to the Hive metastore in secure mode (via kinit).

## 19.5. (Optional) Configuring Dynamic Resource Allocation

The dynamic resource allocation feature allocates resources as you need them and releases them when you do not need them, rather than reserving the resources.



### Note

If you are using the Spark Thrift Server, there is no need to set up dynamic resource allocation. As of HDP 2.4.2, the Spark Thrift Server automatically uses dynamic resource allocation. You can also enable dynamic resource allocation for individual Spark jobs. For more information, see [Configuring Dynamic Resource Allocation](#) in the *Spark Component Guide*.

## 19.6. (Optional) Installing and Configuring Livy

Beginning with HDP 2.6.0, you can use Livy to submit and interact with Spark jobs, through the Livy REST API or from Apache Zeppelin.

When used from Zeppelin, Livy supports security features and user impersonation. When a Zeppelin user submits a Spark job through Livy, user impersonation propagates user information to Livy so that the job runs under the originating user account.

You install both Livy and Zeppelin on the node on which HDP 2.6 and the Spark client are already installed.

For more information about Livy, see the [Spark Component Guide](#).

### 19.6.1. Installing Livy

Before you can install Livy, you need to download the HDP 2.6 repo. See the [HDP 2.6.0 Release Notes](#).

Follow these steps to install the Livy package:

1. Search for Livy in the HDP repository:

- Use this command if you are using RHEL or CentOS:

```
yum search livy
```

- Use this command if you are using SLES:

```
zypper search livy
```

- Use this command if you are using Ubuntu or Debian:

```
apt-cache livy
```

The following example shows all available versions of Livy:

```
livy.noarch: livy Distro virtual package
livy_2_5_0_0_103.noarch : Livy is an open source REST interface for
interacting with Spark from anywhere.
It supports executing snippets of code or programs in a Spark context that
run locally or in YARN.
```

Name and summary matches only: use "search all" for everything.

2. Install the Livy version that corresponds to the HDP version that is installed:

- Use this command if you are using RHEL or CentOS:

```
yum install livy_<version>
```

- Use this command if you are using SLES:

```
zypper install livy_<version>
```

- Use this command if you are using Ubuntu or Debian:

```
apt-get install livy_<version>
```

## 19.6.2. Configuring Livy

Perform the following steps to configure Livy:

1. Login as `root`, or use root privilege to create user `livy`. Optionally, if you plan to use Livy with Zeppelin, create user `zeppelin`.

```
useradd livy -g hadoop
useradd zeppelin -g hadoop
```

2. Create a log directory for Livy:

```
mkdir /var/log/livy
```

3. Change owner of `/var/log/livy` to `livy:hadoop`.

```
chown livy:hadoop /var/log/livy
```

4. `/etc/livy/livy.conf` contains information regarding server configuration.

Create file `/etc/livy/livy.conf` and add the following to the file:

```
livy.spark.master=yarn-cluster
livy.environment production
livy.impersonation.enabled true
livy.server.csrf_protection.enabled true
livy.server.port 8998
livy.server.session.timeout 3600000
```

5. To enable Livy recovery, add the following three settings to the `/etc/livy/livy.conf` file:

<code>livy.server.recovery.mode</code>	<p>Specifies Livy recovery mode.</p> <p>Possible values for this setting are:</p> <p><code>off</code> Default. Turn off recovery. Every time Livy shuts down, it forgets previous sessions.</p> <p><code>recovery</code> Livy persists session info to the state store. When Livy restarts, it recovers previous sessions from the state store.</p>
<code>livy.server.recovery.state-store</code>	<p>Specifies where Livy stores state, for recovery process.</p> <p>Possible values for this setting are:</p> <p><code>&lt;empty&gt;</code> Disables state store. This is the default setting.</p> <p><code>filesystem</code> Stores state in a file system.</p> <p><code>zookeeper</code> Stores state in a ZooKeeper instance.</p>
<code>livy.server.recovery.state-store.url</code>	<p>When a filesystem is used for the state store, specifies the path of the state store directory. You can specify any Hadoop-compatible fs system with atomic rename.</p> <p>When ZooKeeper is used for the state store, specifies the address to the ZooKeeper servers, for example, <code>host1:port1</code> and <code>host2:port2</code>.</p>



### Important

Do not use a filesystem that does not support atomic rename (e.g. S3). Examples of filesystems that do not support atomic rename are: `file:///tmp/livy` and `hdfs:///`.

6. `/etc/livy/spark-blacklist.conf` defines a list of properties that users are not allowed to override when a Spark session is started.

Create a file called `/etc/livy/spark-blacklist.conf` and add the following to the file:

```
Disallow overriding the master and the deploy mode.
spark.master
spark.submit.deployMode

Disallow overriding the location of Spark cached jars.
spark.yarn.jar
```

```
spark.yarn.jars
spark.yarn.archive

Don't allow users to override the RSC timeout.
livy.rsc.server.idle_timeout
```

7. Create file `/etc/livy/livy-env.sh` to define the environmental variables. Add the following to the file:

```
export SPARK_HOME=/usr/hdp/current/spark-client
export LIVY_LOG_DIR=/var/log/livy
export LIVY_PID_DIR=/var/run/livy
export LIVY_SERVER_JAVA_OPTS="-Xmx2g"
```

8. If you are not using Kerberos, skip these steps.

- a. If you are using Kerberos, create Livy principals and keytabs. Optionally, if you plan to use Livy with Zeppelin, create Zeppelin principals and keytabs.

```
kadmin.local -q "addprinc -randkey livy@EXAMPLE.COM"
kadmin.local -q "xst -k /etc/security/keytabs/livy.headless.keytab
 livy@EXAMPLE.COM"
kadmin.local -q "addprinc -randkey zeppelin@EXAMPLE.COM"
kadmin.local -q "xst -k /etc/security/keytabs/zeppelin.headless.keytab
 zeppelin@EXAMPLE.COM"
```

- b. If you are using Kerberos, move the Livy and Zeppelin keytabs to the node on which Livy and Zeppelin will run.

```
chown livy:hadoop /etc/security/keytabs/livy.headless.keytab
chown zeppelin:hadoop /etc/security/keytabs/zeppelin.headless.keytab
```

- c. If you are using Kerberos, add the following to `livy.conf`:

```
livy.server.auth.kerberos.keytab /etc/security/keytabs/spnego.service.
keytab
livy.server.auth.kerberos.principal HTTP/_HOST@EXAMPLE.COM
livy.server.auth.type kerberos
livy.server.launch.kerberos.keytab /etc/security/keytabs/livy.headless.
keytab
livy.server.launch.kerberos.principal livy/_HOST@EXAMPLE.COM
```

9. Ensure that the Livy user can read the contents of the `/etc/livy/conf` directory.

### 19.6.3. Starting, Stopping, and Restarting Livy

Before you start, stop, or restart Livy, you must perform the following steps:

1. Switch user to `livy`:

```
su livy
```

2. Livy runs by default on port 8998. Verify that `host : 8998` is available. You can use `lsof` to verify the port's availability:

```
lsof -i 8998
```

COMMAND NAME	PID	USER	FD	TYPE	DEVICE	SIZE/OFF	NODE
java (LISTEN)	16358	sam	130u	0x47d85f2c7104d1cd	0t1	TCP	*:8998

Follow this step to start the Livy server:

```
/usr/hdp/<hdp_version>/livy/bin/livy-server start
```

To verify that the Livy server is running, access the Livy menu in a browser window; for example:

```
http://<livy-hostname>:8998/
```

Follow this step to stop the Livy server:

```
/usr/hdp/<hdp_version>/livy/bin/livy-server stop
```

There is no specific command to restart Livy. To restart Livy, you must first stop Livy, and then start it again.

## 19.6.4. Granting Livy the Ability to Impersonate

**Prerequisites:** Before completing the steps in this subsection, install and configure Livy as described in [Installing Livy](#) and [Configuring Livy](#).

To grant Livy the ability to impersonate the originating user:

1. Add the following property to `<HADOOP_HOME>/etc/hadoop/core-site.xml`:

```
<property>
 <name>hadoop.proxyuser.livy.groups</name>
 <value>*</value>
</property>

<property>
 <name>hadoop.proxyuser.livy.hosts</name>
 <value>*</value>
</property>
```

2. Login as `root`, or use root privilege, to create a user home directory for the `livy` account, on HDFS.
3. Restart HDFS.
4. Restart YARN.

## 19.6.5. (Optional) Configuring Zeppelin to Interact with Livy

If you plan to use Livy from Zeppelin, you need to install and start Zeppelin, and then configure Zeppelin to work with Livy:

1. Install and configure Zeppelin.

For information regarding the installation and configuration of Zeppelin, see [Installing the Zeppelin Package](#) and [Configuring Zeppelin](#).



2. Configure and use the Zeppelin Livy interpreter to access Apache Spark:

See [Configuring and Using Zeppelin Interpreters](#) in the *Apache Zeppelin Component Guide*.

## 19.7. Validating Spark

To validate the Spark installation, run the Spark jobs described in the [Running Sample Spark 1.x Applications](#) section of the *Spark Component Guide*.

## 20. Installing and Configuring Apache Spark 2

This section describes how to install and configure Apache Spark 2 for HDP. If you are installing and configuring Apache Spark (version 1), see [Installing and Configuring Apache Spark](#).

- [Spark 2 Prerequisites \[225\]](#)
- [Installing Spark 2 \[225\]](#)
- [Configuring Spark 2 \[226\]](#)
- [\(Optional\) Starting the Spark 2 Thrift Server \[229\]](#)
- [\(Optional\) Configuring Dynamic Resource Allocation \[230\]](#)
- [\(Optional\) Installing and Configuring Livy \[230\]](#)
- [Validating Spark 2 \[234\]](#)

For more information about Spark 2 on HDP (including how to install Spark 2 using Ambari), see the [Spark Component Guide](#).

### 20.1. Spark 2 Prerequisites

Before installing Spark 2, make sure your cluster meets the following prerequisites.

**Table 20.1. Prerequisites for running Spark 2**

Prerequisite	Description
Cluster Stack Version	• HDP 2.6.0 or later
(Optional) Ambari Version	• Ambari 2.5.0 or later
Software dependencies	• Spark 2 requires HDFS and YARN  • PySpark and associated libraries require Python version 2.7 or later, or Python version 3.4 or later, installed on all nodes.



#### Note

When you install HDP 2.6.0, Spark 2 is installed.

### 20.2. Installing Spark 2

When you install Spark 2, the following directories are created:

- `/usr/hdp/current/spark2-client` for submitting Spark 2 jobs
- `/usr/hdp/current/spark2-history` for launching Spark 2 master processes, such as the Spark 2 History Server

- `/usr/hdp/current/spark2-thriftserver` for the Spark 2 Thrift Server

To install Spark 2:

1. Search for Spark 2 in the HDP repo:

- For RHEL or CentOS:

```
yum search spark2
```

- For SLES:

```
zypper install spark2
```

- For Ubuntu and Debian:

```
apt-cache spark2
```

This shows all the versions of Spark 2 available. For example:

```
spark_<version>_<build>-master.noarch : Server for Spark 2 master
spark_<version>_<build>-python.noarch : Python client for Spark 2
spark_<version>_<build>-worker.noarch : Server for Spark 2 worker
spark_<version>_<build>.noarch : Lightning-Fast Cluster Computing
```

2. Install the version corresponding to the HDP version you currently have installed.

- For RHEL or CentOS:

```
yum install spark2_<version>-master spark_<version>-python
```

- For SLES:

```
zypper install spark2_<version>-master spark_<version>-python
```

- For Ubuntu and Debian:

```
apt-get install spark2_<version>-master spark_<version>-python
```

3. Before you launch the Spark 2 Shell or Thrift Server, make sure that you set

`$JAVA_HOME`:

```
export JAVA_HOME=<path to JDK 1.8>
```

4. Change owner of `/var/log/spark2` to `spark2:hadoop`.

```
chown spark2:hadoop /var/log/spark2
```

## 20.3. Configuring Spark 2

To configure Spark 2, edit the following configuration files on all nodes that run Spark 2 jobs. These configuration files reside in the Spark 2 client conf directory `/usr/hdp/current/spark2-client/conf` on each node.

- If you plan to use Hive with Spark 2, `hive-site.xml`

- `spark-env.sh`
- `spark-defaults.conf`
- `spark-thrift-sparkconf.conf`



### Note

Note: the following instructions are for a non-Kerberized cluster.

### hive-site.xml

If you plan to use Hive with Spark 2, create a `hive-site.xml` file in the Spark 2 client `SPARK_HOME/conf` directory. (Note: if you installed the Spark 2 tech preview you can skip this step.)

Edit the file so that it contains only the `hive.metastore.uris` property. Make sure that the `hostname` points to the URI where the Hive Metastore is running.



### Important

`hive-site.xml` contains a number of properties that are not relevant to or supported by the Spark 2 thrift server. Ensure that your Spark 2 `hive-site.xml` file contains only the following configuration property.

For example:

```
<property>
 <name>hive.metastore.uris</name>
 <value>thrift://c6401.ambari.apache.org:9083</value>
 <description>URI for client contact metastore server</description>
</property>
```

### spark-env.sh

Create a `spark-env.sh` file in the Spark 2 client `/conf` directory, and make sure the file has the following entries:

```
Location where log files are stored (default: ${SPARK_HOME}/logs)
This can be any directory where the spark user has R/W access
export SPARK_LOG_DIR=/var/log/spark2

Location of the pid file (default: /tmp)
This can be any directory where the spark user has R/W access
export SPARK_PID_DIR=/var/run/spark2
```

These settings are required for starting Spark 2 services (for example, the History Service and the Thrift server). The user who starts Spark 2 services needs to have read and write permissions to the log file and PID directory. By default these files are in the `$SPARK_HOME` directory, typically owned by root in RMP installation.

We recommend that you set `HADOOP_CONF_DIR` to the appropriate directory; for example:

```
set HADOOP_CONF_DIR=/etc/hadoop/conf
```

This minimizes the amount of work you need to do to set up environment variables before running Spark 2 applications.

### spark-defaults.conf

Edit the `spark-defaults.conf` file in the Spark 2 client `/conf` directory.

- Make sure the following values are specified, including hostname and port. For example:

```
spark.yarn.historyServer.address c6401.ambari.apache.org:18080
spark.history.ui.port 18080
spark.eventLog.dir hdfs:///spark-history
spark.eventLog.enabled true
spark.history.fs.logDirectory hdfs:///spark-history
```

- Delete the `spark.yarn.services` property, if specified in the file.

If you submit jobs programmatically in a way that `spark-env.sh` is not executed during the submit step, or if you wish to specify a different cluster version than the version installed on the client, set the following two additional property values:

```
spark.driver.extraJavaOptions -Dhdp.version=<HDP-version>
spark.yarn.am.extraJavaOptions -Dhdp.version=<HDP-version>
```

For example:

```
spark.driver.extraJavaOptions -Dhdp.version=2.6.0.0-3475
spark.yarn.am.extraJavaOptions -Dhdp.version=2.6.0.0-3475
```

### spark-thrift-sparkconf.conf

Add the following properties and values to the `spark-thrift-sparkconf.conf` file:

```
spark.eventLog.dir hdfs:///spark-history
spark.eventLog.enabled true
spark.history.fs.logDirectory hdfs:///spark-history
```

### Create a spark User

To use the Spark 2 History Service, run Hive queries as the `spark` user, or run Spark 2 jobs; the associated user must have sufficient HDFS access. One way of ensuring this is to add the user to the `hdfs` group.

The following example creates a `spark` user:

- Create the `spark` user on all nodes. Add it to the `hdfs` group.

```
useradd spark This command is only required for tarball spark installs, not rpm-based
installs.
```

```
usermod -a -G hdfs spark
```

- Create the `spark` user directory under `/user/spark`:

```
sudo su $HDFS_USER
```

```
hdfs dfs -mkdir -p /user/spark
```

```
hdfs dfs -chown spark:spark /user/spark
```

```
hdfs dfs -chmod -R 755 /user/spark
```

### Create an HDFS Directory

As the `hdfs` service user, create an HDFS directory called `spark-history` with `user:spark`, `user group:hadoop`, and `permissions = 777`:

```
hdfs dfs -mkdir /spark2-history
hdfs dfs -chown -R spark:hadoop /spark2-history
hdfs dfs -chmod -R 777 /spark2-history
```

## 20.4. (Optional) Starting the Spark 2 Thrift Server

To enable and start the Spark 2 Thrift Server:

1. From `SPARK_HOME`, start the Spark 2 SQL Thrift Server. Specify the port value of the Thrift Server (the default is 10015). For example:

```
su spark
```

```
./sbin/start-thriftserver.sh --master yarn-client --executor-memory 512m --hiveconf hive.server2.thrift.port=10015
```

2. Use this port when you connect via Beeline.

### Kerberos Considerations

If you are installing the Spark 2 Thrift Server on a Kerberos-secured cluster, the following instructions apply:

- The Spark 2 Thrift Server must run in the same host as `HiveServer2`, so that it can access the `hiveserver2` keytab.
- Edit permissions in `/var/run/spark2` and `/var/log/spark2` to specify read/write permissions to the Hive service account.
- Use the Hive service account to start the `thriftserver` process.



### Note

We recommend that you run the Spark 2 Thrift Server as user `hive` instead of user `spark` (this supersedes recommendations in previous releases). This ensures that the Spark 2 Thrift Server can access Hive keytabs, the Hive metastore, and data in HDFS that is stored under user `hive`.



### Important

When the Spark 2 Thrift Server runs queries as user `hive`, all data accessible to user `hive` is accessible to the user submitting the query. For a more secure configuration, use a different service account for the Spark 2 Thrift Server. Provide appropriate access to the Hive keytabs and the Hive metastore.

For Spark 2 jobs that are not submitted through the Thrift Server, the user submitting the job must have access to the Hive metastore in secure mode (using kinit).

## 20.5. (Optional) Configuring Dynamic Resource Allocation

The dynamic resource allocation feature allocates resources as you need them and releases them when you do not need them, rather than reserving the resources.

## 20.6. (Optional) Installing and Configuring Livy

Beginning with HDP 2.6.0, you can use Livy to submit and interact with Spark jobs, through the Livy REST API or from Apache Zeppelin.

When used from Zeppelin, Livy supports security features and user impersonation. When a Zeppelin user submits a Spark 2 job through Livy, user impersonation propagates user information to Livy so that the job runs under the originating user account.

You install both Livy and Zeppelin on the node on which HDP 2.6 and the Spark 2 client are already installed.

For more information about Livy, see the [Spark Component Guide](#).

### 20.6.1. Installing Livy

Before you can install Livy, you need to download the HDP 2.6 repo. See the [HDP 2.6.0 Release Notes](#).

Follow these steps to install the Livy package:

1. Search for Livy in the HDP repository:

- Use this command if you are using RHEL or CentOS:

```
yum search livy2
```

- Use this command if you are using SLES:

```
zypper search livy2
```

- Use this command if you are using Ubuntu or Debian:

```
apt-cache livy2
```

The following example shows all available versions of Livy:

```
livy.noarch: livy Distro virtual package
livy_2_5_0_0_103.noarch : Livy is an open source REST interface for
interacting with Spark from anywhere.
It supports executing snippets of code or programs in a Spark context that
run locally or in YARN.

Name and summary matches only: use "search all" for everything.
```

2. Install the Livy version that corresponds to the HDP version that is installed:

- Use this command if you are using RHEL or CentOS:

```
yum install livy2_<version>
```

- Use this command if you are using SLES:

```
zypper install livy2_<version>
```

- Use this command if you are using Ubuntu or Debian:

```
apt-get install livy2_<version>
```

## 20.6.2. Configuring Livy

Perform the following steps to configure Livy:

1. Login as `root`, or use root privilege to create user `livy`. Optionally, if you plan to use Livy with Zeppelin, create user `zeppelin`.

```
useradd livy -g hadoop
useradd zeppelin -g hadoop
```

2. Create a log directory for Livy:

```
mkdir /var/log/livy2
```

3. Change owner of `/var/log/livy2` to `livy:hadoop`.

```
chown livy:hadoop /var/log/livy2
```

4. `/etc/livy2/livy.conf` contains information regarding server configuration.

Create file `/etc/livy2/livy.conf` and add the following to the file:

```
livy.environment production
livy.impersonation.enabled true
livy.server.csrf_protection.enabled true
livy.server.port 8998
livy.server.session.timeout 3600000
```

5. To enable Livy recovery, add the following three settings to the `/etc/livy2/livy.conf` file:

<code>livy.server.recovery.mode</code>	Specifies Livy recovery mode.
	Possible values for this setting are:
<code>off</code>	Default. Turn off recovery. Every time Livy shuts down, it forgets previous sessions.
<code>recovery</code>	Livy persists session info to the state store. When Livy restarts, it



	recovers previous sessions from the state store.
<code>livy.server.recovery.state-store</code>	Specifies where Livy stores state, for recovery process.  Possible values for this setting are:  <empty>      Disables state store. This is the default setting.  filesystem      Stores state in a file system.  zookeeper      Stores state in a ZooKeeper instance.
<code>livy.server.recovery.state-store.url</code>	When a filesystem is used for the state store, specifies the path of the state store directory. You can specify any Hadoop-compatible fs system with atomic rename.  When ZooKeeper is used for the state store, specifies the address to the ZooKeeper servers, for example, <code>host1:port1</code> and <code>host2:port2</code> .



### Important

Do not use a filesystem that does not support atomic rename (e.g. S3). Examples of filesystems that do not support atomic rename are: `file:///tmp/livy` and `hdfs:///`.

6. `/etc/livy2/spark-blacklist.conf` defines a list of properties that users are not allowed to override when a Spark 2 session is started.

Create a file called `/etc/livy/spark-blacklist.conf` and add the following to the file:

```
Disallow overriding the master and the deploy mode.
spark.master
spark.submit.deployMode

Disallow overriding the location of Spark cached jars.
spark.yarn.jar
spark.yarn.jars
spark.yarn.archive

Don't allow users to override the RSC timeout.
livy.rsc.server.idle_timeout
```

7. Create file `/etc/livy2/livy-env.sh` to define the environmental variables. Add the following to the file:

```
livy.spark.master=yarn-cluster
export SPARK_HOME=/usr/hdp/current/spark2-client
```

```
export LIVY_LOG_DIR=/var/log/livy2
export LIVY_PID_DIR=/var/run/livy2
export LIVY_SERVER_JAVA_OPTS="-Xmx2g"
```

8. If you are not using Kerberos, skip these steps.

- a. If you are using Kerberos, create Livy principals and keytabs. Optionally, if you plan to use Livy with Zeppelin, create Zeppelin principals and keytabs.

```
kadmin.local -q "addprinc -randkey livy@EXAMPLE.COM"
kadmin.local -q "xst -k /etc/security/keytabs/livy.headless.keytab
 livy@EXAMPLE.COM"
kadmin.local -q "addprinc -randkey zeppelin@EXAMPLE.COM"
kadmin.local -q "xst -k /etc/security/keytabs/zeppelin.headless.keytab
 zeppelin@EXAMPLE.COM"
```

- b. If you are using Kerberos, move the Livy and Zeppelin keytabs to the node on which Livy and Zeppelin will run.

```
chown livy:hadoop /etc/security/keytabs/livy.headless.keytab
chown zeppelin:hadoop /etc/security/keytabs/zeppelin.headless.keytab
```

- c. If you are using Kerberos, add the following to `livy.conf`:

```
livy.server.auth.kerberos.keytab /etc/security/keytabs/spnego.service.
keytab
livy.server.auth.kerberos.principal HTTP/_HOST@EXAMPLE.COM
livy.server.auth.type kerberos
livy.server.launch.kerberos.keytab /etc/security/keytabs/livy.headless.
keytab
livy.server.launch.kerberos.principal livy/_HOST@EXAMPLE.COM
```

9. Ensure that the Livy user can read the contents of the `/etc/livy2/conf` directory.

## 20.6.3. Starting, Stopping, and Restarting Livy

Before you start, stop, or restart Livy, you must perform the following steps:

1. Switch user to `livy`:

```
su livy
```

2. Livy runs by default on port 8998. Verify that `host:8998` is available. You can use `lsof` to verify the port's availability:

```
lsof -i 8998
COMMAND PID USER FD TYPE DEVICE SIZE/OFF NODE
NAME
java 16358 sam 130u 0x47d85f2c7104d1cd 0t1 TCP *:8998
(LISTEN)
```

Follow this step to start the Livy server:

```
/usr/hdp/<hdp_version>/livy2/bin/livy-server start
```

To verify that the Livy server is running, access the Livy menu in a browser window; for example:

```
http://<livy-hostname>:8998/
```

Follow this step to stop the Livy server:

```
/usr/hdp/<hdp_version>/livy2/bin/livy-server stop
```

There is no specific command to restart Livy. To restart Livy, you must first stop Livy, and then start it again.

## 20.6.4. Granting Livy the Ability to Impersonate

**Prerequisites:** Before completing the steps in this subsection, install and configure Livy as described in [Installing Livy](#) and [Configuring Livy](#).

To grant Livy the ability to impersonate the originating user:

1. Add the following property to `<HADOOP_HOME>/etc/hadoop/core-site.xml`:

```
<property>
 <name>hadoop.proxyuser.livy.groups</name>
 <value>*</value>
</property>

<property>
 <name>hadoop.proxyuser.livy.hosts</name>
 <value>*</value>
</property>
```

2. Login as `root`, or use root privilege, to create a user home directory for the `livy` account, on HDFS.
3. Restart HDFS.
4. Restart YARN.

## 20.6.5. (Optional) Configuring Zeppelin to Interact with Livy

If you plan to use Livy from Zeppelin, you need to install and start Zeppelin, and then configure Zeppelin to work with Livy:

1. Install and configure Zeppelin.

For information regarding the installation and configuration of Zeppelin, see [Installing the Zeppelin Package](#) and [Configuring Zeppelin](#).

2. Configure and use the Zeppelin Livy interpreter to access Apache Spark 2:

See [Configuring and Using Zeppelin Interpreters](#) in the *Apache Zeppelin Component Guide*.

## 20.7. Validating Spark 2

To validate the Spark 2 installation, run the Spark 2 jobs described in the [Running Sample Spark 2.x Applications](#) section of the *Spark Component Guide*.



# 21. Installing and Configuring Apache Kafka

This section describes how to install Apache Kafka, a high-throughput messaging system with publish-and-subscribe semantics. Kafka is often used in place of traditional message brokers like JMS and AMQP because of its higher throughput, replication, and fault tolerance.

To install Apache Kafka, complete the following instructions:

1. [Install Kafka \[236\]](#)
2. [Configure Kafka \[237\]](#)
3. [Validate Kafka \[238\]](#)

## 21.1. Install Kafka

### Prerequisites and Considerations

When installing Kafka, note the following prerequisites and considerations:

- Administrators must use Apache ZooKeeper to manage Kafka for an HDP cluster. Verify that you have successfully installed ZooKeeper before installing and configuring Kafka.
- Kafka does not currently support user authentication and authorization.
- The following underlying file systems are supported for use with Kafka:
  - EXT4: recommended
  - EXT3: supported



### Caution

Encrypted file systems such as SafenetFS are not supported for Kafka. Index file corruption can occur.

### Installation

Install the Kafka RPMs or packages by completing the following steps.



### Note

Hortonworks recommends avoiding using multiple brokers in a single node for Kafka. However, if you need to install a multi-node cluster, use the following instructions to install Kafka on another machine, make sure each `broker.id`

is unique on the cluster, and ensure that `zookeeper.connect` is the same for all brokers.

1. Run the following command on each client cluster node and gateway node:

- For RHEL/CentOS/Oracle Linux

```
yum install kafka
```

- For SLES

```
zypper install kafka
```

- For Ubuntu and Debian

```
apt-get install kafka
```

2. Check the `JAVA_HOME` environment variable. If it has not yet been set, add the following to the `PATH` variable:

```
export JAVA_HOME=<path of installed jdk version folder>
```

## 21.2. Configure Kafka

Use the following procedure to configure Kafka.

1. Verify the values of the following configuration properties in the `server.properties` file:

**Table 21.1. Kafka Configuration Properties**

Kafka Configuration Property	Description
<code>log.dirs</code>	Comma-separated list of directories where Kafka log files are stored. The default value is <code>/kafka-logs</code> .
<code>zookeeper.connect</code>	The hostname or IP address of the host running ZooKeeper and the port to which ZooKeeper listens. The default value is <code>localhost:2181</code> .
<code>log.retention.hours</code>	The number of hours to wait before a Kafka log file is eligible for deletion. The default value is 168 hours (7 days).
Listeners	<p>listener - Comma-separated list of URIs on which we listen and their protocols.</p> <p>Specify hostname as <code>0.0.0.0</code> to bind to all interfaces.</p> <p>Leave hostname empty to bind to default interface.</p> <p>Examples of legal listener lists:</p> <pre>PLAINTEXT:// myhost:9092,SASL_PLAINTEXT://:9091  PLAINTEXT://0.0.0.0:9092, SASL_PLAINTEXT://localhost:9093</pre>
File descriptor	Kafka uses a very large number of files and also large number of sockets to communicate with clients. We suggest the following values:

Kafka Configuration Property	Description
	<ul style="list-style-type: none"> <li>The maximum number of open files. Recommended value: 128000</li> <li>The maximum number of processes. Recommended value: 65536</li> </ul>

## 21.3. Validate Kafka

Use the following procedure to verify the Kafka installation and configuration.

### Before you begin:

- Verify that ZooKeeper is running before starting Kafka and validating the installation.

1. Start the Kafka service using user kafka:

```
su kafka -c "KAFKA_HOME/bin/kafka start"
```

2. Create a Kafka topic with the name "test" that has a replication factor of 1 and 1 partition.

```
bin/kafka-topics.sh --zookeeper localhost:2181 --create --topic test --replication-factor 1 --partitions 1
```

After running this command, you should see the following output:

```
Created topic "test"
```



### Note

The value of `--replication-factor` must be less than or equal to the number of Kafka brokers in the cluster. Otherwise an error occurs. Usually the replication-factor equals the number of Kafka brokers in the cluster.

3. Start a command line Kafka console producer that you can use to send messages. You can type your message once the process is started.

```
<KAFKA_HOME>/bin/kafka-console-producer.sh --broker-list localhost:9092 --topic test
```

You should see your test message, for example:

```
This is a message.
```



### Note

To return to the command prompt after sending the test message, type `Ctrl + C`.

4. Start a command line kafka consumer that you can use to read the messages sent by the producer.

```
<KAFKA_HOME>/bin/kafka-console-consumer.sh --zookeeper localhost:2181 --topic test --from-beginning
```

## 22. Installing and Configuring Zeppelin

This section describes how to install and configure Apache Zeppelin for Hortonworks Data Platform (HDP):

- [Installation Prerequisites \[239\]](#)
- [Installing the Zeppelin Package \[239\]](#)
- [Configuring Zeppelin \[240\]](#)
- [Starting, Stopping, and Restarting Zeppelin \[241\]](#)
- [Validating Zeppelin \[241\]](#)
- [Accessing the Zeppelin UI \[241\]](#)

For more information about Zeppelin on HDP, see the [Apache Zeppelin Component Guide](#)

### 22.1. Installation Prerequisites

Before installing Zeppelin, ensure that your cluster meets the following prerequisites.

**Table 22.1. Installation Prerequisites**

Prerequisite	Description
Cluster stack version	HDP 2.5.0 or later
Software dependencies	Required: <ul style="list-style-type: none"> <li>• HDFS</li> <li>• Apache Spark</li> <li>• YARN</li> <li>• Apache ZooKeeper</li> </ul> Optional: <ul style="list-style-type: none"> <li>• Apache Hive</li> <li>• Livy</li> </ul>

### 22.2. Installing the Zeppelin Package

When you install Zeppelin, the following directories are created:

<code>/etc/zeppelin/conf</code>	Configuration file for submitting Spark jobs
<code>/usr/hdp/current/zeppelin-server</code>	Zeppelin server
<code>/var/lib/zeppelin</code>	Sample notebooks



```
/usr/hdp/current/zeppelin-server/notebook
```

Zeppelin logs

```
/var/run/zeppelin
```

Zeppelin PID  
directory

Follow these steps to install the Zeppelin package:

1. Search for Zeppelin in the HDP repository:

- Use this command if you are using RHEL or CentOS:

```
yum search zeppelin
```

- Use this command if you are using SLES:

```
zypper search zeppelin
```

- Use this command if you are using Ubuntu or Debian:

```
apt-cache zeppelin
```

The following example shows all the available versions of Zeppelin:

```
zeppelin.noarch : zeppelin Distro virtual package
zeppelin_<version>_<build>.noarch : Web-based notebook for Apache Zeppelin
```

2. Install the Zeppelin version that corresponds to the HDP version that you currently have installed:

- Use this command if you are using RHEL or CentOS:

```
yum install zeppelin_<version>
```

- Use this command if you are using SLES:

```
zypper install zeppelin_<version>
```

- Use this command if you are using Ubuntu or Debian:

```
apt-get install zeppelin_<version>
```

## 22.3. Configuring Zeppelin

Perform the following steps to configure Zeppelin:

1. There are two ways to set environmental variables in Zeppelin.

- a. You can edit the `/usr/hdp/current/zeppelin-server/conf/zeppelin-env.sh` file to set the following environmental variables:

```
export JAVA_HOME=<path to JDK 1.8>
export PATH=$JAVA_HOME/bin:$PATH
export SPARK_HOME=/usr/hdp/current/spark-client
export HADOOP_CONF_DIR=/etc/hadoop/conf
export ZEPPELIN_PORT=9995
```

Environment variables override Java properties.

- b. If you do not want to change the environmental variables in `/usr/hdp/current/zeppelin-server/conf/zeppelin-env.sh`, you can copy `/usr/hdp/current/zeppelin-server/conf/zeppelin-site.xml.template` to `/usr/hdp/current/zeppelin-server/conf/zeppelin-site.xml` and add Java properties. See the Apache [Apache Zeppelin Quick Start](#).
2. If you are interested in using Java properties with Zeppelin, see the Apache [Apache Zeppelin Quick Start](#). Environment variables override Java properties.
3. If you are interested in using Shiro authentication for Zeppelin, edit the `shiro.ini` file as specified in [Shiro authentication for Apache Zeppelin](#).

## 22.4. Starting, Stopping, and Restarting Zeppelin

Before you start, stop, or restart Zeppelin, you must switch user to `zeppelin`:

```
su zeppelin
```

Follow this step to start the Zeppelin server:

```
/usr/hdp/current/zeppelin-server/bin/zeppelin-daemon.sh start
```

Follow this step to stop the Zeppelin server:

```
/usr/hdp/current/zeppelin-server/bin/zeppelin-daemon.sh stop
```

Follow this step to restart the Zeppelin server:

```
/usr/hdp/current/zeppelin-server/bin/zeppelin-daemon.sh restart
```

## 22.5. Validating Zeppelin

After successfully starting the Zeppelin server, you should validate the installation by checking the Zeppelin daemon status and the installed version.

There are two ways to check Zeppelin daemon status. Use the following command to check Zeppelin daemon status from the command line:

```
/usr/hdp/current/zeppelin-server/bin/zeppelin-daemon.sh status
```

You can also check the status by opening the Zeppelin host with the port number that you configured for it in `zeppelin-env.sh` in a web browser: for example, `http://zeppelin.local:9995`.

Use the following command to check the version number of Zeppelin:

```
/usr/hdp/current/zeppelin-server/bin/zeppelin-daemon.sh --version
```

## 22.6. Accessing the Zeppelin UI

To access the Zeppelin UI, enter the following address into your browser:

```
http://<zeppelin_host>:<port>
```

In this example, <zeppelin\_host> is the node on which you installed Zeppelin, and <port> is the port on which you installed Zeppelin (default port is 9995).

## 23. Installing Apache Accumulo

Apache Accumulo is a highly scalable structured and distributed key/value store for high performance data storage and retrieval.



### Note

Accumulo requires HDFS and ZooKeeper to be running before starting. Password-less SSH must be configured between at least the Accumulo master and TabletServer machines. We recommend that you run Network Time Protocol (NTP) within the cluster to keep node clocks in sync, to avoid problems with automatically timestamped data.

1. [Installing the Accumulo Package \[243\]](#)
2. [Configuring Accumulo \[244\]](#)
3. [Configuring the "Hosts" Files \[246\]](#)
4. [Validating Accumulo \[246\]](#)
5. [Smoke Testing Accumulo \[246\]](#)

### 23.1. Installing the Accumulo Package

#### Prerequisites

1. You must have at least core Hadoop on your system. See [Configure the Remote Repositories](#) for more information.
2. Verify the HDP repositories are available:

```
yum list accumulo
```

The output should list at least one Accumulo package similar to the following:

```
accumulo.noarch <version>
```

If yum responds with "Error: No matching package to list" as shown below, yum cannot locate a matching RPM. This can happen if the repository hosting the HDP RPMs is unavailable, or has been disabled. Follow the instructions at [Configure the Remote Repositories](#) to configure private repository before proceeding.

```
Error: No matching package to list.
```

#### Installation

To install the Accumulo RPM or package, use the following command:

- For RHEL/CentOS/Oracle Linux:

```
yum install accumulo
```

- For SLES:

```
zypper install accumulo
```

- For Ubuntu and Debian:

```
apt-get install accumulo
```

## 23.2. Configuring Accumulo

1. Accumulo provides example configurations that you can modify. Copy all files from one of the examples folders in `/etc/accumulo/conf/examples` to `/etc/accumulo/conf`.

For example, you would use the following command to copy all files in the `/etc/accumulo/conf/examples/512MB/standalone` folder to the `/etc/accumulo/conf` folder:

```
cp /etc/accumulo/conf/examples/512MB/standalone/* /etc/accumulo/conf
```

2. Accumulo has the option to use a native library that manages the memory used for newly written data outside of the Java heap for the Tablet Servers. This allows Accumulo to manage its memory more efficiently, improving performance. Use of the native library should be enabled whenever possible. To build the native library for your system, run the following on each host:

```
JAVA_HOME=path_to_java_home /usr/hdp/current/accumulo-client/bin/build_native_library.sh
```

Once this is done, various configuration properties must be changed to use the native maps, with examples appearing in the `/etc/accumulo/conf/examples/native-standalone` folder.



### Note

If native maps are not enabled, the examples in the standalone folder should be used instead.

3. Make an Accumulo data directory:

```
su - hdfs
```

```
hadoop fs -mkdir -p /apps/accumulo
```

4. The example configuration files include an `accumulo-site.xml` file. Add the following property to this file to reference the Accumulo data directory:



### Note

Change the value of the `instance.secret` in the `accumulo-site.xml` file, and then change the permissions on the file to 700 to protect the `instance.secret` from being readable by other users.

```
<property>
```

```
<name>instance.volumes</name>
<value>hdfs://namenode:port/apps/accumulo</value>
</property>
```

For example:

```
<property>
 <name>instance.volumes</name>
 <value>hdfs://node-1.example.com:8020/apps/accumulo</value>
</property>
```

5. Add the configuration property `instance.zookeeper.host` to the `accumulo-site.xml` file. The value of this property should be a comma-separated list of ZooKeeper servers.

In this “host” file each non-commented line is expected to be some host which should have a process running on it. The “masters” file contains hosts which should run the Accumulo Master process (only one host is able to be the active master, the rest are hot-standbys) and the “slaves” file contains hosts which should run the Accumulo TabletServer process.

For example:

```
<property>
 <name>instance.zookeeper.host</name>
 <value>server1:2181,server2:2181,server3:2181</value>
</property>
```

6. Change permissions to restrict access to the data directory to the Accumulo user:

```
su - hdfs
hadoop fs -chmod -R 700 /apps/accumulo
```

7. Change ownership of the data directory to the Accumulo user and group.

```
su - hdfs
hadoop fs -chown -R accumulo:accumulo /apps/accumulo
```

8. The example configuration files also include an `accumulo-env.sh` file.

- If `JAVA_HOME` is not defined in the environment, you should specify it by editing the following line of code in the `accumulo-env.sh` file:

```
test -z "$JAVA_HOME" && export JAVA_HOME=/path/to/java
```

If you would like to prevent users from passing `JAVA_HOME` on the command line, remove the text prior to “export” and add the path to your `JAVA_HOME`. For example:

```
export JAVA_HOME=/usr/hadoop-jdk1.7.0_67
```

- If `ZOOKEEPER_HOME` is not defined in the environment, you should specify it by editing the following line of code in the `accumulo-env.sh` file:

```
test -z "$ZOOKEEPER_HOME" && export ZOOKEEPER_HOME=/path/to/zookeeper
```

If you would like to prevent users from passing ZOOKEEPER\_HOME on the command line, remove the text prior to "export" and add the path to your ZOOKEEPER\_HOME. For example:

```
export ZOOKEEPER_HOME=/usr/hdp/current/zookeeper-client/conf
```

## 23.3. Configuring the "Hosts" Files

For multi-node systems, populate the following configuration files in \$ACCUMULO\_CONF\_DIR: masters, slaves, tracers, monitor and gc. Each of these files corresponds to a list of hosts which run certain Accumulo processes. These files are for the Accumulo Master, TabletServer, Tracer, Monitor and GarbageCollector, respectively. In the provided example configurations, "localhost" is populated in these files. These files control the placement of Accumulo processes across many nodes.

When multiple hosts are specified in slaves and tracers, this results in the appropriate process actively running on each of the listed hosts. For the other files, while the appropriate process starts on each listed host, only one of the started processes is active. The other processes stay in a hot-standby state, attempting to become the active process that enables high-availability deployments.

## 23.4. Validating Accumulo

To validate that Accumulo is set up correctly:

1. Start the Accumulo service.
  - a. Initialize Accumulo.

```
/usr/hdp/current/accumulo-client/bin/accumulo init
```

- b. Enter a instance name and password.
- c. Run the Accumulo start-all.sh script.

```
/usr/hdp/current/accumulo-client/bin/start-all.sh
```

2. View the Accumulo native UI.

```
http://<accumulo-master>:50095
```

Look for any errors reported by the Accumulo monitor.

## 23.5. Smoke Testing Accumulo

Perform a smoke test to ensure that Accumulo is working properly by using the Accumulo shell.

1. Using the Accumulo shell, create a table in Accumulo:

```
createtable testtable
```

2. Insert a row and assign a value:

```
insert row colfam colqual value
```

3. Check to ensure the table exists:

```
scan
flush -w
scan
```

4. Delete your test table:

```
deletetable -f testtable
```



## 24. Installing Apache Falcon

Apache Falcon provides a framework for simplifying the development of data management applications in Apache Hadoop. Falcon enables users to automate the movement and processing of data sets. Instead of hard-coding complex data set and pipeline processing capabilities, Hadoop applications can now rely on the Apache Falcon framework for these functions.

1. [Installing the Falcon Package \[248\]](#)
2. [Setting Directories and Permissions \[249\]](#)
3. [Configuring Proxy Settings \[250\]](#)
4. [Configuring Falcon Entities \[250\]](#)
5. [Configuring Oozie for Falcon \[250\]](#)
6. [Configuring Hive for Falcon \[255\]](#)
7. [Configuring for Secure Clusters \[255\]](#)
8. [Validate Falcon \[257\]](#)



### Note

Falcon works with Oozie jobs, Pig scripts, and Hive queries. We recommend that at a minimum you have Oozie and Pig installed to successfully use Falcon for data governance.

### 24.1. Installing the Falcon Package

1. Install the Falcon RPM or package by using the following command:

- RHEL/CentOS/Oracle Linux:

```
yum install falcon
```

- For SLES:

```
zypper install falcon
```

- For Ubuntu or Debian:

```
apt-get install falcon
```

2. After installation, verify that the owner and group of `falcon.war` in `/usr/hdp/current/falcon-server/webapp/` is `falcon:falcon`. If the owner and group are not `falcon:falcon`, change them using the following command:

```
chown falcon:falcon falcon.war.
```

3. Update the `falcon.url` in `/etc/falcon/conf/client.properties` to use the web url of falcon server.
4. By default Falcon starts at port 15443. Set `"falcon.enableTLS"` to `false` in `/etc/falcon/conf/startup-properties` to disable SSL and to start Falcon at port 15000.

## 24.2. Setting Directories and Permissions

1. Create directories and configure ownership and permissions as described below. Run the following commands:

```
mkdir -p $FALCON_LOG_DIR;chown -R $FALCON_USER:$HADOOP_GROUP
 $FALCON_LOG_DIR;chmod -R 755 $FALCON_LOG_DIR;

mkdir -p $FALCON_PID_DIR;chown -R $FALCON_USER:$HADOOP_GROUP
 $FALCON_PID_DIR;chmod -R 755 $FALCON_PID_DIR;

mkdir -p $FALCON_DATA_DIR;chown -R $FALCON_USER:$HADOOP_GROUP
 $FALCON_DATA_DIR;chmod -R 755 $FALCON_DATA_DIR;

mkdir -p <graph.storage.directory>;chown -R $FALCON_USER:$HADOOP_GROUP
 <graph.storage.directory>;chmod -R 755 <graph.storage.directory>;

mkdir -p <config.store.uri>;chown -R $FALCON_USER:$HADOOP_GROUP <config.
store.uri>;chmod -R 755 <config.store.uri>;
```

where:

`$FALCON_LOG_DIR` is the directory to store the Falcon logs. For example, `/var/log/falcon`.

`$FALCON_PID_DIR` is the directory to store the Falcon process ID. For example, `/var/run/falcon`.

`$FALCON_DATA_DIR` is the directory to store the falcon active mq data. For example, `/hadoop/falcon/embeddedmq/data`.

`<graph.storage.directory>` is the graph storage directory defined in Falcon startup.properties key `"*.falcon.graph.storage.directory"`. For example, `/usr/hdp/current/falcon-server/data/graphdb`.

`<config.store.uri>` is the location to store user entity configurations defined in Falcon startup.properties key `"*.config.store.uri"`. For example, `/usr/hdp/current/falcon-server/data/falcon-store/`.

`$FALCON_USER` is the user owning the Falcon service. For example, `falcon`.

`$HADOOP_GROUP` is a common group shared by services. For example, `hadoop`.

2. For the Hive DR feature, the UI expects the template files to be copied to `/apps/data-mirroring` path. Create the following directories in HDFS:

```
su - $FALCON_USER
hdfs dfs -mkdir /apps/data-mirroring
hdfs dfs -mkdir /apps/data-mirroring/workflows/
hdfs dfs -copyFromLocal /usr/hdp/current/falcon-server/data-mirroring /apps
```

```
hdfs dfs -chmod -R 770 /apps/data-mirroring
hdfs dfs -chown -R falcon:users /apps/data-mirroring
```

where:

\$FALCON\_USER is the user owning the Falcon service. For example, falcon.

## 24.3. Configuring Proxy Settings

1. Stop all services. See [Stopping HDP Services](#) in the HDP Reference Guide for details.
2. Change the proxy settings for the falcon user in the core-site.xml file to allow falcon to impersonate users and groups:

```
<property>
 <name>hadoop.proxyuser.falcon.groups</name>
 <value>*</value>
</property>

<property>
 <name>hadoop.proxyuser.falcon.hosts</name>
 <value>*</value>
</property>
```

where:

hadoop.proxyuser.falcon.groups is a comma-separated list of the UNIX groups whose users may be impersonated by Falcon

hadoop.proxyuser.falcon.hosts is a comma-separated list of the hosts that are allowed to submit requests by Falcon

3. Start all Services. See [Controlling HDP Services Manually](#) in the HDP Reference Guide for details.

## 24.4. Configuring Falcon Entities

Falcon provides the following XML configuration files to build your data pipeline:

- **Cluster:** Defines where your data and processes are stored.
- **Feed:** Defines the datasets to be cleaned and processed.
- **Process:** Consumes feeds, invokes processing logic, and produces further feeds.

After you have installed Falcon, edit the example entities shown in "Defining Data Pipelines" (in *Data Governance with Apache Falcon*), or create your own based on Falcon Schemas (also in the Data Governance guide).

## 24.5. Configuring Oozie for Falcon

Falcon uses HCatalog for data availability notification when Hive tables are replicated. Make the following configuration changes to Oozie to ensure Hive table replication in Falcon:

1. Stop the Oozie service on all Falcon clusters. Run the following commands on the Oozie host machine.

```
su - $OOZIE_USER
```

```
/usr/hdp/current/oozie-server/bin/oozie-stop.sh
```

where \$OOZIE\_USER is the Oozie user. For example, oozie.

2. Copy each cluster's hadoop conf directory to a different location. For example, if you have two clusters, copy one to `/etc/hadoop/conf-1` and the other to `/etc/hadoop/conf-2`.
3. For each `oozie-site.xml` file, modify the `oozie.service.HadoopAccessorService.hadoop.configurations` property, specifying clusters, the RPC ports of the NameNodes, and HostManagers accordingly. For example, if Falcon connects to three clusters, specify:

```
<property>
 <name>oozie.service.HadoopAccessorService.hadoop.configurations</name>
 <value>*/etc/hadoop/conf,$NameNode:$rpcPortNN=$hadoopConfDir1,
 $ResourceManager1:$rpcPortRM=$hadoopConfDir1,$NameNode2=$hadoopConfDir2,
 $ResourceManager2:$rpcPortRM=$hadoopConfDir2,$NameNode3:$rpcPortNN=
 $hadoopConfDir3,$ResourceManager3:$rpcPortRM=$hadoopConfDir3</value>
 <description>
 Comma separated AUTHORITY=HADOOP_CONF_DIR, where AUTHORITY is the
 HOST:PORT of
 the Hadoop service (JobTracker, HDFS). The wildcard '*'
 configuration is
 used when there is no exact match for an authority. The
 HADOOP_CONF_DIR contains
 the relevant Hadoop *-site.xml files. If the path is relative is
 looked within
 the Oozie configuration directory; though the path can be absolute
 (i.e. to point
 to Hadoop client conf/ directories in the local filesystem.
 </description>
</property>
```

4. Add the following properties to the `/etc/oozie/conf/oozie-site.xml` file:

```
<property>
 <name>oozie.service.ProxyUserService.proxyuser.falcon.hosts</name>
 <value>*</value>
</property>

<property>
 <name>oozie.service.ProxyUserService.proxyuser.falcon.groups</name>
 <value>*</value>
</property>

<property>
 <name>oozie.service.URIHandlerService.uri.handlers</name>
 <value>org.apache.oozie.dependency.FSURIHandler, org.apache.oozie.
 dependency.HCatURIHandler</value>
</property>

<property>
 <name>oozie.services.ext</name>
```

```
<value>org.apache.oozie.service.JMSAccessorService, org.apache.oozie.
service.PartitionDependencyManagerService,
 org.apache.oozie.service.HCatAccessorService</value>
</property>

<!-- Coord EL Functions Properties -->

<property>
 <name>oozie.service.ELService.ext.functions.coord-job-submit-
instances</name>
 <value>now=org.apache.oozie.extensions.OozieELExtensions#ph1_now_echo,
 today=org.apache.oozie.extensions.OozieELExtensions#ph1_today_echo,
 yesterday=org.apache.oozie.extensions.
OozieELExtensions#ph1_yesterday_echo,
 currentMonth=org.apache.oozie.extensions.
OozieELExtensions#ph1_currentMonth_echo,
 lastMonth=org.apache.oozie.extensions.
OozieELExtensions#ph1_lastMonth_echo,
 currentYear=org.apache.oozie.extensions.
OozieELExtensions#ph1_currentYear_echo,
 lastYear=org.apache.oozie.extensions.
OozieELExtensions#ph1_lastYear_echo,
 formatTime=org.apache.oozie.coord.
CoordELFunctions#ph1_coord_formatTime_echo,
 latest=org.apache.oozie.coord.
CoordELFunctions#ph2_coord_latest_echo,
 future=org.apache.oozie.coord.
CoordELFunctions#ph2_coord_future_echo
 </value>
</property>

<property>
 <name>oozie.service.ELService.ext.functions.coord-action-create-inst</
name>
 <value>now=org.apache.oozie.extensions.OozieELExtensions#ph2_now_inst,
 today=org.apache.oozie.extensions.OozieELExtensions#ph2_today_inst,
 yesterday=org.apache.oozie.extensions.
OozieELExtensions#ph2_yesterday_inst,
 currentMonth=org.apache.oozie.extensions.
OozieELExtensions#ph2_currentMonth_inst,
 lastMonth=org.apache.oozie.extensions.
OozieELExtensions#ph2_lastMonth_inst,
 currentYear=org.apache.oozie.extensions.
OozieELExtensions#ph2_currentYear_inst,
 lastYear=org.apache.oozie.extensions.
OozieELExtensions#ph2_lastYear_inst,
 latest=org.apache.oozie.coord.
CoordELFunctions#ph2_coord_latest_echo,
 future=org.apache.oozie.coord.
CoordELFunctions#ph2_coord_future_echo,
 formatTime=org.apache.oozie.coord.
CoordELFunctions#ph2_coord_formatTime,
 user=org.apache.oozie.coord.CoordELFunctions#coord_user
 </value>
</property>

<property>
 <name>oozie.service.ELService.ext.functions.coord-action-create</name>
 <value>
 now=org.apache.oozie.extensions.OozieELExtensions#ph2_now,
```

```

 today=org.apache.oozie.extensions.OozieELExtensions#ph2_today,
 yesterday=org.apache.oozie.extensions.
OozieELExtensions#ph2_yesterday,
 currentWeek=org.apache.oozie.extensions.
OozieELExtensions#ph2_currentWeek,
 lastWeek=org.apache.oozie.extensions.
OozieELExtensions#ph2_lastWeek,
 currentMonth=org.apache.oozie.extensions.
OozieELExtensions#ph2_currentMonth,
 lastMonth=org.apache.oozie.extensions.
OozieELExtensions#ph2_lastMonth,
 currentYear=org.apache.oozie.extensions.
OozieELExtensions#ph2_currentYear,
 lastYear=org.apache.oozie.extensions.
OozieELExtensions#ph2_lastYear,
 latest=org.apache.oozie.coord.
CoordELFunctions#ph2_coord_latest_echo,
 future=org.apache.oozie.coord.
CoordELFunctions#ph2_coord_future_echo,
 formatTime=org.apache.oozie.coord.
CoordELFunctions#ph2_coord_formatTime,
 user=org.apache.oozie.coord.CoordELFunctions#coord_user
 </value>
</property>

<property>
 <name>oozie.service.ELService.ext.functions.coord-job-submit-data</
name>
 <value>
 now=org.apache.oozie.extensions.OozieELExtensions#ph1_now_echo,
 today=org.apache.oozie.extensions.OozieELExtensions#ph1_today_echo,
 yesterday=org.apache.oozie.extensions.
OozieELExtensions#ph1_yesterday_echo,
 currentWeek=org.apache.oozie.extensions.
OozieELExtensions#ph1_currentWeek_echo,
 lastWeek=org.apache.oozie.extensions.
OozieELExtensions#ph1_lastWeek_echo,
 currentMonth=org.apache.oozie.extensions.
OozieELExtensions#ph1_currentMonth_echo,
 lastMonth=org.apache.oozie.extensions.
OozieELExtensions#ph1_lastMonth_echo,
 currentYear=org.apache.oozie.extensions.
OozieELExtensions#ph1_currentYear_echo,
 lastYear=org.apache.oozie.extensions.
OozieELExtensions#ph1_lastYear_echo,
 dataIn=org.apache.oozie.extensions.
OozieELExtensions#ph1_dataIn_echo,
 instanceTime=org.apache.oozie.coord.
CoordELFunctions#ph1_coord_nominalTime_echo_wrap,
 formatTime=org.apache.oozie.coord.
CoordELFunctions#ph1_coord_formatTime_echo,
 dateOffset=org.apache.oozie.coord.
CoordELFunctions#ph1_coord_dateOffset_echo,
 user=org.apache.oozie.coord.CoordELFunctions#coord_user
 </value>
</property>

<property>
<name>oozie.service.ELService.ext.functions.coord-action-start</name>
<value>

```

```

now=org.apache.oozie.extensions.OozieELExtensions#ph2_now,
today=org.apache.oozie.extensions.OozieELExtensions#ph2_today,
yesterday=org.apache.oozie.extensions.OozieELExtensions#ph2_yesterday,
currentMonth=org.apache.oozie.extensions.OozieELExtensions#ph2_currentMonth,
lastMonth=org.apache.oozie.extensions.OozieELExtensions#ph2_lastMonth,
currentYear=org.apache.oozie.extensions.OozieELExtensions#ph2_currentYear,
lastYear=org.apache.oozie.extensions.OozieELExtensions#ph2_lastYear,
latest=org.apache.oozie.coord.CoordELFunctions#ph3_coord_latest,
future=org.apache.oozie.coord.CoordELFunctions#ph3_coord_future,
dataIn=org.apache.oozie.extensions.OozieELExtensions#ph3_dataIn,
instanceTime=org.apache.oozie.coord.CoordELFunctions#ph3_coord_nominalTime,
dateOffset=org.apache.oozie.coord.CoordELFunctions#ph3_coord_dateOffset,
formatTime=org.apache.oozie.coord.CoordELFunctions#ph3_coord_formatTime,
user=org.apache.oozie.coord.CoordELFunctions#coord_user
</value>
</property>

<property>
 <name>oozie.service.ELService.ext.functions.coord-sla-submit</name>
 <value>
 instanceTime=org.apache.oozie.coord.
CoordELFunctions#ph1_coord_nominalTime_echo_fixed,
 user=org.apache.oozie.coord.CoordELFunctions#coord_user
 </value>
</property>

<property>
 <name>oozie.service.ELService.ext.functions.coord-sla-create</name>
 <value>
 instanceTime=org.apache.oozie.coord.
CoordELFunctions#ph2_coord_nominalTime,
 user=org.apache.oozie.coord.CoordELFunctions#coord_user
 </value>
</property>

```

5. Copy the existing Oozie WAR file to `/usr/hdp/current/oozie/oozie.war`. This ensures that all existing items in the WAR file are still present after the current update.

```
su - root
```

```
cp $CATALINA_BASE/webapps/oozie.war /usr/hdp/current/oozie-
server/oozie.war
```

where `$CATALINA_BASE` is the path for the Oozie web app. By default, `$CATALINA_BASE` is:

```
/usr/hdp/2.6.0.0-<$BUILD>/oozie/oozie-server.
```

6. Add the Falcon EL extensions to Oozie.

Copy the extension JAR files provided with the Falcon Server to a temporary directory on the Oozie server. For example, if your standalone Falcon Server is on the same machine as your Oozie server, you can just copy the JAR files.

```
mkdir /tmp/falcon-oozie-jars
```

```
cp /usr/hdp/current/falcon-server/oozie/ext/falcon-oozie-el-
extension-<$version>.jar /tmp/falcon-oozie-jars
```

```
cp /tmp/falcon-oozie-jars/falcon-oozie-el-extension-<
$version>.jar /usr/hdp/2.6.0.0-<$BUILD>/oozie/libext
```

#### 7. Package the Oozie WAR file as the Oozie user

```
su - $OOZIE_USER

cd /usr/hdp/current/oozie-server/bin

./oozie-setup.sh prepare-war
```

Where \$OOZIE\_USER is the Oozie user. For example, oozie.

#### 8. Start the Oozie service on all Falcon clusters. Run these commands on the Oozie host machine.

```
su - $OOZIE_USER

/usr/hdp/current/oozie-server/bin/oozie-start.sh
```

Where \$OOZIE\_USER is the Oozie user. For example, oozie.

## 24.6. Configuring Hive for Falcon

Falcon-generated Hive actions require changes to hive-site.xml to pass the right configuration parameters.



### Important

This configuration change lets you work with Hive tables and Oozie workflows, but impacts all Hive actions, including non-Falcon Oozie workflows.

Under the oozie configuration directory (typically `/etc/oozie/conf`), there is a series of subdirectories `action-conf/hive`. Under the `hive` subdirectory, either create or modify the file `hive-site.xml` and add the following property:

```
<property>
 <name>hive.metastore.execute.setugi</name>
 <value>true</value>
</property>
```

After making this change, restart the Oozie service. If you have Oozie configured for HA, perform this configuration change on all Oozie server nodes.

## 24.7. Configuring for Secure Clusters

If you are using secure clusters, complete the following steps.

1. Verify that `hadoop.security.auth_to_local` in `core-site.xml` is consistent across all clusters.





## Important

Inconsistent rules for `hadoop.security.auth_to_local` can lead to issues with delegation token renewals.

2. For working with secure clusters that use hive and hcatalog, the `cluster.xml` entity should have `hadoop.rpc.protection` set to the value of the hadoop cluster's `hadoop.rpc.protection`. For example:

```
<property name="hadoop.rpc.protection" value="authentication"/>
```



## Note

Value cannot be hard coded to authentication. It has to match the authentication value the hadoop cluster uses.

3. Set `dfs.namenode.kerberos.principal` for the cluster NameNode. For example:

```
<property name="dfs.namenode.kerberos.principal" value="nn/
ip-172-31-47-87.ec2.internal@EXAMPLE.COM" />
```

4. For the hcatalog retention/replication/process to work with secure clusters, set `hive.metastore.sasl.enabled` to true in the cluster entity. For example:

```
<property name="hive.metastore.sasl.enabled" value="true"/>
```

5. Set `hive.metastore.kerberos.principal` and `hive.metastore.uris`. For example:

```
<property name="hive.metastore.kerberos.principal" value="hive/
ip-172-31-47-87.ec2.internal@EXAMPLE.COM" />
<property name="hive.metastore.uris" value="thrift://ip-172-31-47-87.ec2.
internal:9083"/>
```

6. For Windows Azure Storage Blob (WASB) replication to work, the target cluster's `core-site.xml` must have wasb credentials. For example:

```
<property>
 <name>fs.azure.account.key.testuser.blob.core.windows.net</name>
 <value>XX</value>
</property>
```

7. Create the following property definitions in your cluster entity or entities. In the following example, replace `$my.internal@EXAMPLE.COM` and `$my.internal` with your own values.

```
<properties>
 <property name="dfs.namenode.kerberos.principal" value="nn/$my.
internal@EXAMPLE.COM" />
 <property name="hive.metastore.kerberos.principal" value="hive/$my.
internal@EXAMPLE.COM" />
 <property name="hive.metastore.uris" value="thrift://$my.internal:9083" />
 <property name="hive.metastore.sasl.enabled" value="true" />
</properties>
```

## 24.8. Validate Falcon

To validate Falcon, submit your entities to Falcon:

1. Submit your cluster entity. For example, to submit `$sampleClusterFile.xml`:

```
falcon entity -type cluster -submit -file $yourClusterFile.xml
```

2. Submit your dataset or feed entity. For example to submit `$sampleFeedFile.xml`:

```
falcon entity -type feed -submit -file $yourFeedFile.xml
```

3. Submit your process entity. For example, `$sampleProcessFile.xml`:

```
falcon entity -type process -submit -file $yourProcessFile.xml
```

For each entity, you should see the following success message for submit:

```
falcon/default/Submit successful ($entity type) $yourEntityFile
```

For example, for a process entity named `rawEmailIngestProcess`, you would see a successful message such as:

```
falcon/default/Submit successful (process) rawEmailIngestProcess
```

## 25. Installing Apache Knox

Apache Knox Gateway (Apache Knox) is the Web/REST API Gateway solution for Hadoop and provides a single access point for all of Hadoop resources over REST. The Knox Gateway also enables the integration of enterprise identity management solutions and numerous perimeter security features for REST/HTTP access to Hadoop.

Knox can be installed on kerberized and non-kerberized clusters. Complete the following instructions to install Knox:

1. [Install the Knox Package on the Knox Server \[258\]](#)
2. [Set up and Validate the Knox Gateway Installation \[258\]](#)
3. [Configuring Knox Single Sign-on \(SSO\) \[260\]](#)

### 25.1. Install the Knox Package on the Knox Server

To install the Knox RPM or package, run the following command as root:

- RHEL/CentOS/Oracle Linux:

```
sudo yum install knox
```

- For SLES:

```
zypper install knox
```

- For Ubuntu:

```
apt-get install knox
```

The installation creates the following:

- knox user in `/etc/passwd`
- Knox installation directory: `/usr/hdp/current/knox-server`, referred to as `$gateway_home`
- Knox configuration directory: `/etc/knox/conf`
- Knox log directory: `/var/log/knox`

### 25.2. Set up and Validate the Knox Gateway Installation

Setting up and validating the Knox Gateway installation requires a fully operational Hadoop Cluster that can be accessed from the gateway. This section explains how to get the gateway up and running, and how to test access to your existing cluster with the minimal configuration.

Use the steps in this section for initial gateway testing. For detailed configuration instructions, see the [Apache Knox Gateway Overview](#) in the *Hadoop Security Guide*.

To set up the gateway and test access:

1. Set the master secret.

```
su -l Knox -c "$gateway_home/bin/gateway.sh setup"
```

You are prompted for the master secret. Enter the password at the prompt.

2. Start the gateway:

```
su -l Knox -c "/usr/hdp/current/knox-server/bin/gateway.sh start"
```

Starting Gateway succeeded with PID 1871.

The gateway starts. The PID is stored in `/var/run/knox`.

3. Start the demo LDAP service that contains the guest user account for testing.

```
su -l Knox -c "/usr/hdp/current/knox-server/bin/ldap.sh start"
```

Starting LDAP succeeded with PID 1965.

In a production environment, use Active Directory or OpenLDAP for authentication. For detailed instructions on configuring the Knox Gateway, see [Configuring Authentication](#) in the *Hadoop Security Guide*.

4. Verify that the gateway and LDAP service are running:

```
su -l Knox -c "$gateway_home/bin/gateway.sh status"
```

Gateway is running with PID 1871.

```
su -l Knox -c "$gateway_home/bin/ldap.sh status"
```

LDAP is running with PID 1965.

5. Confirm access from the gateway host to the WebHDFS Service host using telnet:



### Note

To enable telnet set `dfs.webhdfs.enabled` to true.

```
telnet $webhdfs_host $webhdfs_port
```



### Important

You must be able to reach the internal cluster service from the machine on which Knox is running before continuing.

6. Update the WebHDFS host information and any other host and port in the topology to match your deployment.



## Note

Your set up is not complete until all of the host:port information is updated.

The WebHDFS host information is located in the `$gateway_home/conf/topologies/sandbox.xml` file.

- a. Find the service definition for WebHDFS and update it as follows:

```
<service>
 <role>WEBHDFS</role>
 <url>http://$webhdfs_host:$webhdfs_port/webhdfs</url>
</service>
```

where `$webhdfs_host` and `$webhdfs_port` (default port is 50070) match your environment.

- b. **(Optional)** Comment out the Sandbox-specific hostmap information:

```
<!-- REMOVE SANDBOX HOSTMAP PROVIDER <provider>
 <role>hostmap</role>
 <name>static</name>
 <enabled>>false</enabled>
 <param><name>localhost</name>
 <value>sandbox,sandbox.hortonworks.com</value></param>
</provider>
-->
```

7. **(Optional)** Rename the Sandbox Topology Descriptor file to match the name of your cluster:

```
mv $gateway_home/conf/topologies/sandbox.xml $gateway_home/conf/topologies/cluster-name.xml
```

The gateway is now configured to allow access to WebHDFS.

8. On an external client that has curl, enter the following command:

```
curl -k -u guest:guest-password -X GET "https://$gateway_host:8443/gateway/sandbox/webhdfs/v1/?op=LISTSTATUS"
```

where `sandbox` is the name of the cluster topology descriptor file that you created for testing. If you renamed it, then replace `sandbox` in the command above.

`$gateway_host` is the Knox Gateway hostname. The status is returned.

## 25.3. Configuring Knox Single Sign-on (SSO)

Knox Single Sign-on (SSO) introduces the ability to configure a single username and password for access control to multiple web UIs. This feature leverages the `hadoop-auth` module in Hadoop common to use a common SSO cookie for web UIs while retaining the non-web browser authentication through `kerberos/SPNEGO`. To configure the Knox SSO feature, complete the following step.

Configure the following properties in the `knoxsso.xml` file located in `{GATEWAY_HOME}/conf/topologies`.

Parameter	Description	Default
<code>knoxsso.cookie.secure.only</code>	This determines whether the browser is allowed to send the cookie over unsecured channels. This should always be set to true in production systems. If during development a relying party is not running ssl then you can turn this off. Running with it off exposes the cookie and underlying token for capture and replay by others.	true
<code>knoxsso.cookie.max.age</code>	optional: This indicates that a cookie can only live for a specified amount of time - in seconds. This should probably be left to the default which makes it a session cookie. Session cookies are discarded once the browser session is closed.	session
<code>knoxsso.cookie.domain.suffix</code>	optional: This indicates the portion of the request hostname that represents the domain to be used for the cookie domain. For single host development scenarios the default behavior should be fine. For production deployments, the expected domain should be set and all configured URLs that are related to SSO should use this domain. Otherwise, the cookie is not presented by the browser to mismatched URLs.	Default cookie domain or a domain derived from a hostname that includes more than 2 dots.
<code>knoxsso.token.ttl</code>	This indicates the lifespan of the token within the cookie. Once it expires a new cookie must be acquired from KnoxSSO. This is in milliseconds. The 3600000 in the topology above gives you 10 hrs.	30000 That is 30 seconds.
<code>knoxsso.token.ttl</code>	This is a comma separated list of audiences to add to the JWT token. This is used to ensure that a token received by a participating application knows that the token was intended for use with that application. It is optional. In the event that an application has expected audiences and they are not present the token must be rejected. In the event where the token has audiences and the application has none expected then the token is accepted. OPEN ISSUE - not currently being populated in WebSSOResource.	empty
<code>knoxsso.redirect.whitelist.regex</code>	A semicolon separated list of regex expressions. The incoming originalUrl must match one of the expressions in order for KnoxSSO to redirect to it after authentication. Defaults to only relative paths and localhost with or without SSL for development usecases. This needs to be opened up for production use and actual participating applications. Note	<code>^/.*\$;^https?:/localhost:\d{0,9}/.*\$</code>

Parameter	Description	Default
	that cookie use is still constrained to redirect destinations in the same domain as the KnoxSSO service - regardless of the expressions specified here.	

The following is a sample KnoxSSO topology.

```
<topology>
 <gateway>
 <provider>
 <role>authentication</role>
 <name>ShiroProvider</name>
 <enabled>true</enabled>
 <param>
 <name>sessionTimeout</name>
 <value>30</value>
 </param>
 <param>
 <name>main.ldapRealm</name>
 <value>org.apache.hadoop.gateway.shirorealm.KnoxLdapRealm</
value>
 </param>
 <param>
 <name>main.ldapContextFactory</name>
 <value>org.apache.hadoop.gateway.shirorealm.
KnoxLdapContextFactory</value>
 </param>
 <param>
 <name>main.ldapRealm.contextFactory</name>
 <value>$ldapContextFactory</value>
 </param>
 <param>
 <name>main.ldapRealm.userDnTemplate</name>
 <value>uid={0},ou=people,dc=hadoop,dc=apache,dc=org</value>
 </param>
 <param>
 <name>main.ldapRealm.contextFactory.url</name>
 <value>ldap://localhost:33389</value>
 </param>
 <param>
 <name>main.ldapRealm.contextFactory.
authenticationMechanism</name>
 <value>simple</value>
 </param>
 <param>
 <name>urls.**</name>
 <value>authcBasic</value>
 </param>
 </provider>
 <provider>
 <role>identity-assertion</role>
 <name>Default</name>
 <enabled>true</enabled>
 </provider>
 </gateway>
 <service>
 <role>KNOXSSO</role>
 <param>
```

```
 <name>knoxssso.cookie.secure.only</name>
 <value>>true</value>
 </param>
 <param>
 <name>knoxssso.token.ttl</name>
 <value>100000</value>
 </param>
 <param>
 <name>knoxssso.redirect.whitelist.regex</name>
 <value>^/. *$;https?://localhost*$</value>
 </param>
 <param>
 <name>knoxssso.cookie.domain.suffix</name>
 <value>.novalocal</value>
 </param>
</service>
</topology>
```

This topology results in a KnoxSSO URL that looks something like:

```
https://{gateway_host}:{gateway_port}/gateway/knoxssso/api/v1/webssso
```



## 26. Installing Apache Slider

### Prerequisites

1. You must have at least core Hadoop on your system. See [Configure the Remote Repositories](#) for more information.
2. Verify the HDP repositories are available:

```
yum list slider
```

The output should list at least one Slider package similar to the following:

```
slider.noarch <version>
```

If yum responds with "Error: No matching package to list" as shown below, yum cannot locate a matching RPM. This can happen if the repository hosting the HDP RPMs is unavailable, or has been disabled. Follow the instructions at [Configure the Remote Repositories](#) to configure private repository before proceeding.

```
Error: No matching package to list.
```

### Installation

1. Run the following command to install Slider.

- For RHEL/CentOS/Oracle Linux:

```
yum install slider_2*
```

- For SLES:

```
zypper install slider_2*
```

- For Ubuntu:

```
apt-get install slider_2*
```

2. As the root user, edit the following properties in the `/etc/hadoop/conf/yarn-site.xml` file.

```
<property>
 <name>hadoop.registry.zk.quorum</name>
 <value>$ZOOKEEPERQUORUM-SERVERS</value>
 <description>List of hostname:port pairs defining the zookeeper quorum
 binding for the registry
</description>
</property>

<property>
 <name>hadoop.registry.rm.enabled</name>
 <value>>true</value>
 <description> Is the registry enabled: does the RM start it up, create
 the user
 and system paths, and purge service records when containers,
 application attempts
```

```

 and applications complete?
 </description>
</property>

```

Set `hadoop.registry.rm.enabled` to `true` and set `hadoop.registry.zk.quorum` to the address and port number of your ZooKeeper Quorum server (usually assigned to port 2181). For example:

```

<property>
 <name>hadoop.registry.zk.quorum</name>
 <value>node-1.example.com:2181</value>
 <description>List of hostname:port pairs defining the zookeeper quorum
 binding for the registry
 </description>
</property>

<property>
 <name>hadoop.registry.rm.enabled</name>
 <value>true</value>
 <description>Is the registry enabled: does the RM start it up, create
 the user
 and system paths, and purge service records when containers,
 application attempts
 and applications complete?
 </description>
</property>

```

3. As the root user, specify the `JAVA_HOME` and `HADOOP_CONF_DIR` settings in the `/etc/slider/conf/slider-env.sh` file. For example:

```

this is the shell script to start Slider deploying an application
Usage: slider <action> <commands>

The env variable SLIDER_JVM_OPTS can be used to override
the default JVM opts

export JAVA_HOME=/usr/hadoop-jdk1.6.0_31
export HADOOP_CONF_DIR=/etc/hadoop/conf

```

4. Use the following command to switch to the slider bin directory:

```
cd /usr/hdp/current/slider-client/bin
```

5. Use the Slider version command to verify that Slider has installed properly:

```
./slider version
```

6. Ensure that there are no errors, and that your results say "Compiled against Hadoop <current\_hadoop\_version>".

```

[root@node-1 bin]# ./slider version
2014-10-27 14:42:45,340 [main] INFO client.SliderClient - Slider Core-0.51.
0.2.6.0.0 Built against commit# d766e78d77 on Java 1.6.0_31 by jenkins
2014-10-27 14:42:45,351 [main] INFO client.SliderClient - Compiled against
Hadoop 2.6.0.0-2800
2014-10-27 14:42:45,375 [main] INFO client.SliderClient - Hadoop runtime
version (no branch) with source checksum 517963c273a1f4f8f5bfc15d92aa013
and build date 2014-10-27T03:27Z

```

```
2014-10-27 14:42:45,383 [main] INFO util.ExitUtil - Exiting with status 0
[root@node-1 bin]#
```

7. If HDP is installed in a cluster without using Ambari, invoke the following command (as user hdfs) after the slider client is installed:

```
slider dependency --upload
```

The above command uploads the Slider dependency tarball in an HDP specific path:

```
/hdp/apps/<hdp_version>/slider/slider.tar.gz
```

All subsequent Slider application creation jobs use this dependency tarball. The benefit is twofold. The application submission time reduces drastically from approximately 10-20 seconds to approximately 1-2 seconds, depending on the hardware. It also eliminates all potential jar conflict issues when 3rd party client applications use the slider-core jar to submit Slider application creation requests.

## 27. Setting Up Kerberos Security for Manual Installs

For information on enabling Kerberos security for a manually installed version of HDP, refer to the [Hadoop Security Guide](#):

- [Preparing Kerberos](#)
- [Configuring HDP](#)
- [Setting up One-Way Trust with Active Directory](#)

## 28. Uninstalling HDP

Use the following instructions to uninstall HDP:

1. Stop all of the installed HDP services. See [Stopping HDP Services](#) in the HDP Reference Guide.

2. If Knox is installed, run the following command on all the cluster nodes:

- For RHEL/CentOS/Oracle Linux:

```
yum remove knox*
```

- For SLES:

```
zypper remove knox*
```

- For Ubuntu/Debian:

```
sudo apt-get remove knox*
```

3. If Ranger is installed, run the following command on all the cluster nodes:

- For RHEL/CentOS/Oracle Linux:

```
yum remove ranger*
```

- For SLES:

```
zypper remove ranger*
```

- For Ubuntu/Debian:

```
sudo apt-get remove ranger*
```

4. If Kafka is installed, run the following command on all the cluster nodes:

- For RHEL/CentOS/Oracle Linux:

```
yum remove kafka*
```

- For SLES:

```
zypper remove kafka*
```

- For Ubuntu/Debian:

```
sudo apt-get remove kafka*
```

5. If Storm is installed, run the following command on all the cluster nodes:

- For RHEL/CentOS/Oracle Linux:

```
yum remove storm*
```

- For SLES:

```
zypper remove storm*
```

- For Ubuntu/Debian:

```
sudo apt-get remove storm*
```

6. If Hive is installed, run the following command on all the cluster nodes:

- For RHEL/CentOS/Oracle Linux:

```
yum remove hive*
```

- For SLES:

```
zypper remove hive*
```

- For Ubuntu/Debian:

```
sudo apt-get remove hive*
```

7. If HBase is installed, run the following command on all the cluster nodes:

- For RHEL/CentOS/Oracle Linux:

```
yum remove hbase*
```

- For SLES:

```
zypper remove hbase*
```

- For Ubuntu/Debian:

```
sudo apt-get remove hbase*
```

8. If Phoenix is installed, run the following command on all the cluster nodes:

- For RHEL/CentOS/Oracle Linux:

```
yum remove phoenix*
```

- For SLES:

```
zypper remove phoenix*
```

- For Ubuntu/Debian:

```
sudo apt-get remove phoenix*
```

9. If Accumulo is installed, run the following command on all the cluster nodes:

- For RHEL/CentOS/Oracle Linux:

```
yum remove accumulo*
```

- For SLES:

```
zypper remove accumulo*
```

- For Ubuntu/Debian:

```
sudo apt-get remove accumulo*
```

10.If Tez is installed, run the following command on all the cluster nodes:

- For RHEL/CentOS/Oracle Linux:

```
yum remove tez*
```

- For SLES:

```
zypper remove tez*
```

- For Ubuntu/Debian:

```
sudo apt-get remove tez*
```

11.If ZooKeeper is installed, run the following command on all the cluster nodes:

- For RHEL/CentOS/Oracle Linux:

```
yum remove zookeeper*
```

- For SLES:

```
zypper remove zookeeper*
```

- For Ubuntu/Debian:

```
sudo apt-get remove zookeeper*
```

12.If Oozie is installed, run the following command on all the cluster nodes:

- For RHEL/CentOS/Oracle Linux:

```
yum remove oozie*
```

- For SLES:

```
zypper remove oozie*
```

- For Ubuntu/Debian:

```
sudo apt-get remove oozie*
```

13.If Pig is installed, run the following command on all the cluster nodes:

- For RHEL/CentOS/Oracle Linux:

```
yum remove pig*
```

- For SLES:

```
zypper remove pig*
```

- For Ubuntu/Debian:

```
sudo apt-get remove pig*
```

14.If compression libraries are installed, run the following command on all the cluster nodes:

```
yum remove snappy* yum remove hadoop-lzo*
```

15.If Knox is installed, run the following command on all the gateway host:

- For RHEL/CentOS/Oracle Linux:

```
yum remove knox*
```

- For SLES:

```
zypper remove knox*
```

- For Ubuntu/Debian:

```
sudo apt-get remove knox*
```

16.Uninstall Hadoop. run the following command on all the cluster nodes:

```
yum remove hadoop*
```

17.Uninstall ExtJS libraries and MySQL connector. Run the following command on all the cluster nodes:

```
yum remove extjs-2.2-1 mysql-connector-java-5.0.8-1*
```