

# Hortonworks Data Platform

## Non-Ambari Cluster Installation Guide

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## Hortonworks Data Platform : Non-Ambari Cluster Installation Guide

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# 1. Getting Ready to Install

This section describes the information and materials you need to get ready to install the Hortonworks Data Platform (HDP) manually. Use the following instructions before you deploy Hadoop cluster using HDP:

1. [Meet minimum requirements](#)
2. [Configure the remote repositories](#)
3. [Decide on deployment type](#)
4. [Collect information](#)
5. [Prepare the environment](#)
6. [Download companion files](#)
7. [Define environment parameters](#)
8. [Optional] [Create System Users and Groups](#)
9. [Determine HDP memory configuration settings](#)
10. [Allocate adequate log space for HDP](#)

## 1.1. Meet Minimum System Requirements

To run the 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 2.3.4 will take up about 2.5 GB of disk space. For more information about HDP hardware recommendations, see the "*HDP Cluster Planning Guide*."

### 1.1.2. Operating System Requirements

The following operating systems are supported:

- 64-bit CentOS 6
- 64-bit CentOS 7
- 64-bit Red Hat Enterprise Linux (RHEL) 6
- 64-bit Red Hat Enterprise Linux (RHEL) 7
- 64-bit Oracle Linux 6
- 64-bit Oracle Linux 7

- 64-bit SUSE Linux Enterprise Server (SLES) 11, SP3
- 64-bit Debian 6 and 7
- 64-bit Ubuntu Precise (12.04 and 14.04)
- Windows Server 2008, 2012

### 1.1.3. Software Requirements

Install the following software on each of your hosts:

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

In addition, if you are creating local mirror repositories as part of the installation process (see [Deploying HDP in Production Data Centers with Firewalls](#), and you are using RHEL/CentOS/SLES, then on the mirror repo server you will need:

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

### 1.1.4. JDK Requirements

Your system must have the correct JDK installed on all cluster nodes. HDP supports the following JDKs:

- Oracle JDK 1.7 64-bit update 51 or higher
- Oracle JDK 1.8

- OpenJDK 1.8 64-bit update 51 or higher
- OpenJDK 1.7 64-bit (latest stable version recommended)

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

### 1.1.4.1. Oracle JDK 1.7 or 1.8

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

1. Verify that you have a `/usr/java` directory. If not, 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. 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>.
3. Copy the downloaded `jdk.tar.gz` file to the `/usr/java` directory.
4. 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 will be extracted into a `/usr/java/jdk1.7.0_67` directory or a `/usr/java/jdk1.8.0_51` directory.

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

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

6. Set the `JAVA_HOME` and `PATH` environment variables.

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

7. Verify that Java is installed in your environment by running the following command:

```
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. OpenJDK 1.7

OpenJDK7 on HDP 2.3.4 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 the version. From a terminal window, type:

```
java -version
```

2. (Optional) Uninstall the Java package if the JDK version is less than 7. For example, if you are using CentOS:

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

3. (Optional) Verify that the default Java package is uninstalled.

```
which java
```

4. (Optional) Download OpenJDK 1.7 RPMs. From the command-line, run:

RedHat/CentOS/Oracle Linux:

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

Ubuntu/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 up 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 if Java is installed in your environment. Execute the following 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)
```

## 1.1.5. Metastore Database Requirements

If you are installing Hive and HCatalog or installing Oozie, 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. HDP supports the following databases for the metastore:

- Postgres 8.x, 9.3+
- MySQL 5.6
- Oracle 11g r2
- SQL Server 2008 R2+

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 Hive: hive\_dbname, hive\_dbuser, and hive\_dbpasswd.
- For 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.

### 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. RHEL/CentOS/Oracle Linux

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:

```
yum 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 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.

Uncomment the `"port = "` line and specify the port number (default is 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 user 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:

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

#### 6. Confirm that the .jar is in the Java share directory.

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

### 1.1.5.2.2. 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. Ubuntu/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 psql -U postgres
echo "GRANT ALL PRIVILEGES ON DATABASE $dbname TO $user;" | sudo -u 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.
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
```

### 1.1.5.3. 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.

### 1.1.5.3.1. RHEL/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, 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
```

where "root" is the root user password.

7. Log in as the root user and 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.

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

### 1.1.5.3.2. 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 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 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.

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

### 1.1.5.3.3. 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

Copyright (c) 2000, 2013, Oracle and/or its affiliates. All rights reserved.
```

```
Oracle is a registered trademark of Oracle Corporation and/or its
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*
```

#### 1.1.5.4. 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, then follow the instructions in "Set up Oracle DB for use with Hive Metastore" in this guide.

## 1.2. Virtualization and Cloud Platforms

HDP is certified and supported when running on virtual or cloud platforms (for example, VMware vSphere or Amazon Web Services EC2) as long as 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 [Meet Minimum System Requirements](#) for the list of supported operating systems for HDP.

## 1.3. Configure the 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.



### Note

If your cluster does not have access to the Internet, or 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 http://public-repo-1.hortonworks.com/HDP/centos6/2.x/updates/2.3.4.0/hdp.repo
```

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

```
wget -nv http://public-repo-1.hortonworks.com/HDP/centos7/2.x/updates/2.3.4.0/hdp.repo
```

- SLES SP3

```
wget -nv http://public-repo-1.hortonworks.com/HDP/suse11sp3/2.x/updates/2.3.4.0/hdp.repo
```

- Ubuntu 12

```
apt-get update
wget http://public-repo-1.hortonworks.com/HDP/ubuntu12/2.x/updates/2.3.4.0/hdp.list -O /etc/apt/sources.list.d/hdp.list
```

- Ubuntu 14

```
apt-get update
wget http://public-repo-1.hortonworks.com/HDP/ubuntu14/2.x/updates/2.3.4.0/hdp.list -O /etc/apt/sources.list.d/hdp.list
```

- Debian 6

```
apt-get update
wget http://public-repo-1.hortonworks.com/HDP/debian6/2.x/updates/2.3.4.0/hdp.list -O /etc/apt/sources.list.d/hdp.list
```

- Debian 7

```
apt-get update
wget http://public-repo-1.hortonworks.com/HDP/debian7/2.x/updates/2.3.4.0/hdp.list -O /etc/apt/sources.list.d/hdp.list
```

## 1.4. Decide on Deployment Type

While it is possible to deploy all of HDP on a single host, this is appropriate only for initial evaluation. In general 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 Hive/HCatalog or Oozie, you need the hostname, database name, username, 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 on that instance.

## 1.6. Prepare the Environment

To deploy your HDP instance, you need to prepare your deployment environment:

- [Enable NTP on the Cluster](#)
- [Disable SELinux](#)
- [Disable IPTables](#)

### 1.6.1. Enable NTP on the Cluster

The clocks of all the nodes in your cluster must be able to synchronize with each other. If your system does not have access to the Internet, set up a master node as an NTP xserver. Use the following instructions to enable NTP for your cluster:

1. Configure NTP clients. Execute the following command on all nodes 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. Execute the following command on all the nodes 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 the existing NTP 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. For example on RHEL hosts you would use:

```
# 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.

- **Option I:** Disable SELinux temporarily by executing the following command:

```
setenforce 0
```

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

## 1.6.3. Disable IPTables

Certain ports must be open and available during installation. The easiest way to do this is to temporarily disable iptables. If the security protocols at your installation do not allow you to disable iptables, you can proceed with them on, as long as all of the relevant ports are open and available. 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 will fail.

## 1.7. Download Companion Files

We have provided a set of companion files, including script files and configuration files, that you can download. You can use these files as a reference point. However, you will need to modify them to match your own cluster environment.

To download and extract the files:

```
wget http://public-repo-1.hortonworks.com/HDP/tools/2.3.4.0/
hdp_manual_install_rpm_helper_files-2.3.4.0.$BUILD.tar.gz
tar zxvf hdp_manual_install_rpm_helper_files-2.3.4.0.$BUILD.tar.gz
```

## 1.8. Define Environment Parameters

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

### 1. Define directories.

The following table describes the directories for install, configuration, data, process IDs, and logs based on the 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 you downloaded in Download Companion Files includes a script, directories.sh, for setting directory environment parameters.

We strongly suggest you edit and source (alternatively, you can also copy the contents to your ~/.bash\_profile) to set up these environment variables in your environment.

**Table 1.1. Define Directories for Core Hadoop**

Hadoop Service	Parameter	Definition
HDFS	DFS_NAME_DIR	Space separated list of directories where NameNode should store the file system image. For example, /grid/hadoop/hdfs/nn /grid1/hadoop/hdfs/nn
HDFS	DFS_DATA_DIR	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	FS_CHECKPOINT_DIR	Space separated list of directories where SecondaryNameNode should store the checkpoint image. For example, /grid/hadoop/hdfs/

Hadoop Service	Parameter	Definition
		snn /grid1/hadoop/hdfs/ snn /grid2/hadoop/hdfs/snn
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 will store container log data. For example, <code>/grid/hadoop/yarn/logs /grid1/hadoop/yarn/log</code> .
YARN	YARN_PID_DIR	Directory for storing the YARN process ID. For example, <code>/var/run/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> .
MapReduce	MAPRED_LOG_DIR	Directory for storing the JobHistory Server logs. For example, <code>/var/log/hadoop/mapred</code> . This directory name is a combination of a directory and the <code>\$MAPRED_USER</code> . In the example <code>mapred</code> is the <code>\$MAPRED_USER</code> .

Table 1.2. Define Directories for Ecosystem Components

Hadoop Service	Parameter	Definition
Pig	PIG_CONF_DIR	Directory to store the Pig configuration files. For example, <code>/etc/pig/conf</code> .
Pig	PIG_LOG_DIR	Directory to store the Pig logs. For example, <code>/var/log/pig</code> .
Pig	PIG_PID_DIR	Directory to store the Pig process ID. For example, <code>/var/run/pig</code> .
Oozie	OOZIE_CONF_DIR	Directory to store the Oozie configuration files. For example, <code>/etc/oozie/conf</code> .

Hadoop Service	Parameter	Definition
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 HBase configuration files. For example, /etc/hbase/conf.
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 ZooKeeper will store 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 Sqoop configuration files. For example, /etc/sqoop/conf.

If you use the Companion files, the following 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 will require you to
# change values in other configuration files.
#
#
# Hadoop Service - HDFS
#
# Space separated list of directories where NameNode will store 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 will store 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 will store
# 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 will store 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 will store 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 will store 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 HDFS services. For example, hdfs.
YARN_USER	User that owns the YARN services. For example, yarn.



Parameter	Definition
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 Falcon services. For example, falcon.
SQOOP_USER	User owning the Sqoop services. For example, sqoop.
KAFKA_USER	User owning the 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. [Optional] Create System Users and Groups

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

1. Add the user to the group.

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

2. Create the username directory.

```
hdfs fs -mkdir /user/<username>
```

3. Give that account ownership over its directory.

```
hdfs fs -chown <username>:<groupname> /user/<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

Hadoop Service	User	Group
HBase	hbase	hadoop
Falcon	falcon	hadoop
Sqoop	sqoop	hadoop
ZooKeeper	zookeeper	hadoop
Oozie	oozie	hadoop
Knox Gateway	knox	hadoop
Nagios	nagios	nagios

## 1.10. Determine HDP Memory Configuration Settings

Two methods can be used to determine YARN and MapReduce memory configuration settings:

- [Running the HDP Utility Script](#)
- [Manually Calculating YARN and MapReduce Memory Configuration Settings](#)

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 GB.
-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:

```
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. Manually Calculating YARN and MapReduce Memory Configuration Settings

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 a 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, 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 = Reserved for stack memory + Reserved for HBase Memory (If HBase is on the same node).

Use the following table to determine the 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

The next calculation is to determine the maximum number of containers allowed per node. The following formula can be used:

$$\# \text{ of containers} = \min (2 * \text{CORES}, 1.8 * \text{DISKS}, (\text{Total available RAM}) / \text{MIN\_CONTAINER\_SIZE})$$

Where DISKS is the value for dfs.data.dirs (number of data disks) per machine.

And MIN\_CONTAINER\_SIZE is the minimum container size (in RAM). This value is dependent on the amount of RAM available – in smaller memory nodes, the minimum container size should also be smaller. The following table outlines the recommended values:

**Table 1.7. Recommended 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

The final calculation is to determine the amount of RAM per container:

$$\text{RAM-per-container} = \max(\text{MIN\_CONTAINER\_SIZE}, (\text{Total Available RAM}) / \text{containers}))$$

With these calculations, the YARN and MapReduce configurations can be set.

**Table 1.8. YARN and MapReduce Configuration Setting Value Calculations**

Configuration File	Configuration Setting	Value Calculation
yarn-site.xml	yarn.nodemanager.resource.memory-mb	= containers * RAM-per-container

Configuration File	Configuration Setting	Value Calculation
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

Cluster nodes have 12 CPU cores, 48 GB RAM, and 12 disks.

Reserved Memory = 6 GB reserved for system memory + (if HBase) 8 GB for HBase Min container size = 2 GB

If there is no HBase:

# of containers =  $\min(2 \times 12, 1.8 \times 12, (48-6)/2) = \min(24, 21.6, 21) = 21$

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

**Table 1.9. Example Value Calculations**

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

If HBase is included:

# of containers =  $\min(2 \times 12, 1.8 \times 12, (48-6-8)/2) = \min(24, 21.6, 17) = 17$

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

**Table 1.10. Example Value Calculations**

Configuration	Value Calculation
yarn.nodemanager.resource.memory-mb	= $17 \times 2 = 34 \times 1024$ MB

Configuration	Value Calculation
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/cores, you can free up 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 pre-configured 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 our example cluster, with the above configurations, YARN will be 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 where 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. 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	1024m	128m
1-5 million files	3072m	512m
5-10	5376m	768m
10-20	9984m	1280m
20-30	14848m	2048m
30-40	19456m	2560m
40-50	24320m	3072m
50-70	33536m	4352m

Number of Files in Millions	Total Java Heap (Xmx and Xms)	Young Generation Size (-XX:NewSize - XX:MaxNewSize)
70-100	47872m	6144m
70-125	59648m	7680m
100-150	71424m	8960m
150-200	94976m	8960m

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

The following are the recommended settings for `HADOOP_NAMENODE_OPTS` in the `hadoop-env.sh` file (replace 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,DRFAAUDIT ${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. For example:

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

## 1.12. Allocate 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.

## 2. 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](#)
2. [Install the Hadoop packages](#)
3. [Install compression libraries](#)
4. [Create directories](#)

### 2.1. 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.

### 2.2. 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
```



## 2.3. Install Compression Libraries

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

### 2.3.1. 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
```

### 2.3.2. Install LZO

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

- RHEL/CentOS/Oracle Linux:

```
yum install lzo lzo-devel hadoop-lzo hadoop-lzo-native
```

- For SLES:

```
zypper install lzo lzo-devel hadoop-lzo hadoop-lzo-native
```

- For Ubuntu/Debian:

```
apt-get install liblzo2-2 liblzo2-dev hadoop-lzo
```

## 2.4. 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 will need to modify them to match your own cluster environment.

Use the following instructions to create appropriate directories:

1. [Create the NameNode Directories](#)

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

### 2.4.1. 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.

### 2.4.2. 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.

### 2.4.3. 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`.

## 2.4.4. Create the Log and PID Directories

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

### 2.4.4.1. 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.

### 2.4.4.2. 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.

### 2.4.4.3. 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.

### 2.4.4.4. 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.

#### 2.4.4.5. 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.

#### 2.4.4.6. 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.

### 2.4.5. Symlink Directories with hdp-select



#### Important

HDP 2.3.4 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 2.3.4.0-<$version>
```

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 2.3.4.0-<$version>
```

## 3. 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](#)
2. [Securing Zookeeper with Kerberos](#)
3. [Securing Zookeeper Access](#)
4. [Set Directories and Permissions](#)
5. [Set Up the Configuration Files](#)
6. [Start Zookeeper](#)

### 3.1. 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 will be 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
```

## 3.2. Securing Zookeeper with Kerberos (optional)



### Note

Before starting the following steps, refer to [Setting up Security for Manual Installs](#).

(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
```

## 3.3. 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](#)



- [YARN Configuration](#)
- [HDFS Configuration](#)

### 3.3.1. 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"
```

## 3.3.2. 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` will be 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 "
```

## 3.3.3. 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>
```

## 3.4. 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 will 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 will store 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**

## 3.5. Set Up the Configuration Files

You must be 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 will 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:

```
export JAVA_HOME=/usr/jdk64/jdk1.8.0_40
export ZOOKEEPER_HOME=/usr/hdp/current/zookeeper-server
export ZOOKEEPER_LOG_DIR=/var/log/zookeeper
export ZOOKEEPER_PID_DIR=/var/run/zookeeper/zookeeper_server.pid
export SERVER_JVMFLAGS=-Xmx1024m
export JAVA=$JAVA_HOME/bin/java
export CLASSPATH=$CLASSPATH:$ZOOKEEPER_HOME/*
```

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`.

## 3.6. 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:

```
su - zookeeper -c "export ZOOCFGDIR=/usr/hdp/current/zookeeper-server/
conf ; export ZOOCFG=zoo.cfg; source /usr/hdp/current/zookeeper-server/conf/
zookeeper-env.sh ; /usr/hdp/current/zookeeper-server/bin/zkServer.sh start"
```

```
su -l hdfs -c "/usr/hdp/current/hadoop-hdfs-namenode/../hadoop/sbin/hadoop-
daemon.sh start zkfc"
```

## 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 will 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>
```

- 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>
  <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. 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.

## 6. 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`.

## 5. Validating the Core Hadoop Installation

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

1. [Format and start HDFS](#)
2. [Smoke test HDFS](#)
3. [Configure YARN and MapReduce](#)
4. [Start YARN](#)
5. [Start the MapReduce JobHistory Server](#)
6. [Smoke test MapReduce](#)

### 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/./hadoop/bin/hdfs namenode -format
/usr/hdp/current/hadoop-hdfs-namenode/./hadoop/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-hdfs-secondarynamenode/./hadoop/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 2.3.4.0.

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-nodemananager/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 will return 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 -chmod -R 1777 /mr-history/tmp  
  
hdfs dfs -mkdir -p /mr-history/done  
hdfs dfs -chmod -R 1777 /mr-history/done  
hdfs dfs -chown -R $MAPRED_USER:$HDFS_USER /mr-history  
  
hdfs dis -mkdir -p /app-logs  
hdfs dfs -chmod -R 1777 /app-logs  
  
hdfs dfs -chown $YARN_USER:$HDFS_USER/app-logs
```

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](#)
2. [Set Directories and Permissions](#)
3. [Set up the Configuration Files](#)
4. [Validate the Installation](#)
5. [Start the HBase Thrift and REST APIs](#)

### 6.1. Install the HBase Package

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 will 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 will 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</name>
  <value>kerberos</value>
  <description>Enter the authentication method for the REST server.
</description>
</property>

<property>
  <name>hbase.rest.kerberos.spnego.principal</name>
  <value>HTTP/_HOST@EXAMPLE.COM</value>
  <description>Enter the hostname of the principal.</description>
</property>

<property>
  <name>hbase.rest.keytab.file</name>
  <value>/etc/security/keytabs/spnego.service.keytab</value>
  <description>Enter the location of the keytab.</description>
</property>

```

- After adding these properties to `hbase-site.xml`, you must grant HBase permissions to the user:

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

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

```
grant 'HTTP', 'RWXCA', 'sales', '1'
```

- 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. 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'
```

## 6.5. Starting the HBase Thrift and REST APIs

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

### Starting the HBase Thrift API

Run the following command to start the HBase Thrift API:

```
/usr/bin/hbase thrift start
```

### Starting the HBase REST API

Run the following command to start the HBase REST API:

```
/usr/hdp/current/hbase-master/bin/hbase-daemon.sh start rest --  
infoport 8085
```

## 7. Installing Apache Phoenix

To install Apache Phoenix, complete the following instructions on all HBase Region Servers and all Master nodes.

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

### 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 Region servers.
  - 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 and also to prevent deadlocks by ensuring 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 `hbase-site.xml` on all Hbase nodes.

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

3. (Optional) To use local indexing, set the following properties in `hdfs-site.xml` on HBase Master. These properties ensure co-location of data table and local index regions:



### Warning

The local indexing feature is a technical preview and considered under development. Do not use this feature in your production systems. If you have questions regarding this feature, contact Support by logging a case on our [Hortonworks Support Portal](#).

```
<property>
  <name>hbase.master.loadbalancer.class</name>
  <value>org.apache.phoenix.hbase.index.balancer.IndexLoadBalancer</
  value>
</property>

<property>
  <name>hbase.coprocessor.master.classes</name>
  <value>org.apache.phoenix.hbase.index.master.IndexMasterObserver</
  value>
</property>

<property>
  <name>hbase.coprocessor.regionserver.classes</name>
  <value>org.apache.hadoop.hbase.regionserver.LocalIndexMerger</value>
</property>
```

4. Restart the HBase Master and Region Servers.

## 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 psql.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/ ./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.

### 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. Best Practices for Setting Client-side Timeouts

Hortonworks recommends the following best practices for timeout values, located in the HBase-site.xml file:

Setting	Value
hbase.rpc.timeout	300000
hbase.client.scanner.timeout.period	300000
zookeeper.session.timeout	300000
phoenix.query.timeoutMs	300000
phoenix.query.keepAliveMs	300000

## 7.6. 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](#)
2. [Installing the Tez Package](#)
3. [Configuring Tez](#)
4. [Creating a New Tez Instance](#)
5. [Validating the Tez Installation](#)
6. [Troubleshooting](#)

### 8.1. Prerequisites

Verify that your cluster is upgraded to HDP 2.3.4 or higher before installing Tez.



#### Note

Please note that the instructions for installing and configuring Tez on HDP 2.3.4 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 2.3.4.0.

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/2.3.4.0-$BUILD/
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 2.3.4.0.

**Table 8.1. Tez Configuration Parameters**

Configuration Parameter	Description	Default Value
tez.am.acls.enabled	Enables or disables access control list checks on Application Master (AM) and history data.	true
tez.am.am-rm.heartbeat.interval-ms.max	The maximum heartbeat interval between the AM and RM in milliseconds.	250
tez.am.client.am.port-range	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
tez.am.container.idle.release-timeout-max.millis	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	<p><b>Note:</b> This property should only be set by administrators – it should not be used by non-administrative users.</p> <p>Cluster default Java options for the Tez AppMaster process. These will be prepended to the properties specified with tez.am.launch.cmd-opts.</p>	-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	<p>Root logging level passed to the Tez Application Master.</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><b>Advanced configuration:</b> 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><b>Note:</b>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>	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 white space, 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 will be 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 white space, 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 will be 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 will be 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).	/hdp/apps/<hdp_version>/tez/tez.tar.gz
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"> <li>LEGACY</li> <li>PIPELINED</li> </ul> <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 &gt; 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><b>Note:</b>Collection will not block 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 will rename 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><b>Note:</b> 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 will be 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><b>Advanced configuration:</b> 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><b>Note:</b>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 will use 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. 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 Tex.

## 8.5. 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
```

## 8.6. 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, sessionId=
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](#)
2. [Setting Directories and Permissions](#)
3. [Setting Up the Hive/HCatalog Configuration Files](#)
4. [Setting Up the Database for the Hive Metastore](#)
5. [Setting up RDBMS for use with Hive Metastore](#)
6. [Creating Directories on HDFS](#)
7. [Enabling Tez for Hive Queries](#)
8. [Disabling Tez for Hive Queries](#)
9. [Configuring Tez with the Capacity Scheduler](#)
10. [Validating Hive-on-Tez Installation](#)

### 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 Hive user can consume in your server `/etc/security/limits.conf` file as follows.

#### For non-secured clusters:

<code>&lt;hive user ID&gt;</code>	<code>soft</code>	<code>nproc</code>	<code>128</code>
<code>&lt;hive user ID&gt;</code>	<code>hard</code>	<code>nproc</code>	<code>1024</code>

#### For secured clusters:

<code>&lt;hive user ID&gt;</code>	<code>soft</code>	<code>nproc</code>	<code>128</code>
<code>&lt;hive user ID&gt;</code>	<code>hard</code>	<code>nproc</code>	<code>32768</code>

1. On all client/gateway nodes (on which Hive programs will be 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 will 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/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 Directories and Permissions

Create directories and configure ownership + 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 Hive/HCatalog configuration. (See [Download Companion Files](#). You can use these files as a reference point. However, you will 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 to create the appropriate directories. If any of these directories already exist, we recommend deleting and recreating them.

1. Execute these commands on the Hive server machine:

```
mkdir -p $HIVE_LOG_DIR ;  
chown -R $HIVE_USER:$HADOOP_GROUP $HIVE_LOG_DIR ;  
chmod -R 755 $HIVE_LOG_DIR ;
```

where:

- \$HIVE\_LOG\_DIR is the directory for storing the Hive Server logs.
- \$HIVE\_USER is the user owning the Hive services. For example, hive.
- \$HADOOP\_GROUP is a common group shared by services. For example, hadoop.

This directory name is a combination of a directory and the \$HIVE\_USER.

## 9.3. 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 will 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`. Note that the `datanucleus.cache.level2` configuration parameter is ignored, and assigning a value of `none` to this parameter will not have the desired effect.

## 9.3.1. 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 $HIVE_USER:$SHADOOP_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`.
- `$SHADOOP_GROUP` is a common group shared by services. For example, `hadoop`.

## 9.3.2. 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.

### 9.3.2.1. 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
<code>hive.execution.engine</code>	This setting determines whether Hive queries will be executed using Tez or MapReduce.	If this value is set to "mr," Hive queries will be executed using MapReduce. If this value is set to "tez," Hive queries will be executed using Tez. All queries executed through HiveServer2 will use the specified <code>hive.execution.engine</code> setting.
<code>hive.tez.container.size</code>	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 ( <code>mapreduce.map.memory.mb</code> ) will be used by default for map tasks.
<code>hive.tez.java.opts</code>	Java command line options for Tez.	If this is not specified, the MapReduce java opts settings ( <code>mapreduce.map.java.opts</code> ) will be used by default.
<code>hive.server2.tez.default.queues</code>	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.
<code>hive.server2.tez.sessions.per.default.queue</code>	The number of sessions for each queue named in the <code>hive.server2.tez.default.queues</code> .	1; Larger clusters might improve performance of HiveServer2 by increasing this number.
<code>hive.server2.tez.initialize.default.sessions</code>	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
<code>hive.server2.enable.doAs</code>	Required when the queue-related configurations above are used.	false

### 9.3.2.2. 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 will be 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 will be 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`.

#### 9.3.2.3. Using Hive-on-Tez with Capacity Scheduler

You can use the `tez.queue.name` property to specify which queue will be used for Hive-on-Tez jobs. You can also set this property in the Hive shell, or in a Hive script.

## 9.4. 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 /grid/0/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/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;
```

# 9.5. Setting up RDBMS for use with Hive Metastore

Hive supports multiple databases. This section uses Oracle as an example. To use OracleDB 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 admin 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.

## 9.6. Creating Directories on HDFS

1. Create the Hive user home directory on HDFS.

Login as \$HDFS\_USER

```
hdfs dfs -mkdir -p /user/$HIVE_USER
```

```
hdfs dfs -chown $HIVE_USER:$HDFS_USER /user/$HIVE_USER
```

2. Create the warehouse directory on HDFS.

Login as \$HDFS\_USER.

```
hdfs dfs -mkdir -p /apps/hive/warehouse
```

```
hdfs dfs -chown -R $HIVE_USER:$HDFS_USER /apps/hive
```

```
hdfs dfs -chmod -R 775 /apps/hive
```

where:

- \$HDFS\_USER is the user owning the HDFS services. For example, hdfs.
- \$HIVE\_USER is the user owning the Hive services. For example, hive.

3. Create the Hive scratch directory on HDFS.

Login as \$HDFS\_USER

```
hdfs dfs -mkdir -p /tmp/hive
```

```
hdfs dfs -chown -R $HIVE_USER:$HDFS_USER /tmp/hive
```

```
hdfs dfs -chmod -R 777 /tmp/hive
```

where:

- \$HDFS\_USER is the user owning the HDFS services. For example, hdfs.
- \$HIVE\_USER is the user owning the Hive services. For example, hive.

## 9.7. Enabling Tez for Hive Queries

### Limitations

This release of Tez does not support the following actions:

- SELECT TRANSFORM queries
- Index creation
- Skew joins

To enable Tez for Hive Queries:

1. Copy the hive-exec\*.jar to HDFS at the following location: /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;
```

## 9.8. 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 will then be disabled for Hive queries.

## 9.9. Configuring Tez with the Capacity Scheduler

You can use the `tez.queue.name` property to specify which queue will be 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
```

## 9.10. 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:

```
hive> SELECT COUNT(*) FROM student;
Query ID = hdfs_20140604161313_544c4455-dfb3-4119-8b08-b70b46fee512
Total jobs = 1
Launching Job 1 out of 1
```

```
Number of reduce tasks determined at compile time: 1
In order to change the average load for a reducer (in bytes):
  set hive.exec.reducers.bytes.per.reducer=<number>
In order to limit the maximum number of reducers:
  set hive.exec.reducers.max=<number>
In order to set a constant number of reducers:
  set mapreduce.job.reduces=<number>
Starting Job = job_1401734196960_0007, Tracking URL = http://c6401.ambari.
apache.org:8088/proxy/application_1401734196960_0007/
Kill Command = /usr/lib/hadoop/bin/hadoop job -kill job_1401734196960_0007
Hadoop job information for Stage-1: number of mappers: 1; number of
  reducers: 1
2014-06-04 16:13:24,116 Stage-1 map = 0%, reduce = 0%
2014-06-04 16:13:30,670 Stage-1 map = 100%, reduce = 0%, Cumulative CPU 0.82
  sec
2014-06-04 16:13:39,065 Stage-1 map = 100%, reduce = 100%, Cumulative CPU 1.
  97 sec
MapReduce Total cumulative CPU time: 1 seconds 970 msec
Ended Job = job_1401734196960_0007
MapReduce Jobs Launched:
Job 0: Map: 1 Reduce: 1 Cumulative CPU: 1.97 sec HDFS Read: 240 HDFS Write:
  2 SUCCESS
Total MapReduce CPU Time Spent: 1 seconds 970 msec
OK
1
Time taken: 28.47 seconds, Fetched: 1 row(s)
hive>
```

## 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](#)
2. [Validate the Installation](#)

### 10.1. Install the Pig Package

On all the hosts where you will execute Pig programs, install the RPMs.

- For RHEL or CentOS:

```
yum install pig
```

- For SLES:

```
zypper install pig
```

- For Ubuntu or Debian:

```
apt-get install pig
```

The RPM will install 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](#)
2. [Upload the Pig, Hive and Sqoop tarballs to HDFS](#)
3. [Set directories and permissions](#)
4. [Modify WebHCat configuration files](#)
5. [Set up the HDFS user and prepare the WebHCat directories](#)
6. [Validate the installation](#)

## 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 will 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 will be impersonated.

Variable	Value
hadoop.proxyuser.USER.hosts	A comma-separated list of the hosts that will 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 will 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.](#)
2. [Set directories and permission.](#)
3. [Set up the Oozie configuration files.](#)
4. [Configure your database for Oozie.](#)
5. [Setting up the Sharelib.](#)
6. [Validate the installation.](#)

### 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 either a public or 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. Modify the /etc/oozie/conf/oozie-env.sh file to look like:

From:

```
export OOZIE_CONFIG=${OOZIE_CONFIG:-/usr/hdp/current/oozie-server/conf}
export OOZIE_DATA=${OOZIE_DATA:-/var/lib/oozie/data}
export OOZIE_LOG=${OOZIE_LOG:-/var/log/oozie}
export CATALINA_BASE=${CATALINA_BASE:-/usr/hdp/current/oozie-server/oozie-server}
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_BASE_URL=http://oozie.example.com:11000/oozie
```

For secure clusters, replace the last line with the jks path and add a password to match the system configuration:

```
export OOZIE_CONFIG=${OOZIE_CONFIG:-/usr/hdp/current/oozie-server/conf}
export OOZIE_DATA=${OOZIE_DATA:-/var/lib/oozie/data}
export OOZIE_LOG=${OOZIE_LOG:-/var/log/oozie}
export CATALINA_BASE=${CATALINA_BASE:-/usr/hdp/current/oozie-server/oozie-server}
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_BASE_URL=https://oozie.example.com:11443/oozie
```



```
export OOOIE_HTTPS_KEYSTORE_FILE=/etc/security/hadoop/server.jks
export OOOIE_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/2.3.4.0-$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/2.3.4.0-\$BUILD/oozie/  
tomcat-deployment/conf/ssl, copy over that SSL directory to usr/  
hdp/current/oozie-server/conf:

```
cp -r /grid/0/hdp/2.3.4.0-$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 will 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 will 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. 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.JPAService.jdbc.driver</name>
  <value>org.apache.derby.jdbc.EmbeddedDriver</value>
</property>

<property>
  <name>oozie.service.JPAService.jdbc.driver</name>
  <value>org.apache.derby.jdbc.EmbeddedDriver</value>
</property>

<property>
  <name>oozie.service.JPAService.jdbc.username</name>
  <value>$OOZIE_DBUSER</value>
</property>

<property>
  <name>oozie.service.JPAService.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
```

3. 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`.

4. 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.

5. 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.)

1. 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.JPAService.jdbc.driver</name>
  <value>org.postgresql.Driver</value>
</property>

<property>
  <name>oozie.service.JPAService.jdbc.url</name>
  <value>jdbc:postgresql://localhost:5432/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 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=${OOZIE_CONFIG:-/usr/hdp/2.3.4.0-$BUILD/oozie/conf}
export OOZIE_DATA=${OOZIE_DATA:-/var/db/oozie}
export OOZIE_LOG=${OOZIE_LOG:-/var/log/oozie}
export CATALINA_BASE=${CATALINA_BASE:-/usr/hdp/2.3.4.0-$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. Setting 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
```

## 12.6. Validate the Installation

1. Start the Oozie server:

```
su -l oozie -c "/usr/hdp/current/oozie-server/bin/ooziedb.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](#).

## 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 Apache Ranger and the Ranger plug-ins in a LINUX Hadoop environment. It includes information about the following steps:

- [Installation Prerequisites](#)
- [Installing Policy Manager](#)
- [Installing UserSync](#)
- [Installing Ranger Plug-ins](#)
- [Verifying the Installation](#)

For information on the different tasks you can perform with Apache Ranger, refer to the [Ranger User Guide](#). For information about installing Ranger over Ambari, see [Installing Ranger Over Ambari 2.0](#).

### 13.1. Installation Prerequisites

Before beginning Ranger installation, make sure the following software is already installed:

- JDK 7 or above (available from the [Oracle Java Download site](#))
- Supported Operating Systems:
  - 64-bit CentOS 6
  - 64-bit CentOS 7
  - 64-bit Red Hat Enterprise Linux (RHEL) 6
  - 64-bit Oracle Linux 6
  - 64-bit SUSE Linux Enterprise Server (SLES) 11, SP3
  - 64-bit Debian 6
  - Windows Server 2008, 2012
- Supported Databases:
  - MySQL v. 5.6 or above
  - PostgreSQL 8.4.2
  - SQL Server 2012
  - Oracle DB 11G or above (Oracle LINUX 6)

If the database server is not installed at the same host, Ranger services need to have access to the database server host.



### Note

If you are installing over an HDP-2.2 version of Ranger, you should review the data in the `xa_access_audit` table in the Ranger Audit Database. Truncate historical data to reduce install time, especially if you have a lot of data in `xa_access_audit` table.

- You should also [set up Hadoop group mapping for LDAP/AD](#).

## 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 2.3.4 repository is added to your site's list of yum repositories.

If it has not yet been added, add it now by performing the following steps:

- For RHEL/Centos6/Oracle LINUX 6:

```
wget -nv http://public-repo-1.hortonworks.com/HDP/centos6/2.x/updates/2.3.4.0/hdp.repo -O /etc/yum.repos.d/hdp.repo
```

- For Ubuntu 12.04:

```
apt-get update wget http://public-repo-1.hortonworks.com/HDP/ubuntu12/2.x/updates/2.3.4.0/hdp.list -O /etc/apt/sources.list.d/hdp.list
```

- For Debian 6:

```
apt-get update wget http://public-repo-1.hortonworks.com/HDP/debian6/2.x/updates/2.3.4.0/hdp.list -O /etc/apt/sources.list.d/hdp.list
```

2. Find the Ranger Policy Admin software:

```
yum search ranger
```

3. Install the Ranger Policy Admin software:

```
yum install ranger_<version>
```

4. 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 absolute path including the jar name.	/usr/share/java/mysql-connector-java.jar (default)	Y
	/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 Database</b>		
<b>audit_db_name</b> Ranger audit database name - This can be a different database in the same database server mentioned above	ranger_audit (default)	Y
<b>audit_db_user</b> Ranger audit database name - This can be a different database in the same database server mentioned	rangerlogger (default)	Y
<b>audit_db_password</b> database password for the "audit_db_user"	RangerLoggerPassW0Rd	Y
<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) (default)	Y
<b>unix_group</b> UNIX group associated with the UNIX user who runs the Policy Admin Tool process	ranger (default)	Y

Configuration Property	Default/Example Value	Required?
<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
<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-address) 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. 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 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.

### 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

It is out of the scope in this document to describe the steps you need to follow in order to install and configure a load balancer.

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](#)
- [Install UserSync and Start the Service](#)

### 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	<i>http://policymanager.xasecure.net:6080</i>	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

Configuration Property Name	Default/Example Value	Required?
<b>LDAP user/group synchronization</b>		
<b>SYNC_LDAP_URL</b> URL of source ldap	ldap://ldap.example.com:389	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	cn=admin,ou=users,dc=hadoop,dc=apache,dc-org	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 crypted password is kept	/usr/lib/xausersync/.jceks/ xausersync.jceks (default) / etc/ranger/usersync/.jceks/ xausersync.jceks	Mandatory if SYNC_SOURCE is selected as ldap
<b>SYNC_LDAP_USER_SEARCH_BASE</b> Search base for users	ou=users,dc=hadoop,dc=apache,dc=org	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	(dept=eng)	N (defaults to an empty string)
<b>SYNC_LDAP_USER_NAME_ATTRIBUTE</b> Attribute from user entry that would be treated as user name	cn (default)	N (defaults to cn)
<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>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	lower (default)	N (defaults to lower)

Configuration Property Name	Default/Example Value	Required?
upper case when saving it to ranger db		
<b>logdir</b> Location of the log directory where the usersync logs are stored	logs (default)	Y

- Set the Policy Manager URL to `http://<ranger-admin-host>:6080`
- Check the JAVA\_HOME environment variable. If JAVA\_HOME has not yet been set, enter:

```
export JAVA_HOME=<path of installed jdk version folder>
```

- Install the Ranger UserSync service:

```
cd /usr/hdp/<version>/ranger-usersync
```

```
./setup.sh
```

- Start the Ranger UserSync service:

```
service ranger-usersync start
```

- To verify that the service was successfully started, wait 6 hours for LDAP and 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>
```



## 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 repository and install the HDFS plug-in.

### Install the HDFS Plug-in

1. Create an HDFS repository in the Ranger Policy Manager. To do this, complete the HDFS Create Repository screen, as described in the [HDFS Repository Configuration](#) section of the *Hortonworks Data Platform Ranger User Guide*.

Make a note of the name you gave to this repository; 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>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

Configuration Property Name	Default/Example Value	Required?
<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
<b>SSL Information (https connectivity to Policy Admin Tool)</b>		

Configuration Property Name	Default/Example Value	Required?
<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 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_3_4_0_${BUILD-yarn-plugin-0.5.0.2.3.4.0}-${BUILD.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
<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

Configuration Property Name	Default/Example Value	Required?
<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
<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	none (default)	Only if SSL is enabled

Configuration Property Name	Default/Example Value	Required?
the default value as it is - do not set as EMPTY if SSL not used		

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 repository 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:
- Login to Ranger Admin as an admin user.
  - Click 'Edit' for the YARN service. The service name is something like cl1\_yarn (where 'cl1' is the name of the cluster).
  - Update property 'YARN REST URL', with the https URL for the resource manager.
  - 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_3_4_0_$BUILD-kafka-plugin-0.5.0.2.3.4.0-$BUILD.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>	<code>/usr/hdp/2.3.4.0-\$BUILD/kafka</code>	Y
<b>POLICY_MGR_URL</b> URL for policy admin	<code>http://&lt;FQDN of ranger admin host&gt;:6080</code>	Y
<b>REPOSITORY_NAME</b> The repository name used in Policy Admin Tool for defining policies	<code>kafkadev</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> <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</code> (default), <code>TRUE</code>	Y
<b>XAAUDIT.DB.FLAVOUR</b> Specifies the type of database used for audit logging (MYSQL, ORACLE)	<code>MYSQL</code> (default)	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 above database user - for db audit logging	<code>rangerlogger</code>	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	<code>hdfs://</code> <code>__REPLACE__NAME_NODE_HOST:8020/</code> (format) <code>hdfs://namenode.mycompany.com:8020/</code>	Y

Configuration Property Name	Default/Example Value	Required?
	ranger/audit/%app-type%/ %time:yyyyMMdd%	
<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
<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	/etc/hadoop/conf/ranger-plugin-truststore.jks (default)	Only if SSL is enabled



Configuration Property Name	Default/Example Value	Required?
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		
<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 repository 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/2.3.4.0-$BUILD/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 repository
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 repository in the Ranger Policy Manager. To do this, complete the HBase Create Repository screen, as described in the [HBase Repository Configuration](#) section of the *Apache Ranger User Guide*.

Make a note of the name you gave to this repository; 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> <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.  <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.	<code>FALSE</code> (default)	Y
<b>XAAUDIT.DB.FLAVOUR</b> Specifies the type of database used for audit logging (MYSQL,ORACLE)	<code>MYSQL</code> (default)	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 above database user - for db audit logging	<code>rangerlogger</code>	Y
<b>HDFS Audit</b>		

Configuration Property Name	Default/Example Value	Required?
<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
<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.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).	<i>/etc/hbase/conf/ranger-plugin- keystore.jks (default)</i>	Y, if SSL is enabled

Configuration Property Name	Default/Example Value	Required?
<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>		
<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

3. To enable the HBase plug-in, enter the following commands:

```
cd /usr/hdp/<version>1/ranger-hbase-plugin
```

```
./enable-hbase-plugin.sh
```

4. Restart HBase.
5. 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:

1. Create a Hive repository.
2. Install the Hive plug-in and configure related Hive properties.

3. Enable the Hive plug-in.

4. Restart Hive.

### Install the Hive Plug-in

1. Create a Hive repository. To create the Hive repository, complete the Hive Create Repository screen as described in the [Hive Repository Configuration](#) section of the *Apache Ranger User Guide*.

Make a note of the name you gave to this repository; you will need to use it again during Hive plug-in setup.

2. 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.	/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.  <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	rangerlogger	Y

Configuration Property Name	Default/Example Value	Required?
audit log inserts (should be same username used in the ranger-admin installation process)		
<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/ ranger/audit/%app-type%/ %time:yyyyMMdd% (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	__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-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	10	Y

Configuration Property Name	Default/Example Value	Required?
number of local audit log files that will be kept in the archive directory		
<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.	<i>/etc/hive/conf/ranger-plugin-keystore.jks</i> (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
<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/hive/conf/ranger-plugin-truststore.jks</i> (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

3. To enable the Hive plug-in, enter the following commands:

```
cd /usr/hdp/<version>/ranger-hive-plugin
```

```
./enable-hive-plugin.sh
```

4. Restart Hive.
5. 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:

1. Create a Knox repository.
2. Install the Knox plug-in and configure related Hive properties.
3. Enable the Knox plug-in.
4. Restart Knox.

Instructions assume that Knox has already been installed, as described in "*Installing Knox*."

### Install the Knox Plug-in

1. Create a Knox repository. To do this, complete the Knox Create Repository screen as described in the [Knox Repository Configuration](#) section of the *Apache Ranger User 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 repository; 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:</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	<code>true</code>	Y



Configuration Property Name	Default/Example Value	Mandatory?
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)	MYSQL	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://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)	%hostname%-audit.log	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-HH:mm:ss%.log	Y
<b>XAAUDIT.HDFS.LOCAL_BUFFER_FLUSH_INTERVAL_SECONDS</b> Local audit log file writes are	60	Y

Configuration Property Name	Default/Example Value	Mandatory?
flushed to filesystem at regular flush interval		
<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>SSL (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.	<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.

7. 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.

1. Create a Storm repository.
2. Install the Storm plug-in and configure related Storm properties.
3. Enable the Storm plug-in.
4. Restart Storm.

### Install the Storm Plug-in

1. Create a Storm repository, as described in the [Storm Repository Configuration](#) section of the *Apache Ranger User Guide*.

Make a note of the name you gave to this repository; you will need to use it again during Storm plug-in setup.

2. At all servers where Storm Supervisor is installed, install the Storm plug-in:

- a. Go to the home directory of the Storm plug-in:

```
cd /usr/hdp/<version>/ranger-storm-plugin
```

- b. 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	stormdev	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.	<div> <div>/usr/share/java/mysql-connector-java.jar (default)</div> <div>/usr/share/java/postgresql.jar</div> <div>/usr/share/java/sqljdbc4.jar</div> <div>/usr/share/java/ojdbc6.jar</div> </div>	Y
<b>XAAUDIT.DB.IS_ENABLED</b> Enable or disable database audit logging.	false (default) true	Y
<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		

Configuration Property Name	Default/Example Value	Mandatory?
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
<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

Configuration Property Name	Default/Example Value	Mandatory?
<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 (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>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. Enabling Audit Logging for HDFS and Solr

The Ranger service provides the capability for you to enable audit logging for HDFS and/or Solr databases, which can be very helpful to maintain/query audit data when data grows to a significant amount.

To enable auditing for HDFS, perform the steps listed below.

1. Set the XAAUDIT.HDFS.ENABLE value to "true" for the component plug-in in the `install.properties` file, which can be found here:

```
/usr/hdp/<version>/ranger-<component>=plugin
```

2. Configure the NameNode host in the `XAAUDIT.HDFS.HDFS_DIR` field.
3. Create a policy in the HDFS service from the Ranger Admin for individual component users (`hive/hbase/knox/storm/yarn/kafka/kms`) to provide READ and WRITE permissions for the audit folder (i.e., for enabling Hive component to log Audits to HDFS, you need to create a policy for the hive user with Read and WRITE permissions for the audit directory).
4. Set the Audit to HDFS caches logs in the local directory, which can be specified in `XAAUDIT.HDFS.LOCAL_BUFFER_DIRECTORY` (this can be like `/var/log/<component>/**`), which is the path where the audit is stored for a short time. This is similar for archive logs that need to be updated.

To enable auditing reporting from the Solr database, perform the steps listed below.

1. Modify the following properties in the Ranger service `install.properties` to enable auditing to the Solr database in Ranger:

- `audit_store=solr`
- `audit_solr_urls=http://solr_host:6083/solr/ranger_audits`
- `audit_solr_user=ranger_solr`
- `audit_solr_password-NONE`

2. Restart Ranger.

To enable auditing to the Solr database for a plug-in (e.g., HBase), perform the steps listed below.

1. Set the following properties in `install.properties` of the plug-in to begin audit logging to the Solr database:

- `XAAUDIT.SOLR.IS.ENABLED=true`
- `XAAUDIT.SOLR.ENABLE=true`

- XAAUDIT.SOLR.URL=http://solr\_host:6083/solr/ranger\_audits
  - XAAUDIT.SOLR.USER=ranger\_solr
  - XAAUDIT.SOLR.PASSWORD=NONE
  - XAAUDIT.SOLR.FILE\_SPOOL\_DIR=/var/log/hadoop/hdfs/audit/solr/spool
2. Enable the Ranger HBase plug-in.
  3. Restart the HBase component.

## 13.6. Verifying the Installation

To verify that installation was successful, perform the following checks:

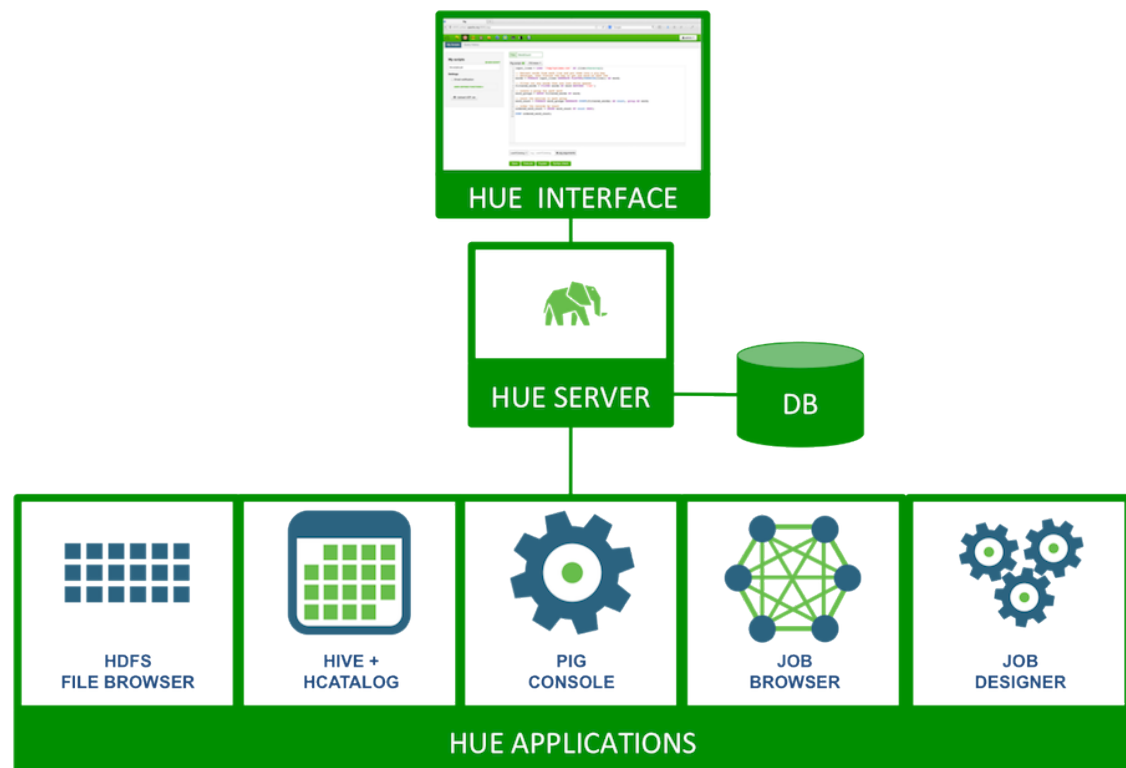
- Check whether the Database `RANGER_ADMIN_DB_NAME` is present in the MySQL server running on `RANGER_ADMIN_DB_HOST`
- Check whether the Database `RANGER_AUDIT_DB_NAME` is present in the MySQL server running on `RANGER_AUDIT_DB_HOST`
- Check whether the "ranger-admin" service is installed in services.msc (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

This chapter describes how to install, start, configure, and validate Hue.

1. [Prerequisites](#)
2. [Configure HDP](#)
3. [Install Hue](#)
4. [Configure Hue](#)
5. [Start Hue](#)
6. [Validate Configuration \[151\]](#)
7. [Configuring Hue for an External Database](#)

Hue provides a Web application interface for Apache Hadoop. It supports a file browser, JobTracker interface, Hive, Pig, Oozie, HBase, and more.



### 14.1. Prerequisites



#### Note

Hue is not supported on Ubuntu or Debian.



Complete the following prerequisites before deploying Hue.

1. Verify that you have a host that supports Hue:



### Note

Hue is not supported on CentOS 7 in HDP 2.3.4.

- 64-bit Red Hat Enterprise Linux (RHEL) 6
- 64-bit CentOS 6 • 64-bit Oracle Linux 6
- 64-bit SUSE Linux Enterprise Server (SLES) 11 or SP3

2. Verify that you have a browser that supports Hue:

**Table 14.1. Hue-Supported Browsers**

Linux (RHEL, CentOS, Oracle, SLES)	Windows (VISTA, 7)	Mac OS X (10.6 or later)
Firefox latest stable release	Firefox latest stable release	Firefox latest stable release
Google Chrome latest stable release	Google Chrome latest stable release	Google Chrome latest stable release
N/A	Internet Explorer 9 (for Vista + Windows 7)	N/A
N/A	Safari latest stable release	Safari latest stable release

3. Verify that you have at least Python 2.6.6 or higher installed.
4. Stop all of the services in your cluster. For more information see the instructions provided in the [Stopping HDP Services](#) in the HDP Reference Guide.
5. Install and run the HDP Hadoop cluster from HDP-2.3.4.0.

The following table outlines dependencies on HDP components:

**Table 14.2. Hue Dependencies on HDP Components**

Component	Required	Applications	Notes
HDFS	Yes	Core, Filebrowser	HDFS access through WebHDFS or HttpFS
YARN	Yes	Core, Filebrowser	Transitive dependency via Hive or Oozie
Oozie	No	JobDesigner, Oozie	Oozie access through REST API
Hive	No	Hive, HCatalog	Beeswax server uses the Hive client libraries
WebHCat	No	HCatalog, Pig	HCatalog and Pig use WebHCat REST API

6. Choose a Hue Server host machine in your cluster to deploy your Hue Server.

You can deploy Hue on any host within 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.

7. Configure the firewall.

- 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.

## 14.2. Configure HDP

If you are using an Ambari-managed cluster, use Ambari to update the service configurations (core-site.xml, mapred-site.xml, webhcat-site.xml and oozie-site.xml). Do not edit the configuration files directly and use Ambari to start and stop the services.

```
su - $HDFS_USER
```

```
/usr/hdp/current/hadoop-client/sbin/hadoop-daemon.sh stop namenode
```

### 1. Modify the hdfs-site.xml file.

On the NameNode, Secondary NameNode, and all the DataNodes, add the following property to the `$HADOOP_CONF_DIR/hdfs-site.xml` file, where `$HADOOP_CONF_DIR` is the directory for storing the Hadoop configuration files. For example, `/etc/hadoop/conf`.

```
<property>
  <name>dfs.webhdfs.enabled</name>
  <value>true</value>
</property>
```

### 2. Modify the core-site.xml file.

On the NameNode, Secondary NameNode, and all the DataNodes, add the following properties to the `$HADOOP_CONF_DIR/core-site.xml` file, where `$HADOOP_CONF_DIR` is the directory for storing the Hadoop configuration files. For example, `/etc/hadoop/conf`.

```
<property>
  <name>hadoop.proxyuser.hue.hosts</name>
  <value>*</value>
</property>

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

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

<property>
  <name>hadoop.proxyuser.hcat.hosts</name>
  <value>*</value>
</property>
```

### 3. Modify the oozie-site.xml file. On the Oozie Server host, add the following properties to the `$OOZIE_CONF_DIR/oozie-site.xml` file, where

`$OOZIE_CONF_DIR` is the directory for storing Oozie configuration files. For example, `/etc/oozie/conf`.

```
vi $OOZIE_CONF_DIR/oozie-site.xml
```

```
<property>
  <name>oozie.service.ProxyUserService.proxyuser.hue.hosts</name>
  <value>*</value>
</property>

<property>
  <name>oozie.service.ProxyUserService.proxyuser.hue.groups</name>
  <value>*</value>
</property>
```

4. Modify the `hive-site.xml` file. On the HiveServer2 host, add the following properties to the `$HIVE_CONF_DIR/hive-site.xml` file, where `$HIVE_CONF_DIR` is the directory for storing Hive configuration files. For example, `/etc/hive/conf`.

```
vi $HIVE_CONF_DIR/hive-site.xml
```

```
<property>
  <name>hive.server2.enable.impersonation</name>
  <value>>true</value>
</property>
```

## 14.3. Install Hue

Run the following command on all Hue Server host machines:

- For RHEL/CentOS/Oracle Linux:

```
yum install hue
```

- For SLES:

```
zypper install hue
```



### Note

Not supported for Ubuntu or Debian.

## 14.4. Configure Hue

Use the following commands to explore the configuration options for Hue.

- To list all available configuration options:

```
/usr/lib/hue/build/env/bin/hue config_help | less
```

- As per the instructions below, modify the default configuration file provided: `/etc/hue/conf/hue.ini`.

### Configure Web Server

Use the following instructions to configure Web server:

These configuration variables are under the [desktop] section in the 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 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.

Install pyOpenSSL in order to configure Hue to serve over HTTPS. To install pyOpenSSL, from the root of your Hue installation path, complete the following instructions:

- Run the following command on the Hue Server:

```
./build/env/bin/easy_install pyOpenSSL
```

- Configure Hue to use your private key. Add the following to 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

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
```

To upload files using the Hue File Browser over HTTPS, you must have a proper SSL Certificate.

## Configure Hadoop

Use the following instructions to configure Hadoop.

The following configuration variables are in the [hadoop] section of the `hue.ini` configuration file.

### 1. Configure an HDFS Cluster.

Hue currently supports only one HDFS cluster. Ensure that you define the HDFS cluster under the [hadoop][hdfs\_clusters] [[default]] subsection. Use the following variables to configure the HDFS cluster:

**Table 14.3. Variables to Configure HDFS Cluster**

Variable	Description	Default/Example Value
fs_defaultfs	This is equivalent to fs.defaultFS (fs.default.name) in the Hadoop configuration.	hdfs://fqdn.namenode.host:8020
webhdfs_url	WebHDFS URL.	The default value is the HTTP port on the NameNode. Example: http://fqdn.namenode.host:50070/webhdfs/v1

### 2. Configure a YARN (MR2) Cluster.

Hue supports only one YARN cluster currently. Ensure that you define the YARN cluster under the [hadoop][yarn\_clusters] [[default]] sub-section. Use the following variables to configure the YARN cluster:

**Table 14.4. Variables to Configure the YARN Cluster**

Variable	Description	Default/Example Value
submit_to	Set this property to true. Hue will submit jobs to this YARN cluster. Note that JobBrowser will not be able to show MR2 jobs.	true
resourcemanager_api_url	The URL of the ResourceManager API.	http://fqdn.resourcemanager.host:8088
proxy_api_url	The URL of the ProxyServer API.	http://fqdn.resourcemanager.host:8088
history_server_api_url	The URL of the HistoryServer API.	http://fqdn.historyserver.host:19888
node_manager_api_url	The URL of the NodeManager API.	http://fqdn.resourcemanager.host:8042



## Note

For more information on how to configure Hue with a NameNode HA cluster, see "Deploy Hue with an HA Cluster."

### Configure Beeswax

In the [beeswax] section of the configuration file, you can specify the following values:

**Table 14.5. Beeswax Configuration Values**

Variable	Description	Default/Example Value
hive_server_host	Host where Hive server Thrift daemon is running. If Kerberos security is enabled, use fully-qualified domain name (FQDN).	
hive_server_port	Port on which HiveServer2 Thrift server runs.	10000
hive_conf_dir	Hive configuration directory where hive-site.xml is located.	/etc/hive/conf
server_conn_timeout	Timeout in seconds for Thrift calls to HiveServer2.	120



## Important

Depending on your environment and the Hive queries you run, queries may 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`.

### Configure Hue to Communicate with HiveServer2 over SSL (Optional)

(Optional) Use the following changes to `hue.ini` to configure Hue to communicate with HiveServer2 over SSL:

```
[[ssl]]
SSL communication enabled for this server.
enabled=false
Path to Certificate Authority certificates.
cacerts=/etc/hue/cacerts.pem
Path to the public certificate file.
cert=/etc/hue/cert.pem
Choose whether Hue should validate certificates received from the server.
validate=true
```

### Configure JobDesigner and Oozie

In the [liboozie] section of the configuration file, specify `oozie_url`, the URL of the Oozie service as specified by the `OOZIE_URL` environment variable for Oozie.

### Configure WebHCat

In the [hcatalog] section of the `hue.ini` configuration file, set `templeton_url`, to the hostname or IP of the WebHCat server. For example: `http://hostname:50111/templeton/v1/`.

## 14.5. Start Hue

As a root user, start subprocesses corresponding to the different Hue components. Run the following command on the Hue Server: `/etc/init.d/hue start`

To stop Hue, run the following command: `/etc/init.d/hue stop`

To restart Hue, run the following command: `/etc/init.d/hue restart`

### Checking the Configuration

For any invalid configurations, Hue displays a red alert icon on the top navigation bar.

To view the current configuration of your Hue Server, select **About > Configuration** or `http://hue.server:8000/dump_config`.

## 14.6. Configuring Hue for an External Database

By default, Hue uses an embedded database, SQLite 3.6, but you can configure Hue to use any of the following external databases:

- [Using Hue with Oracle](#)
- [Using Hue with MySQL](#)
- [Using Hue with PostgreSQL](#)

### 14.6.1. 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 Oracle's [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 symbolic link for library expected by cx\_Oracle:

```
ln -sf libclntsh.so.11.1 libclntsh.so
```

- e. Install the cx\_Oracle python module. Confirm that python-setuptools are present on 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
```

- f. Install the cx\_Oracle module:

```
/usr/lib/hue/build/env/bin/pip install cx_Oracle
```

- g. 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:

```
/usr/lib/hue/build/env/bin/hue syncdb --noinput
```

```
/usr/lib/hue/build/env/bin/hue migrate
```

5. Populate /usr/lib64 with Oracle instant-client library files.

Copy the \*.so.\* files from oracle instantclient directory path to /usr/lib64.

6. Start Hue.

```
/etc/init.d/hue start
```

## 14.6.2. 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;
```

where \$HUEUSER is the Hue user name and \$HUEPASSWORD is the Hue user password.

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 (modify for your MySQL setup).

```
[[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.

```
/usr/lib/hue/build/env/bin/hue syncdb --noinput
```

5. Start Hue.

```
/etc/init.d/hue start
```

### 14.6.3. 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 and 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:

```
/usr/lib/hue/build/env/bin/hue syncdb --noinput
```

7. Start Hue:

```
/etc/init.d/hue start
```

## 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](#)
- [Set Up the Sqoop Configuration](#)
- [Validate the Installation](#)

### 15.1. Install the Sqoop Package

#### 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 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 [Configuring the Remote Repositories](#) to configure either a public or 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 will 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=${HIVE_HOME:-/usr/hdp/current/hive-server2}`
- `export ZOOCFGDIR=${ZOOCFGDIR:-/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 will 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](#)
- [Validate Mahout](#)

### 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).

Use the following links to install and configure Flume for HDP:

- [Understanding Flume](#)
- [Installing Flume](#)
- [Configuring Flume](#)
- [Starting Flume](#)
- [HDP and Flume](#)
- [A Simple Example](#)

## 17.1. Understanding Flume

Flume is a top-level project at the Apache Software Foundation. While it can function as a general-purpose event queue manager, in the context of Hadoop it is most often used as a log aggregator, collecting log data from many diverse sources and moving them to a centralized data store.



### Note

What follows is a very high-level description of the mechanism. For more information, access the Flume HTML documentation set installed with Flume. After you install Flume, access the documentation set at `file:///usr/hdp/current/flume-server/docs/index.html` on the host on which Flume is installed.

The “Flume User Guide” is available at `file:///usr/hdp/current/flume-server/docs/FlumeUserGuide.html`. If you have access to the Internet, the same documentation is also available at the [Flume website](#).

### Flume Components

A Flume data flow is made up of five main components: Events, Sources, Channels, Sinks, and Agents:

**Events** An event is the basic unit of data that is moved using Flume. It is similar to a message in JMS and is generally small. It is made up of headers and a byte-array body.

**Sources** The source receives the event from some external entity and stores it in a channel. The source must understand the type of event that is sent to it: an Avro event requires an Avro source.

**Channels** A channel is an internal passive store with certain specific characteristics. An in-memory channel, for example, can move events very quickly, but does not provide

persistence. A file-based channel provides persistence. A source stores an event in the channel where it stays until it is consumed by a sink. This temporary storage lets source and sink run asynchronously.

**Sinks** The sink removes the event from the channel and forwards it to either to a destination, like HDFS, or to another agent/dataflow. The sink must output an event that is appropriate to the destination.

**Agents** An agent is the container for a Flume data flow. It is any physical JVM running Flume. An agent must contain at least one source, channel, and sink, but the same agent can run multiple sources, sinks, and channels. A particular data flow path is set up through the configuration process.

## 17.2. 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:

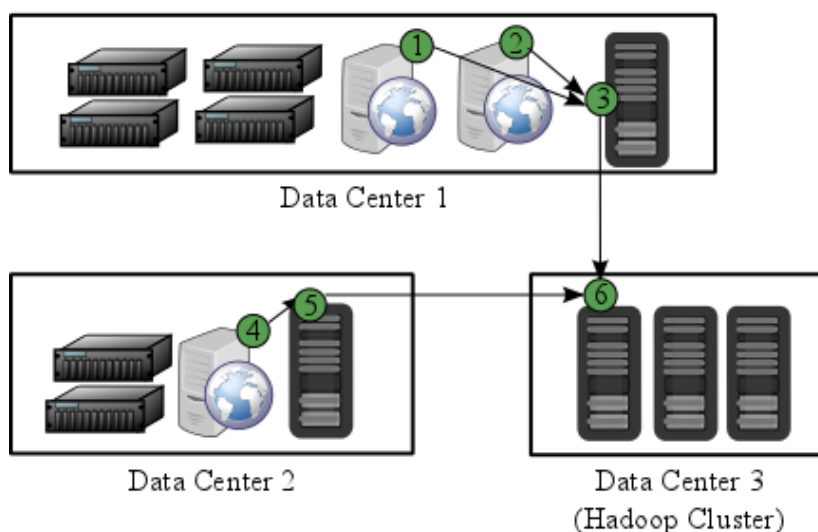
- Agents 1, 2, and 4 installed on web servers in Data Centers 1 and 2.
- Agents 3 and 5 installed on separate hosts in Data Centers 1 and 2 to collect and forward server data in Avro format.
- Agent 6 installed on a separate host on the same network as the Hadoop cluster in Data Center 3 to write all 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.

## 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.el6 HDP-2.3
```

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 either a public or 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.
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 2.4
HBase Sink	HBase 0.98.0
Hive Sink	Hive 0.13.0, HCatalog 0.13.0, and Hadoop 2.4

## 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`.

## 17.3. 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 1.5.2 User 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
```

## 17.4. 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
```

## 17.5. HDP and Flume

Flume ships with many source, channel, and sink types. The following types have been thoroughly tested for use with HDP:

### Sources

- Exec (basic, restart)
- Syslogtcp
- Syslogudp

### Channels

- Memory
- File

### Sinks

- HDFS: secure, nonsecure
- HBase

See the [Apache Flume 1.5.2 User Guide](#) for a complete list of all available Flume components.

## 17.6. A Simple Example

The following snippet shows some of the kinds of properties that can be set using the properties file. For more detailed information, see the “Flume User Guide.”

```
agent.sources = pstream  
agent.channels = memoryChannel  
agent.channels.memoryChannel.type = memory  
  
agent.sources.pstream.channels = memoryChannel  
agent.sources.pstream.type = exec  
agent.sources.pstream.command = tail -f /etc/passwd  
  
agent.sinks = hdfsSinkagent.sinks.hdfsSink.type = hdfs  
agent.sinks.hdfsSink.channel = memoryChannel  
agent.sinks.hdfsSink.hdfs.path = hdfs://hdp/user/root/flumetest  
agent.sinks.hdfsSink.hdfs.fileType = SequenceFile  
agent.sinks.hdfsSink.hdfs.writeFormat = Text
```

The source here is defined as an exec source. The agent runs a given command on startup, which streams data to stdout, where the source gets it.

In this case, the command is a Python test script. The channel is defined as an in-memory channel and the sink is an HDFS sink.

# 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](#)
2. [Configure Storm](#)
3. [Configure a Process Controller](#)
4. [\(Optional\) Configure Kerberos Authentication for Storm](#)
5. [\(Optional\) Configuring Authorization for Storm](#)
6. [Validate the Installation](#)



## Note

To install and configure Storm on an Ambari-managed cluster, refer to [Adding a Service](#) in the *Ambari User's Guide*.

To configure Storm for Kerberos in an Ambari-Managed Cluster, refer to [Configuring Storm for Kerberos in an Ambari-Managed Cluster](#).

## 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

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 `/tmp/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:

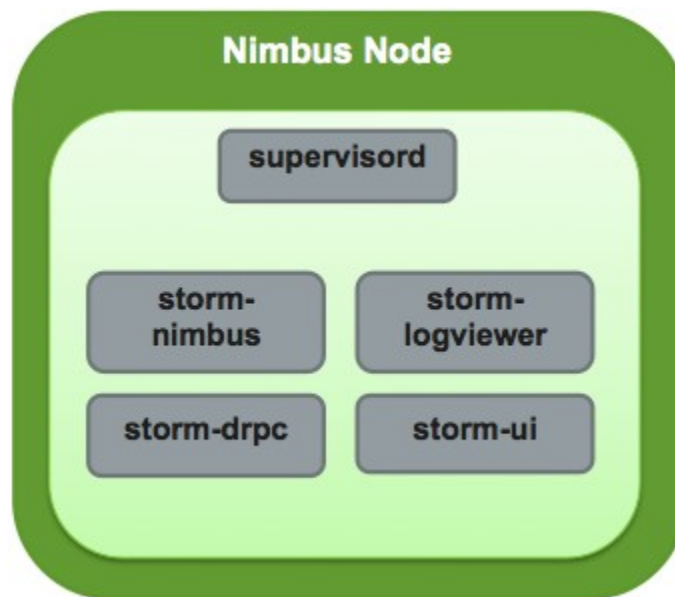
```
chown -R storm:storm $STORM_LOCAL_DIR
```

```
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 supervisord 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. Make sure that you have performed the steps in [Securing Zookeeper with Kerberos](#).
2. Create a principal for the Nimbus server and the Storm DRPC daemon:

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

3. 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"
```

4. Copy the keytab to the Nimbus node and the node that runs the Storm DRPC daemon.
5. 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'
```

6. 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"
```

7. 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: "backtype.storm.security.auth.kerberos.
KerberosSaslTransportPlugin"
java.security.auth.login.config: "/path/to/jaas.conf"
nimbus.authorizer: "backtype.storm.security.auth.authorizer.
SimpleACLAuthorizer"
storm.principal.to.local: "backtype.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.witzend.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
backtype.storm.security.auth.authorizer. SimpleACLAuthorizer	Default authorizer for the Nimbus node and all Storm nodes except DRPC.
backtype.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>backtype.storm.security.auth.kerberos.AutoTGT</code> .
<code>drpc.authorizer</code>	Set to <code>backtype.storm.security.auth.authorizer.DRPCSimpleACLAuthorizer</code> to enable authorizer for Storm DRPC node.
<code>nimbus.authorizer:</code>	Set to <code>"backtype.storm.security.auth.authorizer.SimpleACLAuthorizer"</code> to enable authorizer for Storm nimbus node.
<code>storm.principal.tolocal:</code>	Set to <code>"backtype.storm.security.auth.KerberosPrincipalToLocal"</code> enable transforming kerberos principal to local user names.
<code>storm.zookeeper.superACL:</code>	<code>"sasl:storm"</code> This will 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

`/usr/hdp/current/storm-client/bin/worker-launcher` is a program that runs Storm worker nodes. You must configure `worker-launcher` to run Storm worker nodes as the user who submitted a topology, rather than the user running the supervisor process controller. To do this, set the following configuration properties in the `/etc/storm/conf/worker-launcher.cfg` configuration file on all Storm nodes:

**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-*.jar-with-dependencies.jar  
storm.starter.WordCountTopology wordcount
```



# 19. Installing and Configuring Apache Spark

This section describes how to install and configure Apache Spark for HDP:

- [Spark Prerequisites](#)
- [Installing Spark](#)
- [Configuring Spark](#)
- [Validating Spark](#)

For more information about Spark on HDP (including how to install Spark using Ambari), see the [Spark Guide](#).

## 19.1. Spark Prerequisites

Before installing Spark, make sure your cluster meets the following prerequisites.

**Table 19.1. Prerequisites for running Spark 1.5.2**

Prerequisite	Description
Cluster Stack Version	• HDP 2.3.4 or later
(Optional) Ambari Version	• 2.2 or later
Software dependencies	• Spark requires HDFS and YARN • PySpark requires Python to be installed on all nodes



### Note

HDP 2.3.4 supports several versions of Apache Spark. When you install HDP 2.3.4, Spark 1.5.2 is installed. If you prefer to use an earlier version of Spark, follow the Spark Manual Downgrade procedure in the Release Notes.

## 19.2. Installing Spark

When you install Spark, the following directories will be 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 will show all the versions of Spark available. For example:

```
spark_2_3_4_0_3485-master.noarch : Server for Spark master
spark_2_3_4_0_3485-python.noarch : Python client for Spark
spark_2_3_4_0_3485-worker.noarch : Server for Spark worker
spark_2_3_4_0_3485.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 apt-get install
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>
```

## 19.3. Configuring Spark

To configure Spark, edit the following configuration files on all nodes that will run Spark jobs. These configuration files reside in the Spark client conf directory `/usr/hdp/current/spark-client/conf` on each node.

- `java-opts`
- If you plan to use Hive with Spark, `hive-site.xml`
- `spark-env.sh`
- `spark-defaults.conf`



### Note

Note: the following instructions are for a non-Kerberized cluster.

### java-opts

Create a `java-opts` file in the Spark client `/conf` directory. Add the following line to the file.

```
-Dhdp.version=<HDP-version>
```

For example:

```
-Dhdp.version=2.3.4.0-3485
```

### 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 to 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 will minimize the amount of work you will 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.yarn.services org.apache.spark.deploy.yarn.history.YarnHistoryService
spark.driver.extraJavaOptions -Dhdp.version=2.3.4.0-3371
spark.history.provider org.apache.spark.deploy.yarn.history.
YarnHistoryProvider
spark.yarn.am.extraJavaOptions -Dhdp.version=2.3.4.0-3371
```

### **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
```

## **19.4. (Optional) Starting the Spark Thrift Server**

To enable and start the Spark Thrift Server:

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=100015
```

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 supercedes 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` will be 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. Validating Spark

To validate the Spark installation, run the Spark jobs described in the [Spark Examples](#) section of the *Spark Guide*.

## 20. 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.



### Note

Administrators must use Apache Zookeeper to manage Kafka for an HDP cluster. Verify that you have successfully installed Zookeeper before installing and configuring Kafka.

Complete the following instructions to install Apache Kafka:

1. [Install Kafka](#)
2. [Configure Kafka](#)
3. [Validate Kafka](#)



### Note

Kafka does not currently support user authentication and authorization.

### 20.1. Install Kafka



### 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.

Install the Kafka RPMs or packages by completing the following steps.

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>
```

## 20.2. Configure Kafka

Use the following procedure to configure Kafka.

1. By default, Kafka is installed at `/usr/hdp/current/kafka-broker`.
2. Verify the values of the following configuration properties in the `server.properties` file:

**Table 20.1. Kafka Configuration Properties**

Kafka Configuration Property	Description
broker.id	Each Kafka broker requires a unique integer as an identifier. The default value is 0.
port	The port to which the Kafka socket server listens. The default value is 9092.
log.dirs	Comma-separated list of directories where Kafka log files are stored. The default value is <code>/tmp/kafka-logs</code> .
zookeeper.connect	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> .
log.retention.hours	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 we will listen on and their protocols.</p> <p>Specify hostname as 0.0.0.0 to bind to all interfaces.</p> <p>Leave hostname empty to bind to default interface.</p> <p>Examples of legal listener lists:</p> <p>PLAINTEXT://myhost:9092,PLAINTEXTSASL://:9091</p> <p>PLAINTEXT://0.0.0.0:9092, PLAINTEXTSASL://localhost:9093</p>

## 20.3. Validate Kafka

Use the following procedure to verify the Kafka installation and configuration.



### Note

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 will occur. 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
```



## 21. 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. [Install the Accumulo Package](#)
2. [Configure Accumulo](#)
3. [Configuring the "Hosts" Files](#)
4. [Validate Accumulo](#)
5. [Smoke Test Accumulo](#)

### 21.1. Installing the Accumulo Package

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
```

### 21.2. 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 will be the active master, the rest will be 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
```

## 21.3. 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 will result in the appropriate process actively running on each of the listed hosts. For the other files, while the

appropriate process will be started on each listed host, only one of the started processes will be active. The other processes will stay in a hot-standby state, attempting to become the active process that enables high-availability deployments.

## 21.4. 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.

## 21.5. 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
```

## 22. 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](#)
2. [Setting Directories and Permissions](#)
3. [Configuring Proxy Settings](#)
4. [Configuring Falcon Entities](#)
5. [Configuring Oozie for Falcon](#)
6. [Configuring Hive for Falcon](#)
7. [Configuring for Secure Clusters](#)
8. [Validate Falcon](#)



### 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.

### 22.1. 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.

## 22.2. 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.

## 22.3. 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.

## 22.4. 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).

## 22.5. 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 will ensure 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/2.3.4.0-<$version>/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-<
$version>.jar /usr/hdp/2.3.4.0-<$version>/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.

## 22.6. 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.

## 22.7. 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 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>
```

## 22.8. 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
```

## 23. 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](#)
2. [Set up and Validate the Knox Gateway Installation](#)

### 23.1. 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`

### 23.2. 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 [Knox Gateway Administrator 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 will be 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 Knox Gateway Administrator 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.

## 24. Installing Apache Slider

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.
0.2.3.4.0 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 2.3.4.0-$BUILD
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.

## 25. Installing and Configuring Apache Atlas

This section describes how to install and configure Apache Atlas for HDP:

- [Atlas Prerequisites](#)
- [Installing Atlas](#)
- [Installing Atlas Metadata Hive Plugin](#)
- [Configuring Hive Hook](#)
- [Configuring the Graph Database to Use HBase and SolrCloud](#)
- [Configuring for Secure Clusters](#)
- [Configuring Atlas in a Kerberized Cluster](#)
- [Validating Atlas](#)

### 25.1. Atlas Prerequisites

Before installing Atlas, make sure your cluster meets the following prerequisites:

**Table 25.1. Atlas Cluster Prerequisites**

Item	Prerequisite
Cluster Stack Version	HDP 2.3.4 or later

### 25.2. Installing Atlas

To install Atlas, run the following commands as root:

- For RHEL or CentOS:

```
yum install atlas-metadata_2_3_*
```

- For SLES:

```
zypper install atlas-metadata_2_3_*
```

- For Ubuntu and Debian:

```
apt-get install atlas-metadata_2_3_*
```

### 25.3. Installing Atlas Metadata Hive Plugin

To install Atlas Metadata Hive Plugin on the HiveServer2 Host, use the following command:

- For RHEL or CentOS:

```
yum install atlas-metadata_2_3_*-hive-plugin*
```

- For SLES:

```
zypper install atlas-metadata_2_3_*-hive-plugin*
```

- For Ubuntu and Debian:

```
apt-get install atlas-metadata_2_3_*-hive-plugin*
```



### Note

By default the config directory used by Atlas is `/usr/hdp/<hdp-version>/atlas/conf`. To override this set environment the variable `METADATA_CONF` to the path of the conf dir. `atlas-env.sh` is included in Atlas config directory. This file can be used to set various environment variables that you need for your services. In addition, you can set any other environment variables you might need.

## 25.4. Configuring Hive Hook

Atlas requires changes to `hive-site.xml` as well as additional configuration files as follows:

1. Create a new file in `/etc/hive/conf` named `client.properties` and another new file in `/etc/hive/conf/conf.server` named `client.properties` with the following contents:

```
atlas.http.authentication.enabled=false|true
```

```
atlas.http.authentication.type=simple|kerberos
```

2. Configure the Hive post execution hook by manually adding the following properties to `hive-site.xml`:

```
<property>
  <name>atlas.cluster.name</name>
  <value>NAME-OF-CLUSTER</value>
</property>

<property>
  <name>atlas.rest.address</name>
  <value>http://ATLAS-FQDN:21000</value>
</property>
```

3. Add the Atlas hook to list of any existing Hive post execution hooks. For example:

```
<property>
  <name>hive.exec.post.hooks</name>
  <value>org.apache.hadoop.hive.ql.hooks.ATSHook, org.apache.atlas.hive.
hook.HiveHook</value>
</property>
```

4. If Hive actions are executed with Oozie, add the JAR files that are included with the Atlas server to the `/user/oozie/share/lib/lib_$/hive` directory, where `$DATE` represents the name of the Oozie directory. You can obtain the name of the Oozie directory by executing the command: `hdfs dfs -ls /user/oozie/share/lib`.

To populate the Oozie directory with the Atlas server JAR files, run the following commands from the Atlas Hive package installation directory:

```
hdfs dfs -copyFromLocal . /usr/hdp/current/atlas-server/bridge/hive/atlas-
client-*.jar
/user/oozie/share/lib/lib_${DATE}/hive/

hdfs dfs -copyFromLocal . /usr/hdp/current/atlas-server/bridge/hive/atlas-
typesystem*.jar
/user/oozie/share/lib/lib_${DATE}/hive/

hdfs dfs -copyFromLocal . /usr/hdp/current/atlas-server/bridge/hive/hive-
bridge*.jar
/user/oozie/share/lib/lib_${DATE}/hive/

hdfs dfs -copyFromLocal . /usr/hdp/current/atlas-server/bridge/hive/json4s-
ast*.jar
/user/oozie/share/lib/lib_${DATE}/hive/

hdfs dfs -copyFromLocal . /usr/hdp/current/atlas-server/bridge/hive/json4s-
core*.jar
/user/oozie/share/lib/lib_${DATE}/hive/

hdfs dfs -copyFromLocal . /usr/hdp/current/atlas-server/bridge/hive/json4s-
native*.jar
/user/oozie/share/lib/lib_${DATE}/hive/

hdfs dfs -copyFromLocal . /usr/hdp/current/atlas-server/bridge/hive/scala-
compiler*.jar
/user/oozie/share/lib/lib_${DATE}/hive/

hdfs dfs -copyFromLocal . /usr/hdp/current/atlas-server/bridge/hive/scala-
library*.jar
/user/oozie/share/lib/lib_${DATE}/hive/

hdfs dfs -copyFromLocal . /usr/hdp/current/atlas-server/bridge/hive/scalap*.
jar
/user/oozie/share/lib/lib_${DATE}/hive/

hdfs dfs -copyFromLocal . /usr/hdp/current/atlas-server/bridge/hive/scala-
reflect*.jar
/user/oozie/share/lib/lib_${DATE}/hive/
```

## 25.5. Configuring the Graph Database

Atlas uses [Titan](#) as its metadata storage and indexing repository. Titan supports BerkeleyDB and HBase as its storage backend. It supports ElasticSearch (embedded) and Solr as its indexing backend. For more information, see [Choosing Between Storage Backends](#) and [Choosing Between Indexing Backends](#) below.

All Titan configurations are set in the `application.properties` file, located in the `/conf` directory at the location where Atlas is deployed. The `application.properties` file contains sections where you can set the following:

- [Set HBase as the backend graph persistence engine](#)
- [Set SolrCloud as the backend indexing engine](#)

## 25.5.1. Choosing Between Storage Backends

BerkeleyDB is suitable for smaller data sets up to 10 million vertices with ACID guarantees. It can be used for proofs of concept or testing in developer environments. On the other hand, HBase does not provide ACID guarantees, but is capable of scaling for large graphs. In addition, HBase inherently provides high availability and generally has higher expected response times while creating types and entities than does BerkeleyDB. For further details, see <http://s3.thinkaurelius.com/docs/titan/0.5.4/bdb.html> and <http://s3.thinkaurelius.com/docs/titan/0.5.4/hbase.html>.

## 25.5.2. Choosing Between Indexing Backends

By default, Atlas runs Elasticsearch in embedded mode as its indexing backend, which works well for proofs of concept or testing in developer environments. For production environments, Hortonworks recommends using Solr in cloud mode for HDP clusters. For further details, see <http://s3.thinkaurelius.com/docs/titan/0.5.4/elasticsearch.html> and <http://s3.thinkaurelius.com/docs/titan/0.5.4/solr.html>.

## 25.5.3. Configure Atlas to Use HBase

### Prerequisites for Switching to HBase as the Storage Backend for the Graph Repository

- **Supported HBase versions:** Currently, only HBase versions 1.1.x are supported
- **To run HBase as a distributed cluster:** You must have:
  - 3 or 5 ZooKeeper nodes
  - At least 3 RegionServer nodes. It is ideal to run the DataNodes on the same hosts as the RegionServers for data locality
- **Clear the data in the indexing backend:** Before you switch to HBase as your storage backend, you must clear the data in the indexing backend. If you do not, there might be discrepancies between the storage and indexing backends, which can result in errors during searches.

ElasticSearch runs by default in embedded mode, so you can clear the data by deleting the `ATLAS_HOME/data/es` directory.

To clear Solr data, delete the collections that are created during installation of Atlas: `vertex_index`, `edge_index`, and `fulltext_index`. This will clean up the indexing data.

- [To configure Atlas to use HBase on an unsecured cluster \[207\]](#)
- [To configure Atlas to use HBase on a cluster secured by Kerberos \[208\]](#)

### To configure Atlas to use HBase on an unsecured cluster:

1. In the graph persistence engine section of the `application.properties` file, set the following properties:

```
#Set the backend graph persistence engine to HBase
atlas.graph.storage.backend=hbase

#For standalone mode, specify 'localhost' as the hostname; for distributed
mode, specify the ZooKeeper quorum as the hostname
atlas.graph.storage.hostname=<localhost|ZooKeeper_quorum>
```



## Note

The value for `ZooKeeper_quorum` can be retrieved from the `hbase.zookeeper.quorum` property setting in the `hbase-site.xml` file. For example:

```
<property>
  <name>hbase.zookeeper.quorum</name>
  <value>c6401.ambari.apache.org,c6402.ambari.apache.org,
c6403.ambari.apache.org</value>
</property>
```

2. Add `HBASE_CONF_DIR` to the classpath so the Titan graph database can retrieve the client configuration settings from the `hbase-site.xml` file:

```
export HBASE_CONF_DIR=/etc/hbase/conf
```

3. Ensure that `hbase-site.xml` includes a value for the `zookeeper.znode.parent` property. For example:

```
<property>
<name>zookeeper.znode.parent</name>
<value>/hbase-unsecure</value>
</property>
```

4. Restart Atlas.

```
/usr/hdp/current/atlas-server/bin/atlas_stop.py
/usr/hdp/current/atlas-server/bin/atlas_start.py
```

**To configure Atlas to use HBase on a cluster secured by Kerberos:**

### Prerequisite: Setting Permissions

When Atlas is configured to use HBase as the storage backend, the Titan graph database needs sufficient user permissions to create and access an HBase table. In a secure cluster, it might be necessary to grant permissions to the `atlas` user for the Titan table.

You can use Apache Ranger to configure a policy for the Titan database. See "[Policy Manager](#)" in the *Ranger User Guide*.

If you do not use Apache Ranger, the HBase shell can be used to set the permissions:

```
su hbase
kinit -k -t <HBase_keytab> <HBase_principal>
echo "grant 'atlas', 'RWXCA', 'titan'" | hbase shell
```

1. Create an Atlas JAAS (Java Authentication and Authorization Service) configuration file at the following location:

```
/etc/atlas/conf/atlas-jaas.conf
```



Add configurations into the `atlas-jaas.conf` file that point to your keyTab and principal. For example:

```
Client {  
    com.sun.security.auth.module.Krb5LoginModule required  
        useKeyTab=true  
        useTicketCache=false  
        keyTab="/etc/security/keytabs/atlas.service.keytab"  
        principal="atlas/c6401.ambari.apache.org@EXAMPLE.COM";  
};
```

2. In the Atlas environment variable `METADATA_OPTS`, set `java.security.auth.login.config` to point to the JAAS configuration file that you created in Step 1.
3. Update the `hbase-site.xml` file to include the following configurations:

```
<property>  
    <name>zookeeper.znode.parent</name>  
    <value>/hbase-secure</value>  
</property>  
  
<property>  
    <name>hbase.security.authentication</name>  
    <value>kerberos</value>  
</property>  
  
<property>  
    <name>hbase.security.authorization</name>  
    <value>true</value>  
</property>  
  
<property>  
    <name>hbase.master.kerberos.principal</name>  
    <value>hbase/_HOST@EXAMPLE.COM</value>  
</property>  
  
<property>  
    <name>hbase.master.keytab.file</name>  
    <value>/etc/security/keytabs/hbase.service.keytab</value>  
</property>  
  
<property>  
    <name>hbase.regionserver.kerberos.principal</name>  
    <value>hbase/_HOST@EXAMPLE.COM</value>  
</property>  
  
<property>  
    <name>hbase.regionserver.keytab.file</name>  
    <value>/etc/security/keytabs/hbase.service.keytab</value>  
</property>
```

4. Add `HBASE_CONF_DIR` to the classpath so the Titan graph database can retrieve the client configuration settings from the `hbase-site.xml` file:

```
export HBASE_CONF_DIR=/etc/hbase/conf
```

5. Create `hbase_master_jaas.conf` and `hbase_regionserver_jaas.conf` configuration files at the following locations:

```
/usr/hdp/current/hbase-regionserver/conf/hbase_master_jaas.conf
/usr/hdp/current/hbase-regionserver/conf/hbase_regionserver_jaas.conf
```

Add configurations into these files that point to your keyTab and principal. For example:

```
Client {
    com.sun.security.auth.module.Krb5LoginModule required
    useKeyTab=true
    storeKey=true
    useTicketCache=false
    keyTab="/etc/security/keytabs/hbase.service.keytab"
    principal="hbase/c6401.ambari.apache.org@EXAMPLE.COM" ;
};
```

6. Update the `hbase-env.sh` script so that the environment variables `HBASE_MASTER_OPTS` and `HBASE_REGIONSERVER_OPTS` include `java.security.auth.login.config` for the `jaas.conf` files that you created in Step 1 and Step 5.

For example:

```
export
    HBASE_MASTER_OPTS="-Djava.security.auth.login.config=/usr/hdp/current/
hbase-regionserver/conf/hbase_master_jaas.conf ..."

export
    HBASE_REGIONSERVER_OPTS="-Djava.security.auth.login.config=/usr/hdp/
current/hbase-regionserver/conf/hbase_regionserver_jaas.conf ..."
```

7. Restart the services.

## 25.5.4. Configure Atlas to Use SolrCloud



### Important

Currently, Atlas supports Solr in cloud mode only. HTTP mode is not supported. For more information, refer to the Solr documentation at <https://cwiki.apache.org/confluence/display/solr/SolrCloud>.

#### Prerequisites for Switching to SolrCloud as the Indexing Backend for Atlas

- **Memory:** Solr is both memory and CPU intensive. Ensure that the server that is running Solr has adequate memory, CPU, and disk space. Solr works well with 32GB of RAM. Provide as much memory as possible to the Solr process.
- **Disk:** If you must store a large number of entities, make sure you have at least 500 GB of free space in the volume where Solr stores the index data.
- **SolrCloud support for replication and sharding:** Hortonworks recommends that you use SolrCloud with at least 2 Solr nodes running on different servers with replication enabled. ZooKeeper must be installed and configured with 3 to 5 ZooKeeper nodes for SolrCloud.
- **Clear the storage backend data:** When you switch the indexing backend, you must clear the storage backend data. Otherwise, there might be discrepancies between the storage and indexing backends because when you switch the indexing backend, indexing data is lost. This might cause fulltext queries to not work properly on the existing data.

To clear data for BerkeleyDB, delete the `ATLAS_HOME/data/berkeley` directory.

To clear data for HBase, in the HBase shell, run:

```
disable titan
drop titan
```

**To configure the Titan graph database to use SolrCloud as the indexing backend on unsecured clusters:**

1. Download and install Solr version 5.2.1. You can download Solr 5.2.1 from [here](#). Documentation is included in the download.

2. Start Solr in cloud mode.

SolrCloud mode uses a ZooKeeper service as a central location for cluster management. For a small cluster, you can use an existing ZooKeeper quorum. For larger clusters, use a separate ZooKeeper quorum with at least 3 servers.

3. If the Atlas instance and the Solr instance are located on 2 different hosts, copy the required configuration files from the `ATLAS_HOME/conf/solr` directory on the Atlas instance host to the Solr instance host. Then run the following commands from the `SOLR_HOME` directory to create collections in Solr that correspond to the indexes that Atlas uses:

```
bin/solr create -c vertex_index -d SOLR_CONF -shards <#numShards> -
replicationFactor <#replicationFactors>
bin/solr create -c edge_index -d SOLR_CONF -shards <#numShards> -
replicationFactor <#replicationFactors>
bin/solr create -c fulltext_index -d SOLR_CONF -shards <#numShards> -
replicationFactor <#replicationFactors>
```

Where `SOLR_CONF` refers to the directory where the Solr configuration files have been copied to on Solr host from the Atlas host.

If `numShards` and `replicationFactor` are not specified, they default to 1, which is adequate if you are testing Solr with Atlas on a single node instance. Otherwise, specify the number of hosts that are in the Solr cluster and the `maxShardsPerNode` configuration.



### Important

The number of shards cannot exceed the total number of Solr nodes in your SolrCloud cluster.

4. Set the following Atlas configuration parameters in the `application.properties` file that is located in the `/conf` directory:

```
atlas.graph.index.search.backend=solr5
atlas.graph.index.search.solr.mode=cloud
atlas.graph.index.search.solr.zookeeper-url=<ZooKeeper_quorum>
```

Where `ZooKeeper_quorum` is the ZooKeeper quorum that is set up for Solr as a comma-separated value. For example: `10.1.6.4:2181,10.1.6.5:2181`

## 5. Restart Atlas.

```
/usr/hdp/current/atlas-server/bin/atlas_stop.py  
/usr/hdp/current/atlas-server/bin/atlas_start.py
```

## 25.6. Configuring for Secure Clusters

There are two sets of configuration properties required to secure the Atlas server: service identify properties and HTTP authentication properties.

### 1. Set the service identify properties.

The following properties designate the authentication mechanism leveraged by the server to establish its identity:

```
atlas.authentication.method = simple|kerberos
```

```
atlas.authentication.principal = atlas/_HOST (required if the method  
selected is "kerberos")
```

```
atlas.authentication.keytab = <path to keytab file containing  
defined principal>
```

### 2. Set the HTTP Authentication properties.

The properties for configuring the Atlas server HTTP authentication mechanism are:

```
atlas.http.authentication.enabled = true|false
```

```
atlas.http.authentication.type = simple|kerberos
```

```
atlas.http.authentication.kerberos.principal = HTTP/_HOST (required  
for Kerberos authentication type)
```

```
atlas.http.authentication.kerberos.keytab = <path to SPNEGO  
keytab> (required for Kerberos authentication type)
```

### 3. Configure the Hive post execution hook by manually adding the following properties to hive-site.xml:

```
<property>  
  <name>atlas.cluster.name</name>  
  <value>NAME-OF-CLUSTER</value>  
</property>  
  
<property>  
  <name>atlas.rest.address</name>  
  <value>http://ATLAS-FQDN:21000</value>  
</property>
```

### 4. Add the Atlas hook to list of any existing Hive post execution hooks. For example:

```
<property>  
  <name>hive.exec.post.hooks</name>  
  <value>org.apache.hadoop.hive.ql.hooks.ATSHook, org.apache.atlas.hive.  
hook.HiveHook</value>
```

```
</property>
```

## 25.7. Configuring Atlas in a Kerberized Cluster

If your cluster is in a Kerberized environment, complete the following steps to configure Atlas.

1. Create the Atlas JAAS configuration file.

```
/etc/atlas/conf/atlas-jaas.conf
```

2. Update Atlas METADATA\_OPTS to include the login configuration. METADATA\_OPTS must include "java.security.auth.config" set to the above Atlas JAAS configuration file. For example:

```
-Xmx1024m -Djava.security.auth.login.config=/etc/atlas/conf/atlas-jaas.conf
```

3. Update the hbase-site.xml file to include the following:

```
<property>
  <name>zookeeper.znode.parent</name>
  <value>/hbase-secure</value>
</property>

<property>
  <name>hbase.security.authentication</name>
  <value>kerberos</value>
</property>

<property>
  <name>hbase.security.authorization</name>
  <value>true</value>
</property>

<property>
  <name>hbase.master.kerberos.principal</name>
  <value>hbase/_HOST@EXAMPLE.COM</value>
</property>

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

<property>
  <name>hbase.regionserver.kerberos.principal</name>
  <value>hbase/_HOST@EXAMPLE.COM</value>
</property>

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

4. Create the hbase\_master\_jaas.conf file and the hbase\_regionserver\_jaas.conf file in /usr/hdp/current/hbase\_regionserver/conf.

5. Update `hbase-env.sh`. `HBASE_MASTER_OPTS` and `HBASE_REGIONSERVER_OPTS` must include `'java.security.auth.login.config'` for the above `jaas.conf` files. For example:

```
export
HBASE_MASTER_OPTS="-Djava.security.auth.login.config=/usr/hdp/current/hbase-regionserver/conf/hbase_master_jaas.conf ..."

export
HBASE_REGIONSERVER_OPTS="-Djava.security.auth.login.config=/usr/hdp/current/hbase-regionserver/conf/hbase_regionserver_jaas.conf ..."
```

6. Restart the services.

## 25.8. Validating Atlas

1. On Atlas Metadata Server host, run the following command to start ATLAS server:

```
/usr/hdp/<hdp-version>/atlas/bin/atlas_start.py -port 21000
```

2. Open the Atlas Dashboard by visiting the following url:

```
http://<ATLAS_Metadata_Server_FQDN>:21000/
```

3. To validate Atlas is running properly in an unsecure configuration, access the Atlas REST API by invoking the following command:

```
curl -sL -w "%{http_code} %{url_effective}\\n" "http://<ATLAS-HOST>:21000" -o /dev/null
```

where `ATLAS-HOST` is the FQDN of the host where Atlas has been installed. The expected response should return a 200 response along with the URL that was accessed; similar to:

```
200 http://localhost:21000/
```

## 26. 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](#)

## 27. 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\*
```