

# Hortonworks Data Platform

## Installing HDP Manually

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## Hortonworks Data Platform : Installing HDP Manually

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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 system 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](#)

## 1.1. Meet Minimum System Requirements

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

- [Hardware Recommendations](#)
- [Operating System Requirements](#)
- [Software Requirements](#)
- [Metastore Database Requirements](#)
- [JDK Recommendations](#)

### 1.1.1. Hardware Recommendations

Although there is no single hardware requirement for installing HDP, there are some basic guidelines. You can see sample setups here: [Suggested Hardware for a Typical Hadoop Cluster](#).

### 1.1.2. Operating Systems Requirements

The following operating systems are supported:

- 64-bit CentOS 5 or 6
- 64-bit Red Hat Enterprise Linux (RHEL) 5 or 6
- 64-bit Oracle Linux 5 or 6
- 64-bit SUSE Linux Enterprise Server (SLES) 11, SP1 and SP3

- 64-bit Debian 6
- 64-bit Ubuntu Precise (12.04)

### 1.1.3. Software Requirements

On each of your hosts:

- yum [for RHEL or CentOS]
- zypper [for SLES]
- php\_curl [for SLES]
- apt-get [for Ubuntu]
- rpm
- scp
- curl
- wget
- unzip
- tar

### 1.1.4. 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.x
- MySQL 5.x
- Oracle 11g r2
- SQL Server 2012, 2014

The database administrator must create the following databases users for Hive and/or Oozie:

- For Hive, ensure that your database administrator creates `hive_dbname`, `hive_dbuser`, and `hive_dbpasswd`.
- For Oozie, ensure that your database administrator creates `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.

- [Installing and Configuring Postgres 8.x and 9.x](#)
- [Installing and Configuring MySQL 5.x](#)
- [Installing and Configuring Oracle 11g r2](#)

### 1.1.4.1. 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.

To install a new instance of PostgreSQL:

1. Connect to the host machine where you plan to deploy PostgreSQL instance and from a terminal window, type:

- For RHEL and CentOS:

```
yum install postgresql-server
```

- For SLES:

```
zypper install postgresql-server
```

- For Ubuntu and Debian:

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

2. Start the instance. For RHEL and CentOS:

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



#### Note

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

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

3. Reconfigure PostgreSQL server:

- a. Edit the `/var/lib/pgsql/data/postgresql.conf` file and change the value of `#listen_addresses = 'localhost'` to the following:

```
listen_addresses = '*'
```

- b. Edit the `/var/lib/pgsql/data/postgresql.conf` file and change the port setting `#port = 5432` to the following:

```
port = 5432
```

- c. Edit the `/var/lib/pgsql/data/pg_hba.conf` and add the following:

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

- d. 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 as the postgres user.

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

Where *\$postgres* is the postgres user.



### 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.

- a. Install the connector.

#### RHEL/CentOS/Oracle Linux

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

#### SLES

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

- b. Copy the connector .jar file to the Java share directory.

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

- c. Confirm that .jar is in the Java share directory.

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

- d. Change the access mode of the .jar file to 644.

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

## 1.1.4.2. Installing and Configure MySQL

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

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, type:

For RHEL/CentOS/Oracle Linux:

```
yum install mysql-server
```

For SLES:

```
zypper install mysql-server
```

For Ubuntu and Debian:

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

3. Start the instance.

For RHEL/CentOS/Oracle Linux:

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

For SLES:

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

For Ubuntu and Debian:

```
/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. Now that the root password has been set, you can use the following command to log in to MySQL as `root`:

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

As `root`, 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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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>
```

7. Use the `exit` command to exit MySQL.
8. 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.

9. Install the MySQL connector JAR file.

- For RHEL/CentOS/Oracle Linux:

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

- For SLES:

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

- For Ubuntu and Debian:

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

### 1.1.4.3. Installing and Configuring Oracle



#### Note

The following procedure is Hive-specific, and assumes that you have already installed HDP and Hive.

To set up Oracle for use with Hive:

1. On the Hive Metastore host, install the appropriate JDBC .jar file.
  - a. Download the Oracle JDBC (OJDBC) driver from <http://www.oracle.com/technetwork/database/features/jdbc/index-091264.html>.

- b. Select Oracle Database 11g Release 2 - ojdbc6.jar.
- c. Copy the .jar file to the Java share directory.

```
cp ojdbc6.jar /usr/share/java
```

- d. Make sure the .jar file has the appropriate permissions - 644.

## 2. Create a user for Hive and grant it permissions.

- Using 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.

## 3. Load the Hive database schema.

```
sqlplus $HIVEUSER/$HIVEPASSWORD < hive-schema-0.13.0.oracle.sql
```



### Note

The hive schema is located at `/usr/lib/hive/scripts/metastore/upgrade/oracle/`.

## 1.1.5. JDK Requirements

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

- Oracle JDK 1.7 64-bit update 51 or higher
- Oracle JDK 1.6 update 31 64-bit



### Note

Deprecated as of HDP 2.1

- OpenJDK 7 64-bit

### 1.1.5.1. Oracle JDK 7 update 51

Use the following instructions to manually install JDK 7:

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.

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

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

```
which java
```

4. Navigate to the `usr/java` folder. If this folder does not already exist, create the folder:

```
mkdir usr/java
cd usr/java
```

5. Download the Oracle 64-bit JDK (`jdk-7u51-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>.

Accept the license agreement and download the file labeled "jdk-7u51-linux-x64.tar.gz".



### Note

The label on the download page is "jdk-7u51-linux-x64.tar.gz", but the actual name of the file is "jdk-7u51-linux-x64.gz".

6. Copy the downloaded `jdk-7u51-linux-x64.gz` file to the `/usr/java` folder.
7. Navigate to the `/usr/java` folder and extract the `jdk-7u51-linux-x64.gz` file.

```
cd /usr/java
tar zxvf jdk-7u51-linux-x64.gz
```

The JDK files will be extracted into a `usr/java/jdk1.7.0_51` directory.

8. Create a symbolic link (symlink) to the JDK.

```
ln -s /usr/java/jdk1.7.0_51 /usr/java/default
```

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

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

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

```
java -version
```

You should see the following output:

```
java version "1.7.0_51"
Java(TM) SE Runtime Environment (build 1.7.0_51-b13)
Java HotSpot(TM) 64-Bit Server VM (build 24.51-b03, mixed mode)
```

## 1.1.5.2. Oracle JDK 1.6 update 31 (Deprecated)

Use the following instructions to manually install JDK 1.6 update 31:

1. Check the version. From a terminal window, type:



```
java -version
```

- Optional - Uninstall the Java package if the JDK version is less than v1.6 update 31.

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

- Optional - Verify that the default Java package is uninstalled.

```
which java
```

- Download the Oracle 64-bit JDK (jdk-6u31-linux-x64.bin) from the Oracle download site. Open a web browser and navigate to <http://www.oracle.com/technetwork/java/javase/downloads/java-archive-downloads-javase6-419409.html>.

Accept the license agreement and download `jdk-6u31-linux-x64.bin` to a temporary directory (`$JDK_download_directory`).

- Change directory to the location where you downloaded the JDK and run the install.

```
mkdir /usr/jdk1.6.0_31  
cd /usr/jdk1.6.0_31  
chmod u+x $JDK_download_directory/jdk-6u31-linux-x64.bin  
./$JDK_download_directory/jdk-6u31-linux-x64.bin
```

- Create symbolic links (symlinks) to the JDK.

```
mkdir /usr/java  
ln -s /usr/jdk1.6.0_31/jdk1.6.0_31 /usr/java/default  
ln -s /usr/java/default/bin/java /usr/bin/java
```

- 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
```

- Verify if Java is installed in your environment. Execute the following from the command line console:

```
java -version
```

You should see the following output:

```
java version "1.6.0_31"  
Java(TM) SE Runtime Environment (build 1.6.0_31-b04)  
Java HotSpot(TM) 64-Bit Server VM (build 20.6-b01, mixed mode)
```

### 1.1.5.3. OpenJDK 7



#### Note

OpenJDK7 on HDP 2.1 does not work if you are using SLES as your OS.

Use the following instructions to manually install OpenJDK 7:

- Check the version. From a terminal window, type:

```
java -version
```

- (Optional) Uninstall the Java package if the JDK version is less than 7.

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

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

```
which java
```

- Download OpenJDK 7 RPMs. From the command-line, run:

RedHat/CentOS/Oracle Linux:

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

SUSE:

```
zypper install java-1.7.0-openjdk java-1.7.0-openjdk-devel
```

Ubuntu:

```
apt-get install java-1.7.0-openjdk java-1.7.0-openjdk-devel
```

- Create symbolic links (symlinks) to the JDK.

```
mkdir /usr/java  
ln -s /usr/lib/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
```

- 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
```

- 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)
```

## 1.1.6. 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 (OS) is supported by HDP and any issues detected on these platforms are reproducible on the same supported OS installed on bare metal.

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

## 1.2. 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 [Deployment Strategies for Data Centers with Firewalls](#), a separate document in this set.

1. Download the yum repo configuration file `hdp.repo`. On your local mirror server, execute the following command:

- For RHEL/CentOS 5:

```
wget -nv http://public-repo-1.hortonworks.com/HDP/centos5/2.x/updates/2.1.15.0/hdp.repo -O /etc/yum.repos.d/hdp.repo
```

- For RHEL/CentOS 6:

```
wget -nv http://public-repo-1.hortonworks.com/HDP/centos6/2.x/updates/2.1.15.0/hdp.repo -O /etc/yum.repos.d/hdp.repo
```

- For SLES 11 SP3:

```
wget -nv http://public-repo-1.hortonworks.com/HDP/suse11sp3/2.x/updates/2.1.15.0/hdp.repo -O /etc/zypp/repos.d/hdp.repo
```

- For SLES 11 SP1:

```
wget -nv http://public-repo-1.hortonworks.com/HDP/sles11sp1/2.x/updates/2.1.15.0/hdp.repo -O /etc/zypp/repos.d/hdp.repo
```

- For Ubuntu 12.04:

```
wget http://public-repo-1.hortonworks.com/HDP/ubuntu12/2.x/updates/2.1.15.0/hdp.list -O /etc/apt/sources.list.d/hdp.list
```

- For Debian 6:

```
wget http://public-repo-1.hortonworks.com/HDP/debian6/2.x/updates/2.1.15.0/hdp.list -O /etc/apt/sources.list.d/hdp.list
```

2. For Ubuntu hosts, add the gpg keys as the root user:

```
gpg --keyserver pgp.mit.edu --recv-keys B9733A7A07513CAD  
gpg -a --export 07513CAD | apt-key add -
```

3. Confirm the HDP repository is configured.

- For RHEL/CentOS/Oracle Linux:

```
yum repolist
```

You should see something like this. Verify that you have HDP-2.1.15.0 directory:

```
Loaded plugins: fastestmirror, security
Loading mirror speeds from cached hostfile
* base: mirrors.cat.pdx.edu
* extras: linux.mirrors.es.net
* updates: mirrors.usc.edu
repo id repo name status
HDP-2.1.15.0 Hortonworks Data Platform Version - HDP-2.1.15.0 enabled: 53
```

- For SLES:

```
zypper repos
```

- For Ubuntu and Debian:

```
apt-get update
```

## 1.3. 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 three hosts: one master host and two slaves.

## 1.4. Collect Information

To deploy your HDP installation, you need to collect the following information:

- The fully qualified domain name (FQDN) for each host in your system, and which component(s) you wish to set up on which host. You can use `hostname -f` to check for the FQDN if you do not know it.
- The hostname (for an existing instance), database name, username, and password for the MySQL instance, if you install Hive/HCatalog.



### Note

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

## 1.5. Prepare the Environment

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

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

## 1.5.1. 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 the nodes in your cluster:

- For RHEL/CentOS/Oracle Linux:

```
yum install ntp
```

- 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 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 Ubuntu and Debian:

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

4. You can use the existing NTP server in your environment. 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. See the following sample rule:

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

Restart iptables. Execute the following command on all the nodes in your cluster:

```
# iptables service iptables restart
```

Configure clients to use the local NTP server. Edit the `/etc/ntp.conf` and add the following line:

```
server $LOCAL_SERVER_IP OR HOSTNAME
```

## 1.5.2. Check DNS

All hosts in your system must be configured for DNS and Reverse DNS.



### Note

If you are unable to configure DNS and Reverse DNS, you must edit the hosts file on every host in your cluster to contain each of your hosts.

Use the following instructions to check DNS for all the host machines in your cluster:

#### 1. Forward lookup checking.

For example, for domain `localdomain` that contains host with name `host01` and IP address `192.168.0.10`, execute the following command:

```
nslookup host01
```

You should see a message similar to the following:

```
Name: host01.localdomain
Address: 192.168.0.10
```

#### 2. Reverse lookup checking.

For example, for domain `localdomain` that contains host with name `host01` and IP address `192.168.0.10`, execute the following command:

```
nslookup 192.168.0.10
```

You should see a message similar to the following:

```
10.0.168.192.in-addr.arpa name = host01.localdomain.
```

If you do not receive valid responses (as shown above), set up a DNS zone in your cluster or configure host files on each host of the cluster using one of the following options:

- **Option I:** Configure hosts file on each node of the cluster.

For all nodes of cluster, add to the `/etc/hosts` file key-value pairs like the following:

```
192.168.0.11 host01
```

- **Option II:** Configuring DNS using BIND nameserver.

The following instructions, use the example values given below:

```
Example values:
domain name: "localdomain"
nameserver: "host01"/192.168.0.11
hosts: "host02"/192.168.0.12, "host02"/192.168.0.12
```

#### 1. Install BIND packages:

```
yum install bind
yum install bind-libs
yum install bind-utils
```

## 2. Initiate service

```
chkconfig named on
```

## 3. Configure files. Add the following lines for the example values given above (ensure that you modify these for your environment) :

- Edit the `/etc/resolv.conf` (for all nodes in cluster) and add the following lines:

```
domain localdomain
search localdomain
nameserver 192.168.0.11
```

- Edit the `/etc/named.conf` (for all nodes in cluster) and add the following lines:

```
listen-on port 53 { any; }; //by default it is opened only for localhost
...
zone "localdomain" {
    type master;
    notify no;
    allow-query { any; };
    file "named-forw.zone";
};
zone "0.168.192.in-addr.arpa" {
    type master;
    notify no;
    allow-query { any; };
    file "named-rev.zone";
};
```

- Edit the `named-forw.zone` as shown in the following sample forward zone configuration file:

```
$TTL 3D
@ SOA  host01.localdomain.root.localdomain
      (201306030;3600;3600;3600;3600)
NS host01 ; Nameserver Address
localhost IN A 127.0.0.1
host01 IN A 192.168.0.11
host02 IN A 192.168.0.12
host03 IN A 192.168.0.13
```

- Edit the `named-rev.zone` as shown in the following sample reverse zone configuration file:

```
$TTL 3D
@ SOA host01.localdomain.root.localdomain. (201306031;28800;2H;4W;1D);
NS host01.localdomain.; Nameserver Address
11 IN PTR host01.localdomain.
12 IN PTR host02.localdomain.
13 IN PTR host03.localdomain.
```

## 4. Restart bind service.

```
/etc/init.d/named restart
```

## 5. Add rules to firewall.

```
iptables -A INPUT -p udp -m state --state NEW --dport 53 -j ACCEPT
iptables -A INPUT -p tcp -m state --state NEW --dport 53 -j ACCEPT
service iptables save
service iptables restart
```

Alternatively, you can also allow traffic over DNS port (53) using `system-config-firewall` utility.

### 1.5.3. Disable SELinux

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

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

```
getenforce
```

If the result is `permissive` or `disabled`, no further actions are required, else 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.

### 1.5.4. Disable IPTables

For Ambari to communicate during setup with the hosts it deploys to and manages, certain ports must be open and available. The easiest way to do this is to temporarily disable `iptables`.

On all the RHEL/CentOS host machines, execute the following command to disable `iptables`:

```
chkconfig iptables off
/etc/init.d/iptables stop
```

On Ubuntu host machines, execute the following command to disable `iptables`:

```
service ufw stop
```

You can restart `iptables` after setup is complete.

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. If you plan to run with them enabled, see [Configuring Ports \(for the 2.x stack\)](#) for more information on the necessary ports per component.

During the Ambari Server setup process, Ambari checks to see if `iptables` is running. If it is, a warning prints to remind you to check that the necessary ports are open and available. The **Host Confirm** step of the Cluster Install Wizard will also issue a warning for each host that has `iptables` running.





## Important

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

## 1.6. Download Companion Files

We have provided a set of companion files, including script files (`scripts.zip`) and configuration files (`configuration_files.zip`), that you should download and use throughout this process. Download and extract the files:

```
wget http://public-repo-1.hortonworks.com/HDP/tools/2.1.15.0/  
hdp_manual_install_rpm_helper_files-2.1.15.946.tar.gz
```

Hortonworks strongly recommends that copy the contents to your `~/.bash_profile`) to set up these environment variables in your environment.

The following provides a snapshot of a sample script file to create Hadoop directories. This sample script file sources the files included in Companion Files.

```
#!/bin/bash  
./users.sh  
./directories.sh  
  
echo "Create datanode local dir"  
mkdir -p $DFS_DATA_DIR;  
chown -R $HDFS_USER:$HADOOP_GROUP $DFS_DATA_DIR;  
chmod -R 750 $DFS_DATA_DIR;  
  
echo "Create yarn local dir"  
mkdir -p $YARN_LOCAL_DIR;  
chown -R $YARN_USER:$HADOOP_GROUP $YARN_LOCAL_DIR;  
chmod -R 755 $YARN_LOCAL_DIR;  
  
echo "Create yarn local log dir"  
mkdir -p $YARN_LOCAL_LOG_DIR;  
chown -R $YARN_USER:$HADOOP_GROUP $YARN_LOCAL_LOG_DIR;  
chmod -R 755 $YARN_LOCAL_LOG_DIR;
```

## 1.7. 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 in setting 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,  <code>/grid/hadoop/hdfs/nn</code>  <code>/grid1/hadoop/hdfs/nn</code>
HDFS	DFS_DATA_DIR	Space separated list of directories where DataNodes should store the blocks.  For example,  <code>/grid/hadoop/hdfs/dn</code>  <code>/grid1/hadoop/hdfs/dn</code>  <code>/grid2/hadoop/hdfs/dn</code>
HDFS	FS_CHECKPOINT_DIR	Space separated list of directories where SecondaryNameNode should store the checkpoint image.  For example,  <code>/grid/hadoop/hdfs/snn</code>  <code>/grid1/hadoop/hdfs/snn</code>  <code>/grid2/hadoop/hdfs/snn</code>
HDFS	HDFS_LOG_DIR	Directory for storing the HDFS logs. This directory name is a combination of a directory and the <code>\$HDFS_USER</code> .  For example,  <code>/var/log/hadoop/hdfs</code>  where <code>hdfs</code> is the <code>\$HDFS_USER</code> .
HDFS	HDFS_PID_DIR	Directory for storing the HDFS process ID. This directory name is a combination of a directory and the <code>\$HDFS_USER</code> .  For example,  <code>/var/run/hadoop/hdfs</code>  where <code>hdfs</code> is the <code>\$HDFS_USER</code>
HDFS	HADOOP_CONF_DIR	Directory for storing the Hadoop configuration files.  For example,  <code>/etc/hadoop/conf</code>

Hadoop Service	Parameter	Definition
YARN	YARN_LOCAL_DIR	Space-separated list of directories where YARN should store temporary data.  For example,  /grid/hadoop/yarn  /grid1/hadoop/yarn  /grid2/hadoop/yarn.
YARN	YARN_LOG_DIR	Directory for storing the YARN logs.  For example,  /var/log/hadoop/yarn.  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.  /grid/hadoop/yarn/logs  /grid1/hadoop/yarn/log
YARN	YARN_PID_DIR	Directory for storing the YARN process ID.  For example,  /var/run/hadoop/yarn.  This directory name is a combination of a directory and the <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,  /var/log/hadoop/mapred.  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, /etc/pig/conf.
Pig	PIG_LOG_DIR	Directory to store the Pig logs. For example, /var/log/pig.
Pig	PIG_PID_DIR	Directory to store the Pig process ID. For example, /var/run/pig.

Hadoop Service	Parameter	Definition
Oozie	OOZIE_CONF_DIR	Directory to store the Oozie configuration files. For example, /etc/oozie/conf.
Oozie	OOZIE_DATA	Directory to store the Oozie data. For example, /var/db/oozie.
Oozie	OOZIE_LOG_DIR	Directory to store the Oozie logs. For example, /var/log/oozie.
Oozie	OOZIE_PID_DIR	Directory to store the Oozie process ID. For example, /var/run/oozie.
Oozie	OOZIE_TMP_DIR	Directory to store the Oozie temporary files. For example, /var/tmp/oozie.
Hive	HIVE_CONF_DIR	Directory to store the Hive configuration files. For example, /etc/hive/conf.
Hive	HIVE_LOG_DIR	Directory to store the Hive logs. For example, /var/log/hive.
Hive	HIVE_PID_DIR	Directory to store the Hive process ID. For example, /var/run/hive.
WebHCat	WEBHCAT_CONF_DIR	Directory to store the WebHCat configuration files. For example, /etc/hcatalog/conf/webhcat.
WebHCat	WEBHCAT_LOG_DIR	Directory to store the WebHCat logs. For example, var/log/webhcat.
WebHCat	WEBHCAT_PID_DIR	Directory to store the WebHCat process ID. For example, /var/run/webhcat.
HBase	HBASE_CONF_DIR	Directory to store the 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="/grid/0/hadoop/hdfs/nn";
# 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="/grid/0/hadoop/hdfs/dn";
# 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="/grid/0/hadoop/hdfs/snn";
#
# 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="/grid/0/hadoop/yarn/local";
#
# 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="/grid/0/hadoop/yarn/logs";
#
# 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/mapreduce";

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

#

# 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="/grid/0/hadoop/zookeeper/data";

# 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"

export HADOOP_LIBEXEC_DIR=/usr/lib/hadoop/libexec
```

Define users and groups:

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 created in [Create System Users and Groups](#).



### Note

The `scripts.zip` file you downloaded in [Download Companion Files](#) includes a script, `usersAndGroups.sh`, for setting user and group 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 1.3. Define Users and Groups for Systems**

Parameter	Definition
HDFS_USER	User that owns the HDFS services. For example, <code>hdfs</code> .
YARN_USER	User that owns the YARN services. For example, <code>yarn</code> .
ZOOKEEPER_USER	User that owns the ZooKeeper services. For example, <code>zookeeper</code> .
HIVE_USER	User that owns the Hive services. For example, <code>hive</code> .
WEBHCAT_USER	User that owns the WebHCat services. For example, <code>hcat</code> .
HBASE_USER	User that owns the HBase services. For example, <code>hbase</code> .
FALCON_USER	User that owns the Falcon services. For example, <code>falcon</code> .
SQOOP_USER	User owning the Sqoop services. For example, <code>sqoop</code> .
HADOOP_GROUP	A common group shared by services. For example, <code>hadoop</code> .
KNOX_USER	User that owns the Knox Gateway services. For example, <code>knox</code> .
NAGIOS_USER	User that owns the Nagios services. For example, <code>nagios</code> .

## 1.8. [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	<code>hdfs</code>	<code>hadoop</code>



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

## 1.9. Determine HDP Memory Configuration Settings

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

- [Use the HDP Utility Script to calculate memory configuration settings](#)
- [Manually calculate 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.

### 1.9.1. Use the HDP Utility Script to Calculate Memory Configuration Settings

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

#### Running the Script

To run the `hdp-configuration-utils.py` script, execute the following command from the folder containing the script:

```
python hdp-configuration-utils.py <options>
```

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

### Example

Running the following command:

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

Would return:

```
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.java.opts=-Xmx4096m
hive.tez.container.size=6144
hive.tez.java.opts=-Xmx4096m
hive.auto.convert.join.noconditionaltask.size=1342177000
```

## 1.9.2. Manually Calculate 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 (such as MapReduce) running in the cluster. 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 (memory, cpu etc.).

In a Hadoop cluster, it is vital to balance the usage 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.

### 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` (# 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:

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:

Configuration File	Configuration Setting	Value
yarn-site.xml	yarn.nodemanager.resource.memory-mb	= 42 * 1024 MB
yarn-site.xml	yarn.scheduler.minimum-allocation-mb	= 2 * 1024 MB
yarn-site.xml	yarn.scheduler.maximum-allocation-mb	= 42 * 1024 MB
mapred-site.xml	mapreduce.map.memory.mb	= 2 * 1024 MB
mapred-site.xml	mapreduce.reduce.memory.mb	= 4 * 1024 MB
mapred-site.xml	mapreduce.map.java.opts	= 1.6 * 1024 MB
mapred-site.xml	mapreduce.reduce.java.opts	= 3.2 * 1024 MB
yarn-site.xml (check)	yarn.app.mapreduce.am.resource.mb	= 4 * 1024 MB
yarn-site.xml (check)	yarn.app.mapreduce.am.command-opts	= 3.2 * 1024 MB

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

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

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

If HBase is included:

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

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

Configuration	Value Calculation
---------------	-------------------

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

**Notes:**

1. Changing `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.
2. If your installation has high 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`.

### 1.9.2.1. Configuring MapReduce Memory Settings on YARN

MapReduce runs on top of YARN and utilizes YARN Containers to schedule and execute its Map and Reduce tasks. When configuring MapReduce resource utilization on YARN, there are three aspects to consider:

- The physical RAM limit for each Map and Reduce task.
- The JVM heap size limit for each task.
- The amount of virtual memory each task will receive.

You can define a maximum amount of memory for each Map and Reduce task. Since each Map and Reduce task will run in a separate Container, these maximum memory settings should be equal to or greater than the YARN minimum Container allocation.

For the example cluster used in the previous section (48 GB RAM, 12 disks, and 12 cores), the minimum RAM for a Container (`yarn.scheduler.minimum-allocation-mb`) = 2 GB. Therefore we will assign 4 GB for Map task Containers, and 8 GB for Reduce task Containers.

In `mapred-site.xml`:

```
<name>mapreduce.map.memory.mb</name>
<value>4096</value>
<name>mapreduce.reduce.memory.mb</name>
<value>8192</value>
```

Each Container will run JVMs for the Map and Reduce tasks. The JVM heap sizes should be set to values lower than the Map and Reduce Containers, so that they are within the bounds of the Container memory allocated by YARN.

In `mapred-site.xml`:

```
<name>mapreduce.map.java.opts</name>
<value>-Xmx3072m</value>
<name>mapreduce.reduce.java.opts</name>
<value>-Xmx6144m</value>
```

The preceding settings configure the upper limit of the physical RAM that Map and Reduce tasks will use. The virtual memory (physical + paged memory) upper limit for each Map and Reduce task is determined by the virtual memory ratio each YARN Container is allowed. This ratio is set with the following configuration property, with a default value of 2.1:

In `yarn-site.xml`:

```
<name>yarn.nodemanager.vmem-pmem-ratio</name>
<value>2.1</value>
```

With the preceding settings on our example cluster, each Map task will receive the following memory allocations:

- Total physical RAM allocated = 4 GB
- JVM heap space upper limit within the Map task Container = 3 GB
- Virtual memory upper limit =  $4 * 2.1 = 8.2$  GB

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).

## 1.10. 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 and YARN

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 file and directory permissions to 0022 (022). This is typically the default for most Linux distributions.

Use the `umask` command to confirm and set as necessary.

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:

```
apt-get install hadoop hadoop-hdfs libhdfs0 libhdfs0-dev 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

Complete the following instructions on all the nodes in your cluster:

1. Install Snappy. From a terminal window, type:

- For RHEL/CentOS/Oracle Linux:

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

- For SLES:

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

- For Ubuntu:

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

2. Make the Snappy libraries available to Hadoop:

```
ln -sf /usr/lib64/libsnappy.so /usr/lib/hadoop/lib/native/.
```

## 2.3.2. Install LZO

Execute the following command on all the nodes in your cluster. From a terminal window, type:

- For 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:

```
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.

If any of these directories already exist, we recommend deleting and recreating them.

Use the following instructions to create appropriate directories:

1. We strongly suggest that you edit and source the bash script files included with the companion files (downloaded in [Download Companion Files](#)).

Alternatively, you can also copy the contents to your `~/.bash_profile` to set up these environment variables in your environment.

2. [Create the NameNode directories](#)
3. [Create the Secondary NameNode directories](#)



4. [Create the DataNode and YARN NodeManager local directories](#)
5. [Create the log and PID directories](#)

## 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

On all DataNodes, 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`.

On the 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:

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

On the 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:

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

## 2.4.4. Create the Log and PID Directories

On 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`.

```
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`.

```
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`.

```
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`.

```
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 `$MAPREDs_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`.

```
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 `$MAPREDs_USER`.

For example, `/var/run/hadoop/mapred` where `mapred` is the `$MAPRED_USER`.

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

## 3. Setting Up the Hadoop Configuration

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

Use the following instructions to set up Hadoop configuration files:

1. We strongly suggest that you edit and source the bash script files included with the companion files (downloaded in [Download Companion Files](#)).

Alternatively, you can also copy the contents to your `~/.bash_profile` to set up these environment variables in your environment.

2. 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.

3. 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. See [Define Environment Parameters](#) for more information.

- a. Edit the `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>
```

- b. Edit the `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>
```



## 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.

To change the default value:

- i. Edit the `/etc/hadoop/conf/hadoop-env.sh` file.
- ii. Change the value of the `-XX:MaxNewSize` parameter to 1/8th the value of the maximum heap size (`-Xmx`) parameter.
- iii. We also recommend that you set the value of `-XX:NewSize` to the same value as `-XX:MaxNewSize`.

- c. Edit the `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.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>
```

d. Edit the `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>
```

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

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

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

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

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

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

The keys are defined as follows:

- `yarn.nodemanager.linux-container-executor.group` - the configured value of `yarn.nodemanager.linux-container-executor.group`. This must match the value of `yarn.nodemanager.linux-container-executor.group` in `yarn-site.xml`.
  - `banned.users` - a comma separated list of users who cannot run `container-executor`.
  - `min.user.id` - the minimum value of user id, this is to prevent system users from running `container-executor`.
  - `allowed.system.users` - a comma separated list of allowed system users.
6. **Optional:** 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.
7. Copy the configuration files.

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

```
rm -r $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`.

b. Copy all the configuration files to `$HADOOP_CONF_DIR`.

c. Set 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`.

## 4. 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. [Start YARN](#)
4. [Start MapReduce JobHistory Server](#)
5. [Smoke Test MapReduce](#)

### 4.1. Format and Start HDFS

1. Execute these commands on the NameNode host machine:

```
su $HDFS_USER
/usr/lib/hadoop/bin/hadoop namenode -format
/usr/lib/hadoop/sbin/hadoop-daemon.sh --config $HADOOP_CONF_DIR start
namenode
```

2. Execute these commands on the SecondaryNameNode:

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

3. Execute these commands on all DataNodes:

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

where:

- `$HDFS_USER` is the user owning the HDFS services. For example, `hdfs`.
- `$HADOOP_CONF_DIR` is the directory for storing the Hadoop configuration files. For example, `/etc/hadoop/conf`.

### 4.2. Smoke Test HDFS

1. See 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
hadoop fs -mkdir -p /user/hdfs
```

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

```
su $HDFS_USER
hadoop fs -copyFromLocal /etc/passwd passwd
hadoop fs -ls
```

4. Test browsing HDFS:

```
http://$datanode.full.hostname:50075/browseDirectory.jsp?namenodeInfoPort=
50070&dir=/&nnaddr=$namenode.full.hostname:8020
```

## 4.3. Start YARN

1. Execute these commands from the ResourceManager server:

```
<login as $YARN_USER>
export HADOOP_LIBEXEC_DIR=/usr/lib/hadoop/libexec
/usr/lib/hadoop-yarn/sbin/yarn-daemon.sh --config $HADOOP_CONF_DIR start
resourcemanager
```

2. Execute these commands from all NodeManager nodes:

```
<login as $YARN_USER>
export HADOOP_LIBEXEC_DIR=/usr/lib/hadoop/libexec
/usr/lib/hadoop-yarn/sbin/yarn-daemon.sh --config $HADOOP_CONF_DIR start
nodemanager
```

where:

- `$YARN_USER` is the user owning the YARN services. For example, `yarn`.
- `$HADOOP_CONF_DIR` is the directory for storing the Hadoop configuration files. For example, `/etc/hadoop/conf`.

## 4.4. Start MapReduce JobHistory Server

1. Change permissions on the container-executor file.

```
chown -R root:hadoop /usr/lib/hadoop-yarn/bin/container-executor
chmod -R 650 /usr/lib/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
hadoop fs -mkdir -p /mr-history/tmp
hadoop fs -chmod -R 1777 /mr-history/tmp
hadoop fs -mkdir -p /mr-history/done
hadoop fs -chmod -R 1777 /mr-history/done
hadoop fs -chown -R $MAPRED_USER:$HDFS_USER /mr-history

hadoop fs -mkdir -p /app-logs
```

```
hadoop fs -chmod -R 1777 /app-logs
hadoop fs -chown yarn /app-logs
```

3. Execute these commands from the JobHistory server:

```
<login as $MAPRED_USER>
export HADOOP_LIBEXEC_DIR=/usr/lib/hadoop/libexec/
/usr/lib/hadoop-mapreduce/sbin/mr-jobhistory-daemon.sh --
config $HADOOP_CONF_DIR start historyserver
```

where:

- `$HDFS_USER` is the user owning the HDFS services. For example, `hdfs`.
- `$MAPRED_USER` is the user owning the MapRed services. For example, `mapred`.
- `$HADOOP_CONF_DIR` is the directory for storing the Hadoop configuration files. For example, `/etc/hadoop/conf`.

## 4.5. Smoke Test MapReduce

1. Try browsing to the ResourceManager:

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

2. Create a `$CLIENT_USER` in all the nodes and add it in 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 and sort 10GB of data.

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

## 5. Installing Apache ZooKeeper

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

### 5.1. Install the ZooKeeper RPMs

In a terminal window, type:

- For RHEL/CentOS/Oracle Linux

```
yum install zookeeper
```

- For SLES

```
zypper install zookeeper
```

- For Ubuntu

```
apt-get install zookeeper
```



#### Note

Grant the zookeeper user shell access on Ubuntu.

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

### 5.2. 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, we recommend deleting and recreating them. Use the following instructions to create appropriate directories:

1. We strongly suggest that you edit and source the bash script files included with the companion files (downloaded in [Download Companion Files](#)).

Alternatively, you can also copy the contents to your `~/ .bash_profile`) to set up these environment variables in your environment.

2. 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`.
3. 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 second server, enter the corresponding number:

```
3
```

## 5.3. Set Up the Configuration Files

There are several configuration files that need to be set up for ZooKeeper.

- 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.

- Modify the configuration files.

In the respective temporary directories, locate the following files and modify the properties based on your environment. Search for `TODO` in the files for the properties to replace.

1. Edit `zoo.cfg` and modify the following properties:

```
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
```

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

```
<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>
```

- Copy the configuration files

### 1. On all hosts create the config directory:

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

### 2. Copy all the ZooKeeper configuration files to the `$ZOOKEEPER_CONF_DIR` directory.

### 3. Set appropriate permissions:

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

where:

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

## 5.4. Start ZooKeeper

In order to install and configure HBase and other Hadoop ecosystem components, you must start the ZooKeeper service:

```
su - zookeeper -c 'source /etc/zookeeper/conf/zookeeper-env.sh ; export
ZOO_CFG_DIR=/etc/zookeeper/conf;/usr/lib/zookeeper/bin/zkServer.sh start >> /
var/log/zookeeper/zoo.out 2>&1'
```

## 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.

### 6.1. Install the HBase RPMs

#### Prerequisites

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

```
yum list hbase
```

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

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

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

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

#### Installation

In a terminal window, type:

- For RHEL/CentOS/Oracle Linux

```
yum install zookeeper hbase
```

- For SLES

```
zypper install zookeeper hbase
```

- For Ubuntu

```
apt-get install zookeeper hbase
```

### 6.2. Set 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. Use the following instructions to create appropriate directories:

1. We strongly suggest that you edit and source the bash script files included with the companion files (downloaded in [Download Companion Files](#)).



Alternatively, you can also copy the contents to your `~/.bash_profile`) to set up these environment variables in your environment.

2. 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

There are several configuration files that need to be set up for HBase and ZooKeeper.

- Extract the HBase configuration files to a temporary directory.

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

- Modify the configuration files.

In the respective temporary directories, locate the following files and modify the properties based on your environment. Search for `TODO` in the files for the properties to replace.

1. Edit `zoo.cfg` and modify the following properties:

```
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
```

2. Edit the `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>
```

3. 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`.

```
RegionServer1
RegionServer2
RegionServer3
RegionServer4
RegionServer5
RegionServer6
RegionServer7
RegionServer8
RegionServer9
```

- Copy the configuration files

1. On all hosts create the config directory:

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

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

2. Copy all the HBase configuration files to the `$HBASE_CONF_DIR`.
3. 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`.

## 6.4. Validate the Installation

Use these steps to validate your installation.

## 1. Start HBase.

- a. Execute this command from the HBase Master node:

```
<login as $HDFS_USER>  
/usr/lib/hadoop/bin/hadoop fs -mkdir /apps/hbase  
/usr/lib/hadoop/bin/hadoop fs -chown -R hbase /apps/hbase  
<login as $HBASE_USER>  
/usr/lib/hbase/bin/hbase-daemon.sh --config $HBASE_CONF_DIR start master
```

- b. Execute this command from each HBase Region Server node:

```
<login as $HBASE_USER>  
/usr/lib/hbase/bin/hbase-daemon.sh --config $HBASE_CONF_DIR start  
regionserver
```

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`.

## 2. Smoke Test HBase.

From a terminal window, enter:

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

In the HBase shell, enter the following command:

```
status
```

## 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/lib/hbase/bin/hbase-daemon.sh start rest --infoport 8085
```

## 7. Installing Apache Phoenix

To install the Apache Phoenix RPM:

1. Install Phoenix on all HBase Region servers:

- RHEL/CentOS/Oracle Linux:

```
yum install phoenix
```

- For SLES:

```
zypper install phoenix
```

- For Ubuntu or Debian:

```
apt-get install phoenix
```

2. Link the Phoenix core jar file to the HBase Master and Region Servers:

```
ln -sf /usr/lib/phoenix/lib/phoenix-core-4.0.0.$version.jar /usr/lib/hbase/lib/phoenix.jar
```

where *\$version* is the five-digit HDP version of the Phoenix jar. For example, 2.1.5.0-695.

3. Add the following configuration to `hbase-site.xml` on all HBase nodes, the Master Server, and all Region Servers:

```
<property>
  <name>hbase.defaults.for.version.skip</name>
  <value>true</value>
</property>
<property>
  <name>hbase.regionserver.wal.codec</name>
  <value>org.apache.hadoop.hbase.regionserver.wal.IndexedWALEditCodec</value>
</property>
```

4. Restart the HBase Master and Region Servers.
5. Add the `phoenix-4.0-client.jar` to the classpath of any Phoenix client.

### Configuring Phoenix for Security

Phoenix administrators must perform the following additional steps to configure Phoenix to run in a secure Hadoop cluster:

1. Execute the following command to link the HBase configuration file with the Phoenix libraries:

```
ln -sf <HBASE_CONFIG_DIR>/hbase-site.xml <PHOENIX_HOME>/bin/hbase-site.xml
```

2. Execute the following command to link the Hadoop configuration file with the Phoenix libraries:

```
ln -sf <HADOOP_CONFIG_DIR>/core-site.xml <PHOENIX_HOME>/bin/core-site.xml
```



## Note

Phoenix administrators may safely ignore the following warnings when running the `pssql.py` and `sqlline.py` Phoenix scripts in secure mode:

```
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, ignored
java.io.IOException: No FileSystem for scheme: hdfs
```

## Smoke Testing Phoenix

Execute the following commands to verify your installation on an unsecure cluster:



## Note

The command assumes an unsecure cluster with the following values for configuration parameters:

- `hbase.zookeeper.quorum=localhost`
- `hbase.zookeeper.property.clientPort=2181`
- `zookeeper.znode.parent=/hbase-unsecure`

For a secure cluster, the `zookeeper.znode.parent` configuration property requires a different value:

- `zookeeper.znode.parent=/hbase`

```
cd $PHOENIX_HOME/bin
./pssql.py localhost:2181:/hbase-unsecure /usr/share/doc/phoenix-4.0.0.$version/examples/WEB_STAT.sql /usr/share/doc/phoenix-4.0.0.$version/examples/WEB_STAT.csv
/usr/share/doc/phoenix-4.0.0.$version/examples/WEB_STAT_QUERIES.sql
```

where `$version` is the four-digit HDP version. For example, 2.1.5.0.

## Troubleshooting Phoenix

You may 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, as shown in the following example:

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

## 8. Installing Apache Pig

This section describes installing and testing Apache Pig, a platform for creating higher level data flow programs that can be compiled into sequences of MapReduce programs, using Pig Latin, the platform's native language.

Complete the following instructions to install Pig:

1. [Install the Pig RPMs](#)
2. [Set Up Configuration Files](#)
3. [Validate the Installation](#)

### 8.1. Install the Pig RPMs

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/lib/pig`. Pig configuration files are placed in `/usr/lib/pig/conf`.

### 8.2. Set Up Configuration Files

Use the following instructions to set up configuration files for Pig:

1. Extract the Pig configuration files.

From the downloaded `scripts.zip` file, extract the files from the `configuration_files/pig` directory to a temporary directory.

2. Copy the configuration files.

- a. On all hosts where Pig will be executed, create the Pig configuration directory:

```
rm -r $PIG_CONF_DIR
mkdir -p $PIG_CONF_DIR
```

- b. Copy all the configuration files to `$PIG_CONF_DIR`.

- c. Set appropriate permissions:

```
chmod -R 755 $PIG_CONF_DIR
```

where:

- `$PIG_CONF_DIR` is the directory to store Pig configuration files. For example, `/etc/pig/conf`.
- `$PIG_USER` is the user owning the Pig services. For example, `pig`.
- `$HADOOP_GROUP` is a common group shared by services. For example, `hadoop`.

## 8.3. Validate the Installation

Use the following steps to validate your installation:

1. On the host machine where Pig is installed execute the following commands:

```
su $HDFS_USER
/usr/lib/hadoop/bin/hadoop fs -copyFromLocal /etc/passwd passwd
```

2. Create the pig script file `/tmp/id.pig` with the following contents:

```
A = load 'passwd' using PigStorage(':');
B = foreach A generate \${0} as id; store B into '/tmp/id.out';
```

3. Execute the Pig script:

```
su $HDFS_USER
pig -l /tmp/pig.log /tmp/id.pig
```



## 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. [Install the Hive and HCatalog RPMs](#)
2. [Set Directories and Permissions](#)
3. [Set Up the Hive/HCatalog Configuration Files](#)
4. [Create Directories on HDFS](#)
5. [Validate the Installation](#)

### 9.1. Install the Hive and HCatalog RPMs



#### 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:

```
<hive user ID> soft nproc 128
<hive user ID> hard nproc 1024
```

#### For secured clusters:

```
<hive user ID> soft nproc 128
<hive user ID> hard nproc 32768
```

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
yum install hive-hcatalog
```

- For SLES:

```
zypper install hive
zypper install hive-hcatalog
```

- For Ubuntu:

```
apt-get install hive
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, you can choose to enable a local or remote database for the Hive metastore. Hive supports Derby, MySQL, Oracle, SQL Server, and Postgres. 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.



### Note

Administrators who all Hive queries to run as the `hive` system user rather than the actual user who submitted the query must set the `hive.server2.enable.doAs` configuration property to `true` and must configure HiveServer2 to use a local Metastore. A value of `true` for this property requires a local Metastore server.

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]
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/lib/hive/lib/` directory on your Hive host machine.
- c. Verify that the .jar file has appropriate permissions.

## 9.2. Set 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. Use the following instructions to set up Pig configuration files:

1. We strongly suggest that you edit and source the bash script files included in the companion files (downloaded in [Download Companion Files](#)).

Alternatively, you can also copy the contents to your `~/.bash_profile` to set up these environment variables in your environment.

2. 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:

- `$HIVE_LOG_DIR` is the directory for storing the Hive Server logs.  
This directory name is a combination of a directory and the `$HIVE_USER`.
- `$HIVE_USER` is the user owning the Hive services. For example, `hive`.
- `$HADOOP_GROUP` is a common group shared by services. For example, `hadoop`.

## 9.3. Set Up the Hive/HCatalog Configuration Files

Use the following instructions to set up the Hive/HCatalog configuration files:

1. If you have not already done so, download and extract the HDP [companion files](#). A sample `hive-site.xml` file is included in the `configuration_files/hive` folder.
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. Search for `TODO` in the files for the properties to replace.

- a. Edit the connection properties for your Hive metastore database in `hive-site.xml`:

```
<property>  
  <name>javax.jdo.option.ConnectionURL</name>  
  <value>jdbc:mysql://TODO-HIVE-METASTORE-DB-SERVER:TODO-HIVE-METASTORE-DB-PORT/TODO-HIVE-METASTORE-DB-NAME?createDatabaseIfNotExist=true</value>  
  <description>Enter your Hive Metastore Connection URL, for example if MySQL: jdbc:mysql://localhost:3306/mysql?createDatabaseIfNotExist=true</description>  
</property>  
  
<property>  
  <name>javax.jdo.option.ConnectionUserName</name>  
  <value>TODO-HIVE-METASTORE-DB-USER-NAME</value>  
  <description>Enter your Hive Metastore database user name.</description>  
</property>  
  
<property>  
  <name>javax.jdo.option.ConnectionPassword</name>  
  <value>TODO-HIVE-METASTORE-DB-PASSWORD</value>  
  <description>Enter your Hive Metastore database password.</description>  
</property>  
  
<property>
```

```
<name>javax.jdo.option.ConnectionDriverName</name>
<value>TODO-HIVE-METASTORE-DB-CONNECTION-DRIVER-NAME</value>
<description>Enter your Hive Metastore Connection Driver Name, for
example if MySQL: com.mysql.jdbc.Driver</description>
</property>
```

If you plan on storing Hive data in a columnar format, such as ORC, verify that the `hive.optimize.sort.dynamic.partition` property is set to `true`, the default value for Hive 0.13.x. Enabling dynamic partitions improves Hive performance when using columnar formats.

```
<property>
  <name>hive.optimize.sort.dynamic.partition</name>
  <value>true</value>
</property>
```

Optional: If you want storage-based authorization for Hive, set the following Hive authorization parameters in the `hive-site.xml` file:

```
<property>
  <name>hive.security.authorization.enabled</name>
  <value>true</value>
</property>

<property>
  <name>hive.security.authorization.manager</name>
  <value>org.apache.hadoop.hive.ql.security.authorization.
StorageBasedAuthorizationProvider</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.

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=" "
```

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>
```



### Warning

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.



### Note

You can also use the [HDP utility script](#) to fine-tune memory configuration settings based on node hardware specifications.

### 3. Copy the configuration files.

- a. On all Hive hosts create the Hive configuration directory.

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

- b. Copy all the configuration files to `$HIVE_CONF_DIR` directory.

- c. Set appropriate permissions:

```
chown -R $HIVE_USER:$HADOOP_GROUP $HIVE_CONF_DIR/.. / ;
chmod -R 755 $HIVE_CONF_DIR/.. / ;
```

where:

- `$HIVE_CONF_DIR` is the directory to store the Hive configuration files. For example, `/etc/hive/conf`.
- `$HIVE_USER` is the user owning the Hive services. For example, `hive`.
- `$HADOOP_GROUP` is a common group shared by services. For example, `hadoop`.

## 9.3.1. 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 as described in the [previous section](#), the only remaining task would be to adjust the `hive.tez.container.size` and `hive.tez.java.opts` values as described in the following section. You can also use the [HDP utility script](#) to calculate these Tez memory configuration settings.

### 9.3.1.1. 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-Related 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. If this is not specified (-1), the memory settings from the MapReduce configurations ( <code>mapreduce.map.memory.mb</code> ) will be used by default for map 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.
<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 for map tasks.	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.queue</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.queue</code>	The number of sessions for each queue named in the <code>hive.server2.tez.default.queue</code> .	1 Larger clusters may improve performance of HiveServer2 by increasing this number.
<code>hive.server2.tez.initialize.clusters</code>	Enables a user to use HiveServer2 without enabling Tez for HiveServer2. Users may 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

#### 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.



### Tip

You can retrieve a list of queues by executing the following command: `hadoop queue -list`.

### 9.3.1.2. 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. For more details, see "Configuring Tez with the Capacity Scheduler" on [this page](#).

## 9.4. Create Directories on HDFS

1. Create the Hive user home directory on HDFS.

```
Login as $HDFS_USER
hadoop fs -mkdir -p /user/$HIVE_USER
hadoop fs -chown $HIVE_USER:$HDFS_USER /user/$HIVE_USER
```

2. Create the warehouse directory on HDFS.

```
Login as $HDFS_USER
hadoop fs -mkdir -p /apps/hive/warehouse
hadoop fs -chown -R $HIVE_USER:$HDFS_USER /apps/hive
hadoop fs -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
hadoop fs -mkdir -p /tmp/scratch
hadoop fs -chown -R $HIVE_USER:$HDFS_USER /tmp/scratch
hadoop fs -chmod -R 777 /tmp/scratch
```

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`.

## 9.5. Validate the Installation

Use the following steps to validate your installation:

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/lib/hive`

2. 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 $HIVE_USER
nohup hive --service metastore -hiveconf hive.log.file=hivemetastore.log
>$HIVE_LOG_DIR/hive.out 2>$HIVE_LOG_DIR/hive.log &
```



Where `$HIVE_LOG_DIR` is the location of the Hive log directory, for example `/var/log/hive/`



### Note

You may receive the following error after running the `su $HIVE_USER` command:

```
su hive
This account is currently not available.
```

If you get this error, you may 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/nologin
```

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.

- a. Open Hive command line shell.

```
hive
```

- b. Run sample commands.

```
show databases;
create table test(col1 int, col2 string);
show tables;
```

#### 5. Start HiveServer2.

```
su $HIVE_USER
/usr/lib/hive/bin/hiveserver2 -hiveconf hive.metastore.uris=" " -
hiveconf hive.log.file=hiveserver2.log >$HIVE_LOG_DIR/hiveserver2.out
2> $HIVE_LOG_DIR/hiveserver2.log &
```

Where `$HIVE_LOG_DIR` is the location of the Hive log directory, for example `/var/log/hive/`

#### 6. Smoke test HiveServer2.

- a. Open Beeline command line shell to interact with HiveServer2.

```
/usr/lib/hive/bin/beeline
```

b. Establish connection to server.

```
!connect jdbc:hive2://$hive.server.full.hostname:10000 $HIVE_USER  
password org.apache.hive.jdbc.HiveDriver
```

c. Run sample commands.

```
show databases;  
create table test2(a int, b string);  
show tables;
```

where:

- *\$HIVE\_USER* is the user that owns the HIVE services. For example, *hive*.
- *\$HIVE\_LOG\_DIR* is the directory for storing the Hive Server logs. This directory name is a combination of a directory and the *\$HIVE\_USER*.

# 10. Installing and Configuring Apache Tez

Apache Tez is the next generation Hadoop query processing framework and execution engine written on top of YARN. Tez is a replacement for the MapReduce application that supports a range of performance features that radically improve query latency in Hadoop. This improvement in query performance enables the use of Hadoop for interactive queries by business analysts and data scientists. With Tez, Hadoop provides both interactive and batch queries.

## Prerequisites

Verify that your cluster meets the following pre-requisites before installing Tez:

- Apache Hadoop 2.4
- YARN



### Note

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

Use the following instructions to install and configure Tez:

1. [Install the Tez RPM](#)
2. [Configure Tez](#)
3. [Validate the Tez Installation](#)
4. [Enable Tez for Hive Queries](#)
5. [Validate Hive-on-Tez Installation](#)
6. [Troubleshooting](#)



### Note

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

## 10.1. Install the Tez RPM

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 to create the Tez configuration directories. These HDFS directories must be publicly accessible.



### Note

The `$HDFS_USER` is the user that owns the HDFS service. For example, `hdfs`.

```
su $HDFS_USER
hdfs dfs -mkdir -p /apps/tez
```

3. Execute the following commands from any one of the cluster client nodes to upload the Tez jar files and their dependencies into HDFS:

```
su $HDFS_USER
hdfs dfs -copyFromLocal /usr/lib/tez/* /apps/tez
hdfs dfs -chown -R hdfs:users /apps/tez
hdfs dfs -chmod 755 /apps
hdfs dfs -chmod 755 /apps/tez
hdfs dfs -chmod 755 /apps/tez/lib/
hdfs dfs -chmod 644 /apps/tez/*.jar
hdfs dfs -chmod 644 /apps/tez/lib/*.jar
```

4. Execute the following command to verify that the files were copied with the preceding step:

```
hdfs dfs -ls /apps/tez
```

This should return a list of files that looks similar to this:

```
Found 10 items
drwxr-xr-x  - hdfs users          0 2014-06-04 14:07 /apps/tez/conf
drwxr-xr-x  - hdfs users          0 2014-06-04 14:07 /apps/tez/lib
-rwxr-xr-x  3 hdfs users    748252 2014-06-04 14:07 /apps/tez/tez-api-0.4.0.2.1.2.0-402.jar
-rwxr-xr-x  3 hdfs users    29846 2014-06-04 14:07 /apps/tez/tez-common-0.4.0.2.1.2.0-402.jar
-rwxr-xr-x  3 hdfs users    980888 2014-06-04 14:07 /apps/tez/tez-dag-0.4.0.2.1.2.0-402.jar
-rwxr-xr-x  3 hdfs users    242111 2014-06-04 14:07 /apps/tez/tez-mapreduce-0.4.0.2.1.2.0-402.jar
-rwxr-xr-x  3 hdfs users    195627 2014-06-04 14:07 /apps/tez/tez-mapreduce-examples-0.4.0.2.1.2.0-402.jar
-rwxr-xr-x  3 hdfs users    110388 2014-06-04 14:07 /apps/tez/tez-runtime-internals-0.4.0.2.1.2.0-402.jar
-rwxr-xr-x  3 hdfs users    348559 2014-06-04 14:07 /apps/tez/tez-runtime-library-0.4.0.2.1.2.0-402.jar
-rwxr-xr-x  3 hdfs users      2615 2014-06-04 14:07 /apps/tez/tez-tests-0.4.0.2.1.2.0-402.jar
```

## 10.2. Configure Tez

### 10.2.1. Tez Configuration

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. Create the `$TEZ_CONF_DIR` environment variable and set it to the location of the `tez-site.xml` file.

```
export TEZ_CONF_DIR=/etc/tez/conf
```

3. Create the `$TEZ_JARS` environment variable and set it to the location of the Tez jars and their dependencies.

```
export TEZ_JARS=/usr/lib/tez/*:/usr/lib/tez/lib/*
```



#### Note

Be sure to include the asterisks (\*) in the above command.

4. Configure the `tez.lib.uris` property with the HDFS paths containing the Tez jar files in the `tez-site.xml` file.

```
...  
<property>  
  <name>tez.lib.uris</name>  
  <value>${fs.default.name}/apps/tez/,${fs.default.name}/apps/tez/lib/</value>  
</property>  
...
```

5. Add `$TEZ_CONF_DIR` and `$TEZ_JARS` to the `$HADOOP_CLASSPATH` environment variable.

```
export HADOOP_CLASSPATH=$TEZ_CONF_DIR:$TEZ_JARS:$HADOOP_CLASSPATH
```

Where:

- `$TEZ_CONF_DIR` is the location of `tez-site.xml`.
- `$TEZ_JARS` is the location of Tez jars and their dependencies.

## 10.2.2. Tez Configuration Parameters

**Table 10.1. Tez Configuration Parameters**

Configuration Parameter	Description	Default Value
<code>tez.lib.uris</code>	Location of the Tez jars and their dependencies. Tez applications download required jar files from this location, so it should be public accessible.	N/A
<code>tez.am.log.level</code>	Root logging level passed to the Tez Application Master.	INFO
<code>tez.staging-dir</code>	The staging directory used by Tez when application developers submit DAGs, or Dynamic Acyclic Graphs. Tez creates all temporary files for the DAG job in this directory.	<code>/tmp/\${user.name}/staging</code>
<code>tez.am.resource.memory.mb</code>	The amount of memory in MB that YARN will allocate to the Tez Application Master. The size increases with the size of the DAG.	1536
<code>tez.am.java.opts</code>	Java options for the Tez Application Master process. The value specified for <code>-Xmx</code> value should be less than specified in <code>tez.am.resource.memory.mb</code> , typically 512 MB less to account for non-JVM memory in the process.	<code>-server -Xmx1024m -Djava.net.preferIPv4Stack=true -XX:+UseNUMA -XX:+UseParallelGC</code>
<code>tez.am.shuffle-vertex-manager.min-src-fraction</code>	In case of a Shuffle operation over a Scatter-Gather edge connection, Tez may start data consumer tasks before all the data producer tasks complete in order to overlap the shuffle IO. This parameter specifies the fraction of producer tasks which should complete before the consumer tasks are scheduled. The percentage is expressed as a decimal, so the default value of <code>0.2</code> represents 20%.	<code>0.2</code>
<code>tez.am.shuffle-vertex-manager.max-src-fraction</code>	In case of a Shuffle operation over a Scatter-Gather edge connection, Tez may start data consumer tasks before all the data producer tasks complete in order to overlap the shuffle IO. This parameter specifies the fraction of producer tasks which should complete before all consumer tasks are scheduled. The number of consumer tasks ready for scheduling scales linearly between <code>min-fraction</code> and <code>max-fraction</code> . The percentage is expressed as a decimal, so the default value of <code>0.4</code> represents 40%.	<code>0.4</code>
<code>tez.am.rm.heartbeat.interval.ms.max</code>	This parameter determines how frequently the Tez Application Master asks the YARN Resource Manager for resources in milliseconds. A low value can overload the Resource Manager.	250
<code>tez.am.grouping.split-waves</code>	Specifies the number of waves, or the percentage of queue container capacity, used to process a data set where a value of <code>1</code> represents 100% of container capacity. The Tez Application Master considers this parameter value, the available cluster resources, and the resources required by the application to calculate <i>parallelism</i> , or the number of tasks to run. Processing queries with additional containers leads to lower latency. However, resource contention may occur if multiple users run large queries simultaneously.	Tez Default: <code>1.4</code> ; Hive Default: <code>1.7</code>
<code>tez.am.grouping.min-size</code>	Specifies the lower bound of the size of the primary input to each task when The Tez Application Master determines the parallelism of primary input reading tasks. This configuration property prevents input tasks from being too small, which prevents the parallelism for the tasks being too large.	16777216

Configuration Parameter	Description	Default Value
tez.am.grouping.max-size	Specifies the upper bound of the size of the primary input to each task when the Tez Application Master determines the parallelism of primary input reading tasks. This configuration property prevents input tasks from being too large, which prevents their parallelism from being too small.	1073741824
tez.am.container.reuse.enabled	<b>Container</b> is the unit of resource allocation in YARN. This configuration parameter determines whether Tez will reuse the same container to run multiple tasks. Enabling this parameter improves performance by avoiding the memory overhead of reallocating container resources for every task. However, disable this parameter if the tasks contain memory leaks or use static variables.	true
tez.am.container.reuse.rack-fallback.enabled	Specifies whether to reuse containers for rack-local tasks. This configuration parameter is ignored unless <code>tez.am.container.reuse.enabled</code> is enabled.	true
tez.am.container.reuse.non-local-fallback.enabled	Specifies whether to reuse containers for non-local tasks. This configuration parameter is ignored unless <code>tez.am.container.reuse.enabled</code> is enabled.	true
tez.am.container.session.allocation-millis	Determines when a Tez session releases its containers while not actively servicing a query. Specify a value of -1 to never release an idle container in a session. However, containers may still be released if they do not meet resource or locality needs. This configuration parameter is ignored unless <code>tez.am.container.reuse.enabled</code> is enabled.	10000 (10 seconds)
tez.am.container.reuse.locality-allocation-millis	The amount of time to wait in milliseconds before assigning a container to the next level of locality. The three levels of locality in ascending order are NODE, RACK, and NON_LOCAL.	250
tez.task.get-task.sleep.interval-ms.max	Determines the maximum amount of time in milliseconds a container agent waits before asking The Tez Application Master for another task. Tez runs an agent on a container in order to remotely launch tasks. A low value may overload the Application Master.	200
tez.session.client.timeout	Specifies the amount of time in seconds to wait for the Application Master to start when trying to submit a DAG from the client in session mode.	180
tez.session.am.dag.submit.timeout	Specifies the amount of time in seconds that the Tez Application Master waits for a DAG to be submitted before shutting down. The value of this property is used when the Tez Application Manager is running in Session mode, which allows multiple DAGs to be submitted for execution. The idle time between DAG submissions should not exceed this time.	300
tez.runtime.intermediate.output.should-compress	Specifies whether Tez should compress intermediate output.	false
tez.runtime.intermediate.output.compress.codec	Specifies the codec to used when compressing intermediate output. This configuration is ignored unless <code>tez.runtime.intermediate-output.should-compress</code> is enabled.	org.apache.hadoop.io.compress.SnappyCodec
tez.runtime.intermediate.input.is-compressed	Specifies whether intermediate output is compressed.	false
tez.runtime.intermediate.input.compress.codec	Specifies the codec to use when reading intermediate compressed input. This configuration property is ignored unless	org.apache.hadoop.io.compress.SnappyCodec

Configuration Parameter	Description	Default Value
	<code>tez.runtime.intermediate-input.is-compressed</code> is enabled.	
<code>tez.yarn.ats.enabled</code>	Specifies that Tez should start the TimeClient for sending information to the Timeline Server.	false

### 10.2.3. 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 have been configured, the default queue will be used, which means that 100% of the cluster capacity will be used when running Tez jobs. If queues have been configured, a queue name must be configured for each YARN application.

Setting `tez.queue.name` in `tez-site.xml` would apply to Tez applications that use that configuration file. To assign separate queues for each application, you would need separate `tez-site.xml` files, or you could have the application pass this configuration to Tez while submitting the Tez DAG.

For example, in Hive you would use the `tez.queue.name` property in `hive-site.xml` to specify the queue to be used for Hive-on-Tez jobs. To assign Hive-on-Tez jobs to use the "engineering" queue, you would 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` will affect all Hive queries that read that configuration file.

To assign Hive-on-Tez jobs to use the "engineering" queue in a Hive query, you would use the following command in the Hive shell or in a Hive script:

```
set tez.queue.name=engineering;
```

## 10.3. Validate 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. Upload the `test.txt` file into HDFS:

```
hadoop fs -put test.txt /tmp/test.txt
```

4. Execute the following command to run the `OrderedWordCount` application using Tez:

```
hadoop jar /usr/lib/tez/tez-mapreduce-examples-*.jar orderedwordcount /tmp/test.txt /tmp/out
```

5. Run the following command to verify the word count:

```
hadoop fs -cat '/tmp/out/*'
```

This should return:

```
foo 3  
bar 2
```

## 10.4. Enable Tez for Hive Queries

### Limitations

This release of Tez does not support the following actions:

- SMB joins
- **SELECT TRANSFORM** queries
- Index creation
- Skew joins

Use the following instructions to enable Tez for Hive Queries:

1. Copy the `hive-exec-0.13.0.jar` to HDFS at the following location: `/apps/hive/install/hive-exec-0.13.0.jar`.

```
su - $HIVE_USER  
hadoop fs -mkdir /apps/hive/install  
hadoop fs -copyFromLocal /usr/lib/hive/lib/hive-exec-* /apps/hive/install/  
hive-exec-0.13.0.jar
```

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;
```

### Disabling Tez for Hive Queries

Use the following instructions 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.

## 10.5. Validate 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
```

3. Open the Hive command-line shell:

```
su $HDFS_USER
hive
```

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 successfully return results:

```
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>
```

## 10.6. Troubleshooting

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]
```

You can find the application ID at the end of the output to a running application, as shown in the following output from the `OrderedWordCount` application.

```
14/02/26 14:45:33 INFO examples.OrderedWordCount: DAG 1 completed. FinalState=
SUCCEEDED
14/02/26 14:45:33 INFO client.TezSession: Shutting down Tez
Session, sessionName=OrderedWordCountSession, applicationId=
application_1393449467938_0001
```

Apache Tez is still maturing as a technology, and there is not yet complete feature parity between it and Apache MapReduce. Try the following troubleshooting techniques if a Tez-based application does not run successfully.

- Does the application run successfully with Query Vectorization turned off?
- Does the application run successfully with Tez in a different session?
- Does the application run successfully with MapReduce?

Include all configuration settings and the answers to the above three questions with your support call. Providing Hortonworks Technical Support with the Tez configuration settings used for a problematic query is critical. The same query run with both the Tez and MapReduce execution engines should return the same results.

# 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.

Use the following instructions to install WebHCat:

1. [Install the WebHCat RPMs](#)
2. [Set Directories and Permissions](#)
3. [Modify WebHCat Configuration Files](#)
4. [Set Up HDFS User and Prepare WebHCat Directories On HDFS](#)
5. [Validate the Installation](#)

## 11.1. Install the WebHCat RPMs

On the WebHCat server machine, install the necessary RPMs.

- For RHEL/CentOS/Oracle Linux:

```
yum -y install hive-hcatalog hive-webhcat
yum -y install webhcat-tar-hive webhcat-tar-pig
```

- For SLES:

```
zypper install hcatalog webhcat-tar-hive webhcat-tar-pig
```

- For Ubuntu:

```
apt-get install hcatalog webhcat-tar-hive webhcat-tar-pig
```

## 11.2. 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, we recommend deleting and recreating them. Use the following instructions to set up Pig configuration files :

1. We strongly suggest that you edit and source the bash script files included in the companion files (downloaded in [Download Companion Files](#)).

Alternatively, you can also copy the contents to your `~/.bash_profile`) to set up these environment variables in your environment.

2. Execute these 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`.

## 11.3. Modify WebHCat Configuration Files

Use the following instructions to modify the WebHCat config files:

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

The files are located in the `configuration_files/webhcat` 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. See [Define Environment Parameters](#) for more information.

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

```
<property>
  <name>templeton.hive.properties</name>
  <value>hive.metastore.local=false, hive.metastore.uris=thrift://
  /$metastore.server.full.hostname:9083,hive.metastore.sasl.enabled=no,
  hive.metastore.execute.setugi=true</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>
```

```
<property>
  <name>templeton.controller.map.mem</name>
  <value>1600</value>
  <description>Total virtual memory available to map tasks.</description>
</property>
```

```
<property>
  <name>hive.metastore.warehouse.dir</name>
  <value>/path/to/warehouse/dir</value>
</property>
```

### 3. Set up the WebHCat configuration files.

#### a. Delete any existing WebHCat configuration files:

```
rm -rf $WEBHCAT_CONF_DIR/*
```

#### b. Copy all the 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`.

## 11.4. Set Up HDFS User and Prepare WebHCat Directories On HDFS

### 1. Set up the WebHCat user.

```
Login as $WEBHCAT_USER
hadoop fs -mkdir /user/$WEBHCAT_USER
hadoop fs -chown -R $WEBHCAT_USER:$WEBHCAT_USER /user/$WEBHCAT_USER
hadoop fs -mkdir /apps/webhcat
```

### 2. Prepare WebHCat directories on HDFS.

```
hdfs dfs -copyFromLocal /usr/share/HDP-webhcat/pig.tar.gz /apps/webhcat/
hdfs dfs -copyFromLocal /usr/share/HDP-webhcat/hive.tar.gz /apps/webhcat/
hdfs dfs -copyFromLocal /usr/lib/hadoop-mapreduce/hadoop-streaming*.jar /
apps/webhcat/
```

### 3. Set appropriate permissions for the HDFS user and the webhcat directory.

```
hadoop fs -chown -R $WEBHCAT_USER:users /apps/webhcat
hadoop fs -chmod -R 755 /apps/webhcat
```

where:

- `$WEBHCAT_USER` is the user owning the WebHCat services. For example, `hcat`.

## 11.5. Validate the Installation

### 1. Start the WebHCat server.

```
<login as $WEBHCAT_USER>  
su -hcat -c '/usr/lib/hive-hcatalog/sbin/webhcat_server.sh --config /etc/  
hcatalog/conf/webhcat start'
```

2. From the browser, type:

```
http://$WebHCat.server.full.hostname:50111/templeton/v1/status
```

You should see the following output:

```
{"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.

Complete the following instructions to install Oozie:

1. [Install the Oozie RPMs](#)
2. [Set Directories and Permissions](#)
3. [Set Up the Oozie Configuration Files](#)
4. [Validate the Installation](#)

### 12.1. Install the Oozie RPMs

#### 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. Optional - Enable the Oozie Web Console
  - Create a lib extension directory.



```
cd /usr/lib/oozie
```

- Add the ExtJS 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 libext/
```

- For SLES:

```
zypper install extjs-2.2-1  
cp /usr/share/HDP-oozie/ext-2.2.zip libext/
```

- For Ubuntu and Debian:

```
apt-get install extjs  
cp /usr/share/HDP-oozie/ext-2.2.zip libext/
```

- Add LZO JAR files.

```
cp /usr/lib/hadoop/lib/hadoop-lzo-*.jar libext/
```

### 3. Optional: Add database connector JAR files.

- a. Execute the following command on the Oozie metastore machine:

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

- b. Add the downloaded JAR files.

```
/usr/lib/oozie/bin/oozie-setup.sh -hadoop 2.x /usr/lib/hadoop -extjs /  
usr/share/HDP-oozie/ext-2.2.zip -jars /usr/lib/hadoop/lib/hadoop-lzo-*.  
jar:/usr/share/java/mysql-connector-java.jar
```

## 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. Use the following instructions to set up Oozie configuration files:

1. We strongly suggest that you edit and source the bash script files included in the companion files (downloaded in [Download Companion Files](#)).

Alternatively, you can also copy the contents to your `~/.bash_profile` to set up these environment variables in your environment.

2. Execute 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-conf  
chown -R $OOZIE_USER:$HADOOP_GROUP $OOZIE_TMP_DIR;  
chmod -R 755 $OOZIE_TMP_DIR;
```

where:

- `$OOZIE_DATA` is the directory to store the Oozie data. For example, `/var/db/oozie`.
- `$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`.

## 12.3. Set Up the Oozie Configuration Files

Complete the following instructions 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. Modify the configuration files, based on your environment and Oozie database type.

- **For Derby:**

In the temporary directory, locate the following file and modify the properties. Search for `TODO` in the files for the properties to replace.

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

```
<property>  
  <name>oozie.base.url</name>  
  <value>http://$oozie.full.hostname:11000/oozie</value>  
  <description>Enter your Oozie server hostname.</description>  
</property>
```

```
<property>
  <name>oozie.service.StoreService.jdbc.url</name>
  <value>jdbc:derby:$OOZIE_DATA_DIR/$soozie.db.schema.name-db:create=true</value>
</property>
```

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

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

```
<property>
  <name>oozie.service.JPIService.jdbc.password</name>
  <value>$OOZIE_DBPASSWD</value>
</property>
```

```
<property>
  <name>oozie.service.WorkflowAppService.system.libpath</name>
  <value>/user/$OOZIE_USER/share/lib</value>
</property>
```

- **For MySQL:**

- a. Install and start MySQL 5.x.



### Note

See [Metastore Database Requirements](#) for supported versions and [Installing and Configuring MySQL 5.x](#) for instructions.

- b. 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
```

- c. Configure Oozie to use MySQL.

Edit properties in the oozie-site.xml file as follows:

```
... <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.

- d. 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.

- **For Postgres:**

- a. Install PostgreSQL 8.4.x or 9.0.x.



### Note

See [Metastore Database Requirements](#) for supported versions and [Installing and Configuring MySQL 5.x](#) for instructions.

- b. Create the Oozie user and Oozie database. For example, using the Postgres `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
```

- c. Configure Postgres to accept network connections for user oozie.

Edit the Postgres `data/pg_hba.conf` file as follows:

```
host oozie oozie 0.0.0.0/0 md5
```

- d. Reload the Postgres configuration.

```
$ sudo -u postgres pg_ctl reload -s -D /opt/PostgreSQL/8.4/data
```

- e. Configure Oozie to use Postgres.

Edit the `oozie-site.xml` file as follows:

```
... <property>
  <name>oozie.service.JPIService.jdbc.driver</name>
  <value>org.postgresql.Driver</value>
</property>
<property>
  <name>oozie.service.JPIService.jdbc.url</name>
  <value>jdbc:postgresql://localhost:5432/oozie</value>
</property>
<property>
  <name>oozie.service.JPIService.jdbc.username</name>
  <value>oozie</value>
</property>
<property>
  <name>oozie.service.JPIService.jdbc.password</name>
  <value>oozie</value>
</property>
...
```



### Note

In the JDBC URL property, replace `localhost` with the hostname where Postgres is running. In the Postgres case, unlike MySQL or Oracle, there is no need to download and install the JDBC driver separately, because the driver is license-compatible and bundled with Oozie.

- **For Oracle:**

- a. Install and start Oracle 11g.



### Note

See [Metastore Database Requirements](#) for supported versions and [Installing and Configuring MySQL 5.x](#) for instructions.

- b. Create the Oozie Oracle user.

For example, using the Oracle `sqlplus` 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
$
```

c. Configure Oozie to use Oracle.

Edit the `oozie-site.xml` file as follows:

```
... <property>
  <name>oozie.service.JPIService.jdbc.driver</name>
  <value>oracle.jdbc.driver.OracleDriver</value>
</property>
<property>
  <name>oozie.service.JPIService.jdbc.url</name>
  <value>jdbc:oracle:thin:@localhost:1521:oozie</value>
</property>
<property>
  <name>oozie.service.JPIService.jdbc.username</name>
  <value>oozie</value>
</property>
<property>
  <name>oozie.service.JPIService.jdbc.password</name>
  <value>oozie</value>
</property>
...
```



### Note

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.

d. Add the Oracle JDBC driver JAR to Oozie. Copy or symlink the Oracle JDBC driver JAR in the `/var/lib/oozie/` directory.



### Note

Note: You must manually download the Oracle JDBC driver JAR file.

3. Edit the `oozie-env.sh` and modify the following properties to match the directories created:

```
modify: export JAVA_HOME=
add: JRE_HOME=${
{JAVA_HOME}

export OOOIE_CONFIG=${
{OOOIE_CONFIG:-/etc/oozie/conf}

export CATALINA_BASE=${
{CATALINA_BASE:-/var/lib/oozie/oozie-server}

export CATALINA_TMPDIR=${
{CATALINA_TMPDIR:-/var/tmp/oozie}

export OOOIE_CATALINA_HOME=/usr/lib/bigtop-tomcat
```

#### 4. Copy the Configuration Files.

On your Oozie server create the config directory, copy the configuration files, and set the permissions:

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

#### 5. Copy all the config files to `$OOOIE_CONF_DIR` directory.

#### 6. Set appropriate permissions.

```
chown -R $OOOIE_USER:$HADOOP_GROUP $OOOIE_CONF_DIR/./ ;
chmod -R 755 $OOOIE_CONF_DIR/./ ;
```

where:

- `$OOOIE_CONF_DIR` is the directory to store Oozie configuration files. For example, `/etc/oozie/conf`.
- `$OOOIE_DATA` is the directory to store the Oozie data. For example, `/var/db/oozie`.
- `$OOOIE_LOG_DIR` is the directory to store the Oozie logs. For example, `/var/log/oozie`.
- `$OOOIE_PID_DIR` is the directory to store the Oozie process ID. For example, `/var/run/oozie`.
- `$OOOIE_TMP_DIR` is the directory to store the Oozie temporary files. For example, `/var/tmp/oozie`.
- `$OOOIE_USER` is the user owning the Oozie services. For example, `oozie`.
- `$HADOOP_GROUP` is a common group shared by services. For example, `hadoop`.

#### 7. Configure your database for Oozie:

- **For Derby:**

No database configuration is required.

- **For MySQL:**

```
echo "create database if not exists oozie;" | mysql -u root
echo "grant all privileges on oozie.* to 'oozie'@'localhost' identified by
'oozie';" | mysql -u root
echo "grant all privileges on oozie.* to 'oozie'@`hostname -f` identified
by 'oozie';" | mysql -u root
```

- **For Postgres:**

```
echo "CREATE DATABASE oozie;" | psql -U postgres
echo "CREATE USER oozie WITH PASSWORD 'oozie';" | psql -U postgres
echo "GRANT ALL PRIVILEGES ON DATABASE oozie TO oozie;" | psql -U postgres
```

- **For Oracle:**

```
bash -l -c 'echo "create user oozie identified by oozie;" | sqlplus
system/root@`hostname -f`'
bash -l -c 'echo "GRANT SELECT_CATALOG_ROLE TO oozie;" | sqlplus system/
root@`hostname -f`'
bash -l -c 'echo "GRANT CONNECT, RESOURCE TO oozie;" | sqlplus system/
root@`hostname -f`'
```

## 12.4. Validate the Installation

Use these steps to validate your installation.

1. If you are using a non-Derby database, copy your database connector jar file into `/usr/lib/oozie/libext`.
2. Run the setup script to prepare the Oozie Server.

```
cd /usr/lib/oozie/
bin/oozie-setup.sh prepare-war
chmod 777 -R /var/log/oozie
ln -s /etc/oozie/conf/action-conf /etc/oozie/conf.dist/action-conf
```

3. Create the Oozie DB schema

```
cd /usr/lib/oozie/
bin/ooziedb.sh create -sqlfile oozie.sql -run Validate DB Connection
```

4. Start the Oozie server:

```
<login as $oozie_user>
cd /usr/lib/oozie/
/usr/lib/oozie/bin/oozie-start.sh
```

5. Confirm that you can browse to the Oozie server:

```
http://{oozie.full.hostname}:11000/oozie
```

6. Access the Oozie Server with the Oozie client.

```
oozie admin -oozie http://$oozie.full.hostname:11000/oozie -status
```

You should see the following output:



System mode: NORMAL

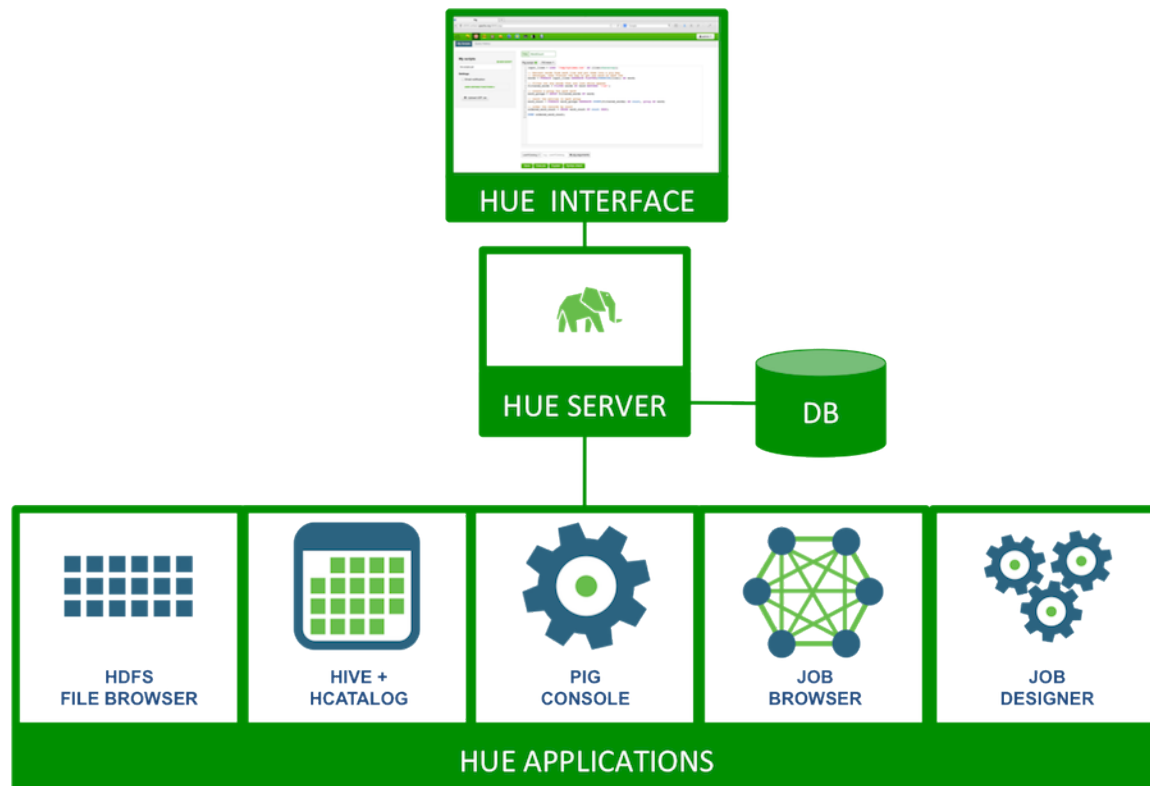
**Next steps:**

For example workflow templates, [download companion files](#), and use `\oozie_workflows`.

For more information about Apache Oozie, see <http://oozie.apache.org/docs/4.0.0/> .

## 13. Installing Hue

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



Complete the following instructions to install Hue:

1. [Prerequisites](#)
2. [Configure HDP](#)
3. [Install Hue](#)
4. [Configure Hue](#)
5. [Start Hue](#)
6. [Validate Hue](#)

### 13.1. Prerequisites

Complete the following prerequisites before deploying Hue.

1. Verify that you have a host that supports Hue:
  - 64-bit Red Hat Enterprise Linux (RHEL) 5 or 6
  - 64-bit CentOS 5 or 6
  - 64-bit Oracle Linux 5 or 6

- 64-bit SUSE Linux Enterprise Server (SLES) 11, SP1 or SP3



## Note

Hue is not supported on Ubuntu.

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

**Table 13.1. Hue Browser Support**

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 the services in your cluster. For more information see the instructions provided [here](#).
5. Install and run the HDP Hadoop cluster from HDP-2.1.X.

The following table outlines the dependencies on the HDP components:

**Table 13.2. Dependencies on the HDP components**

Component	Required	Applications	Notes
HDFS	Yes	Core, Filebrowser	HDFS access through WebHDFS or HttpFS
YARN	Yes	JobDesigner, JobBrowser, Hive	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 where you want to deploy your Hue Server.

Typically, you can choose to deploy Hue on any node within your cluster. However, if your corporate firewall policies allow, you can also use a remote host machine as your Hue server. For pilot or small cluster sizes, you can use the master install machine for HDP as your Hue server.

7. Configure the firewall.
  - a. Verify that the host machines within your cluster can connect to each other over TCP.
  - b. 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.

## 13.2. Configure HDP



### Note

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.

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

On the NameNode, Secondary NameNode, and all the DataNodes, add the following properties 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 `webhcat-site.xml` file. On the WebHCat Server host, add the following properties to the `$WEBHCAT_CONF_DIR/webhcat-site.xml` Where `$WEBHCAT_CONF_DIR` is the directory for storing WebHCat configuration files. For example, `/etc/webhcat/conf`.

```
vi $WEBHCAT_CONF_DIR/webhcat-site.xml
```

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

```
<property>
  <name>webhcat.proxyuser.hue.groups</name>
  <value>*</value>
</property>
```

4. Modify the `oozie-site.xml` file. On the Oozie Server host, add the following properties to the `$OOZIE_CONF_DIR/oozie-site.xml`. Where `$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>
```

5. Switch to the HDFS user and stop the NameNode by running the following command:

```
su $HDFS_USER
/usr/lib/hadoop/sbin/hadoop-daemon.sh --config $HADOOP_CONF_DIR stop
namenode
```

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

## 13.3. Install Hue

### Prerequisites

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

```
yum list hue hue-*
```

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

```
hue.x86_64 <version>
hue-beeswax.x86_64 <version>
hue-common.x86_64 <version>
hue-hcatalog.x86_64 <version>
hue-oozie.x86_64 <version>
hue-pig.x86_64 <version>
hue-server.x86_64 <version>
```

If yum responds with "Error: No matching package to list" 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 Repository](#) to configure either a public or private repository before proceeding.

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

## Installation

Execute the following command on all Hue Server host machines:

- For RHEL/CentOS/Oracle Linux:

```
yum install hue
```

- For SLES:

```
zypper install hue
```



### Note

Hue is not supported on Ubuntu or Debian hosts.

## 13.4. 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
```

- To use multiple files to store your configuration:

Hue loads and merges all of the files with extension `.ini` located in the `/etc/hue/conf` directory.

Use the following instructions to configure Hadoop for Hue:

1. [Configure Web Server](#)
2. [Configure Hadoop](#)
3. [Configure Beeswax](#)
4. [Configure JobDesigner and Oozie](#)
5. [Configure UserAdmin](#)
6. [Configure WebHCat](#)

### 13.4.1. 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:

a. Execute the following command on the Hue Server:

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

b. 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
```

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
```



#### Note

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

## 13.4.2. Configure Hadoop

Use the following instructions to configure Hadoop:

These configuration variables are under the `[hadoop]` section in the `hue.ini` configuration file.

### 1. Configure an HDFS Cluster.

Hue supports only one HDFS cluster currently.

Ensure that you define the HDFS cluster under the `[hadoop][hdfs_clusters][[default]]` sub-section. Use the following variables to configure the HDFS cluster:

<code>fs_defaultfs</code>	This is equivalent to <code>fs.defaultFS</code> ( <code>fs.default.name</code> ) in Hadoop configuration. For example, <code>hdfs://fqdn.namenode.host:8020</code>
<code>webhdfs_url</code>	You can also set this to be the WebHDFS URL. The default value is the HTTP port on the NameNode. For example, <code>http://fqdn.namenode.host:50070/webhdfs/v1</code>
<code>hadoop_hdfs_home</code>	This is the home of your Hadoop HDFS installation. It is the root of the Hadoop untarred directory or usually <code>/usr/lib/hadoop</code> .
<code>hadoop_bin</code>	Use this as the HDFS Hadoop launcher script, which is usually <code>/usr/bin/hadoop</code> .
<code>hadoop_conf_dir</code>	This is the configuration directory of the HDFS, typically <code>/etc/hadoop/conf</code> .



### Note

For more information on how to configure Hue with a NameNode HA cluster, see [Deploy Hue with an HA Cluster](#).

### 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:

<code>resourcemanager_host</code>	The host running the ResourceManager.
<code>resourcemanager_port</code>	The port for the ResourceManager IPC service.
<code>submit_to</code>	Set this property to true. Hue will be submitting jobs to this YARN cluster. But note that JobBrowser will not be able to show MR2 jobs.
<code>hadoop_mapred_home</code>	This is the home of your Hadoop MapReduce installation. It is the root of HDP Hadoop-MapReduce directory ( <code>/usr/lib/hadoop-mapreduce</code> ). If <code>submit_to</code> is true for this cluster, this configuration value is set as the



	<code>\$HADOOP_MAPRED_HOME</code> for BeeswaxServer and child shell processes.
<code>hadoop_bin</code>	Use this as the YARN/MR2 Hadoop launcher script ( <code>/usr/bin/hadoop</code> ).
<code>hadoop_conf_dir</code>	This is the configuration directory of the YARN/MR2 service, typically set to <code>/etc/hadoop/conf</code> .
<code>resourcemanager_api_url</code>	The URL of the ResourceManager API. For example, <code>http://fqdn.resourcemanager.host:8088</code> .
<code>proxy_api_url</code>	The URL of the ProxyServer API. For example, <code>http://fqdn.resourcemanager.host:8088</code> .
<code>history_server_api_url</code>	The URL of the HistoryServer API. For example, <code>http://fqdn.historyserver.host:19888</code> .
<code>node_manager_api_url</code>	The URL of the NodeManager API. For example, <code>http://fqdn.resourcemanager.host:8042</code> .

### 13.4.3. Configure Beeswax

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

<code>beeswax_server_host</code>	The hostname or IP that the Beeswax Server should bind to. By default it binds to localhost, and therefore only serves local IPC clients.
<code>hive_home_dir</code>	The base directory of your Hive installation.
<code>hive_conf_dir</code>	The directory containing your <code>hive-site.xml</code> Hive configuration file.
<code>beeswax_server_heapsize</code>	The heap size ( <code>-Xmx</code> ) of the Beeswax Server.



#### Important

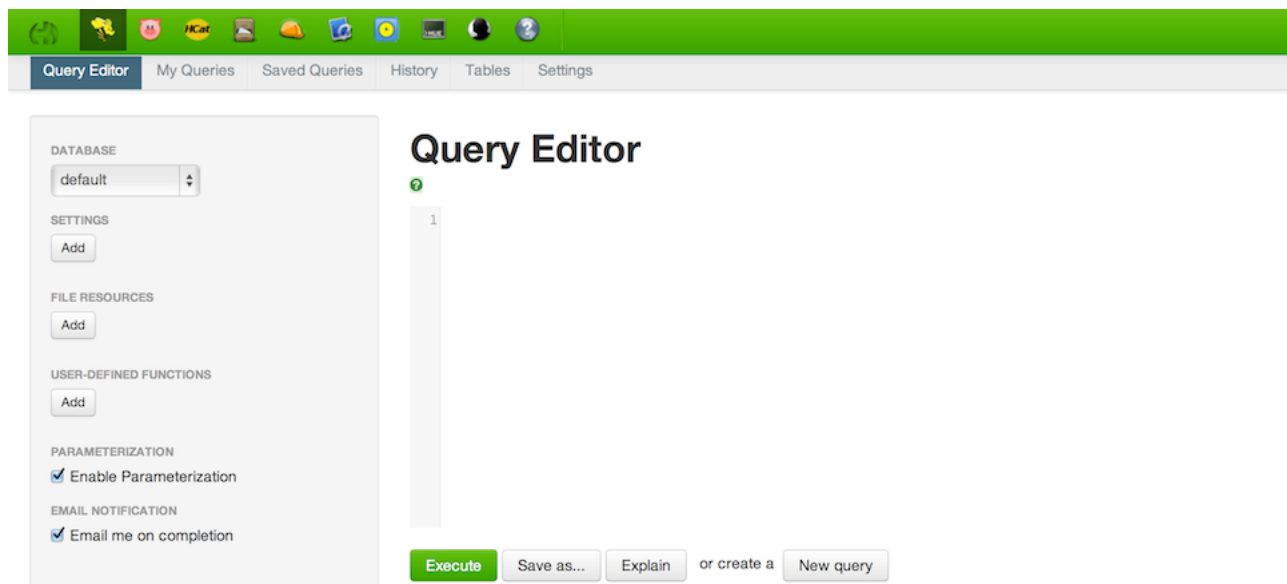
Depending on your environment and the Hive queries you run, queries may fail with an `Internal error processing query message`. Look for an error message `java.lang.OutOfMemoryError: GC overhead limit exceeded` in the `beeswax_server.out` log file. To increase the heap size to avoid this out of memory error, modify the `hadoop-env.sh` file and change the value of `HADOOP_CLIENT_OPTS`.

#### 13.4.3.1. Optional - Configure Beeswax Email Notifications

You can receive email notifications when a query completes.

To configure email notifications:

1. Confirm that the `/etc/hue/conf/hue.ini` file is pointing to the correct SMTP server host and port.
2. Set up your user profile. Select **User Admin** and select your user name for email notifications.
3. Select **Step 2: Names and Groups**.
4. Add your e-mail address and save.
5. From the Beeswax Query Editor, select **Email me on completion** and run your query.



### 13.4.4. Configure JobDesigner and Oozie

In the `[liboozie]` section of the configuration file, you should specify:

`oozie_url`            The URL of the Oozie service as specified by the `OOZIE_URL` environment variable for Oozie.

### 13.4.5. Configure UserAdmin

In the `[useradmin]` section of the configuration file, you can optionally specify:

`default_user_group`            The name of a default group that is suggested when creating a user manually. If the `LdapBackend` or `PamBackend` are configured for user authentication, new users will automatically be members of the default group.

### 13.4.6. Configure WebHCat

In the `[hcatalog]` section of the `hue.ini` configuration file, update the following property:

templeton\_url      The hostname or IP of the WebHCat server. For example: "http://hostname:50111/templeton/v1/"

## 13.5. Start Hue

As a root user, execute the following command on the Hue Server:

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

This command starts several subprocesses corresponding to the different Hue components.



### Note

To stop Hue, execute the following command:

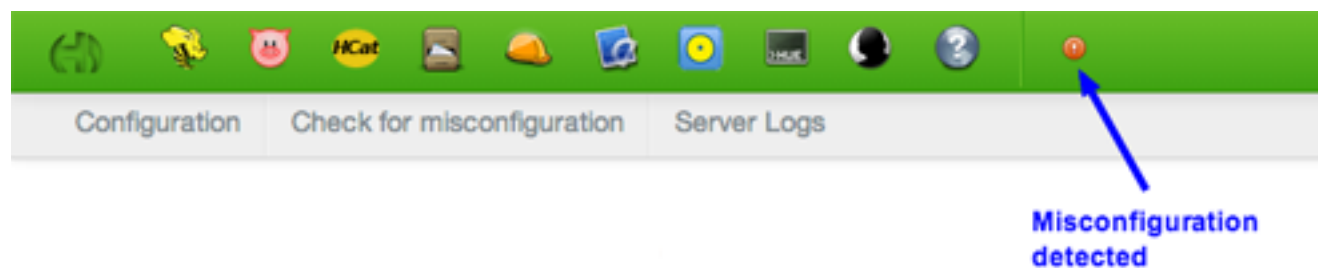
```
/etc/init.d/hue stop
```

To restart Hue, execute the following command:

```
/etc/init.d/hue restart
```

## 13.6. Validate 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`.

## 13.7. 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 11gr2](#)
- [Using Hue with MySQL 5.x](#)
- [Using Hue with PostgreSQL 8.x, 9.x](#)

### 13.7.1. 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
```

4. Install or Upgrade the Django Python library `south`:

```
pip install south --upgrade
```

5. Synchronize Hue with the external database to create the schema and load the data:

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

6. Start Hue.

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

## 13.7.2. 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
```

### 13.7.3. 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):

#### **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
```

## 14. 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:

1. [Install the Sqoop RPMs](#)
2. [Set Up the Sqoop Configuration](#)
3. [Install the Sqoop RPMs](#)

### 14.1. Install the Sqoop RPMs

#### Prerequisites

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

```
yum list sqoop
```

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

```
sqoop.noarch <version>
```

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

- For RHEL/CentOS/Oracle Linux:

```
yum install sqoop
```

- For SLES:

```
zypper install sqoop
```

- For Ubuntu:

```
apt-get install sqoop
```

### 14.2. Set Up the Sqoop Configuration

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

Use the following instructions to set up Sqoop configuration files:

1. We strongly suggest that you edit and source the bash script files included in the companion files (downloaded in [Download Companion Files](#)).

Alternatively, you can also copy the contents to your `~/.bash_profile` to set up these environment variables in your environment.

2. 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.

3. 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. See [Define Environment Parameters](#) for more information.

- a. From the file you downloaded in [Download Companion Files](#) extract the files in `configuration_files/sqoop` to a temporary directory.
- b. Copy all the configuration files to the Sqoop configuration directory, such as `/usr/lib/sqoop/conf`.

## 14.3. Validate the Installation

Execute the following command. You should see the Sqoop version information displayed.

```
sqoop version | grep 'Sqoop [0-9].*'
```



## 15. Installing Apache Mahout

Install Apache Mahout on the machine that will run it, either the Hadoop node or your client environment. Do not install it on every node in your cluster.

To install the Mahout RPM use the following command:

- RHEL/CentOS/Oracle Linux:

```
yum install mahout
```

- For SLES:

```
zypper install mahout
```

- For Ubuntu:

```
apt-get install mahout
```

# 16. Installing and Configuring Apache Flume in HDP

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:

- [Understand Flume](#)
- [Install Flume](#)
- [Configure Flume](#)
- [Start Flume](#)
- [HDP and Flume](#)
- [A Simple Example](#)

## 16.1. Understand 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/lib/flume/docs/index.html` on the host on which Flume is installed. The “*Flume User Guide*” is available at `file:///usr/lib/flume/docs/FlumeUserGuide.html`. If you have access to the Internet, the same documentation is also available at the Flume website, [flume.apache.org](http://flume.apache.org).

### 16.1.1. 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 on 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.

## 16.2. Install Flume

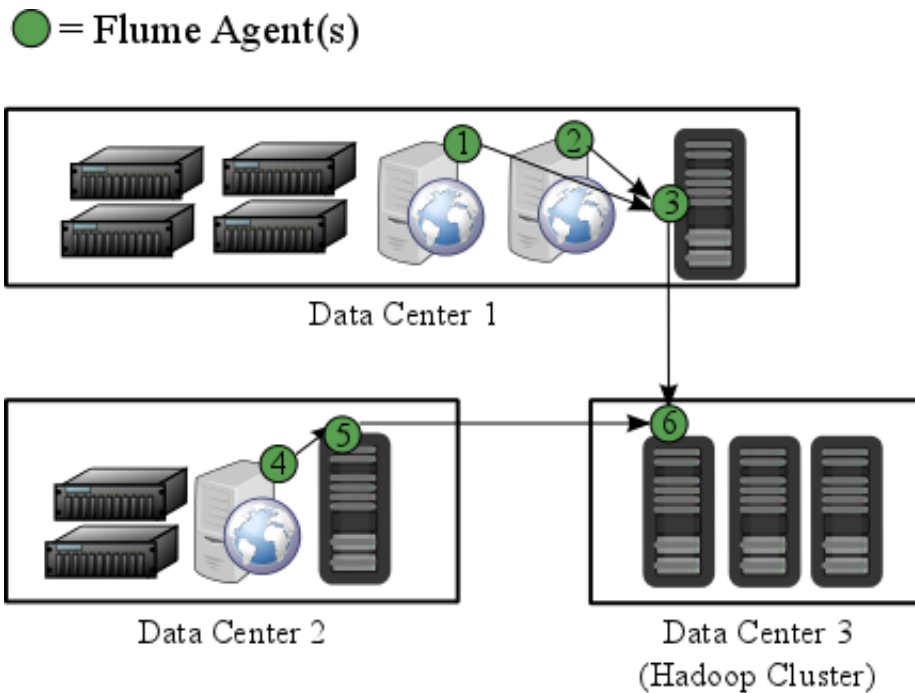
Flume is included in the HDP repository, but it is not installed automatically as part of the standard HDP installation process. Hortonworks recommends that administrators not install Flume agents on any node in a Hadoop cluster. The following image depicts a sample topology with six Flume agents:

- 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.



**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 [Configure Flume](#) for more information about configuring Flume agents.

## 16.3. Prerequisites

1. The following Flume components have HDP component dependencies. You cannot use these Flume components if the dependencies are not installed.

**Table 16.1. Flume 1.4.0 Dependencies**

Flume Component	HDP Component Dependencies
HDFS Sink	Hadoop 2.4
HBase Sink	HBase 0.98.0
Hive SinkHCatalog	Hive 0.13.0, 0.13.0, and Hadoop 2.4

See [HDP Deployment Options](#) 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-2.1
```

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.
```

3. You must correctly set and export your `JAVA_HOME` environment variable for your operating system. See [JDK Requirements](#) for instructions on installing JDK.

## 16.4. Installation

Verify the HDP repositories are available for your Flume installation by entering `yum list flume`. See [Prerequisites](#) for more information.

- 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
```

## 16.5. Directories

The main Flume files are located in `/usr/lib/flume` and the main configuration files are located in `/etc/flume/conf`.

## 16.6. Configure Flume

Administrators edit three configuration files to configure a Flume agent:

- `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 to start a single 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](#):

```
# 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 which 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
```

See the [Apache Flume 1.4.0 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 start-up: `/etc/flume/conf/flume-env.sh.template`.



### Note

Make sure to specify a target folder in HDFS if you use an [HDFS sink](#).

## 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 enable Ganglia monitoring, add the following properties to the `JAVA_OPTS` property:

```
JAVA_OPTS="-Dflume.monitoring.type=ganglia"
```

```
-Dflume.monitoring.hosts=<ganglia-server>:8660"
```

Where <ganglia-server> is the name of the Ganglia server host.

- 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
```

## 16.7. Start Flume

There are two options for starting Flume.

- Start Flume directly. On the Flume host:

```
/usr/lib/flume/bin/flume-ng agent -c /etc/flume/conf -f /etc/flume/conf/flume.conf -n agent
```

- Start Flume as a service. On the Flume host:

```
service flume-agent start
```

## 16.8. HDP and Flume

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

### 16.8.1. Sources

- Exec (basic, restart)
- Syslogtcp
- Syslogudp

### 16.8.2. Channels

- Memory
- File

### 16.8.3. Sinks

- HDFS: secure, nonsecure
- HBase

See the [Apache Flume 1.4.0 User Guide](#) for a complete list of all available Flume components.

## 16.9. 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 = hdfsSink
agent.sinks.hdfsSink.type = hdfs
agent.sinks.hdfsSink.channel = memoryChannel
agent.sinks.hdfsSink.hdfs.path = hdfs://<FQDN>:8020/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 start-up 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.



# 17. 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.

Complete the following instructions to install Apache Storm.

1. [Install the Storm RPMs.](#)
2. [Configure Storm.](#)
3. [Configure supervisor to run the Storm daemons.](#)
4. [Validate the installation.](#)

## 17.1. Install the Storm RPMs

Execute the following command on each client cluster node and gateway node to install the Storm RPMs:

- For RHEL/CentOS/Oracle Linux:

```
yum install storm
```

- For SLES:

```
zypper install storm
```

- For Ubuntu:

```
apt-get install storm
```



### Important

Ubuntu users must manually create the `/etc/storm/conf` directory and the `storm.yaml` file that resides there.

1. Execute the following command to create the `conf` directory:

```
sudo mkdir -p /etc/storm/conf
```

2. Execute the following command to create the `storm.yaml` file:

```
sudo touch /etc/storm/conf/storm.yaml
```



### Note

Storm requires version 2.6 or higher as the default system Python interpreter.

## 17.2. Configure Storm

Use the following procedure to configure Storm:

1. Add the following properties to the `/etc/storm/conf/storm.yaml` file to configure Storm.

```
storm.zookeeper.servers:
  - $ZOOKEEPER_SERVERS

nimbus.host: $NIMBUS_HOSTNAME

drpc.servers:
  - "localhost"

storm.local.dir: $STORM_LOCAL_DIR

logviewer.port: 8081
```

`ZOOKEEPER_SERVERS` is a comma-separated list of ZooKeeper servers.

`NIMBUS_HOSTNAME` is the hostname where the Storm Nimbus server is started.

`STORM_LOCAL_DIR` should be `/tmp/storm/local`, and it must exist on all Storm nodes.

2. Execute the following commands:

```
chown -R storm:storm $STORM_LOCAL_DIR
chmod -R 755 $STORM_LOCAL_DIR
```

## 17.3. (Optional) Configure Storm to Work with a Secured Zookeeper Cluster

Use the following steps to configure Storm to work with a secured Zookeeper cluster:

1. Create a `jaas.conf` file in the `/etc/storm/conf` with the following content on all hosts in the Storm cluster :

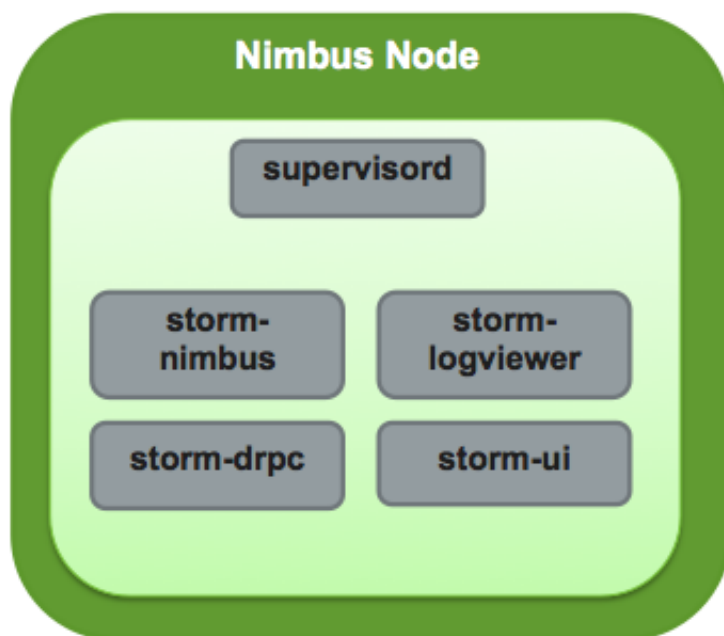
```
Client {
  com.sun.security.auth.module.Krb5LoginModule required
  useKeyTab=true
  keyTab="$keytab"
  storeKey=true
  useTicketCache=false
  serviceName="zookeeper"
  principal="$principal";
};
```

2. Add the following configuration properties to the `storm.yaml` file:

```
nimbus.childopts:"-Djava.security.auth.login.config=/path/to/jaas.conf"
ui.childopts:"-Djava.security.auth.login.config=/path/to/jaas.conf"
supervisor.childopts:"-Djava.security.auth.login.config=/path/to/jaas.conf"
```

## 17.4. Configure 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 `monit` or `daemontools`.



Add the following stanzas to the `/etc/supervisord.conf` to configure Supervisor to start and stop all 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
```

## 17.5. Validate the Installation

Validate the Apache Storm installation to verify a successful installation and configuration.



### Note

You must start ZooKeeper before starting Storm.

1. Execute the following command to start the Storm daemons:

- RHEL/CentOS/Oracle Linux

```
/usr/bin/supervisord start
```

- SLES

```
/usr/bin/supervisord start
```

- Ubuntu

```
service supervisor start
```

2. Execute 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 a web page similar to the following:

# Storm UI

## Cluster Summary

Version	Nimbus uptime	Supervisors	Used slots
0.9.0.1	34m 15s	0	0

## Topology summary

Name	Id	Status	Uptime
<a href="#">WordCount</a>	WordCount-2-1391628483	ACTIVE	21d 6h 5m 2

## Supervisor summary

Id	Host	Uptime
----	------	--------

## Nimbus Configuration

Key	Value
dev.zookeeper.path	/tmp/dev
drpc.childopts	-Xmx768
drpc.invocations.port	3773
drpc.port	3772
drpc.queue.size	128
drpc.request.timeout.secs	600
drpc.servers	["localhos
drpc.worker.threads	64

# 18. Installing Apache Accumulo

Apache Accumulo is a highly scalable structured and distributed key/value store for high performance data storage and retrieval.

1. [Install the accumulo RPM](#)
2. [Configure accumulo](#)
3. [Validate the installation](#)



## 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. It is recommended that you run Network Time Protocol (NTP) within the cluster to keep node clocks in sync to avoid problems with automatically timestamped data.

## 18.1. Install the Accumulo RPM

### Prerequisites

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

```
yum list accumulo
```

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

```
hbase.accumulo <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

To install the Accumulo RPM use the following command:

- RHEL/CentOS/Oracle Linux:

```
yum install accumulo
```

- For SLES:

```
zypper install accumulo
```

- For Ubuntu:

```
apt-get install accumulo
```

## 18.2. Configure 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 of the 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. Make an Accumulo data directory:

```
su hdfs
hadoop fs -mkdir -p /user/accumulo/data
```

3. Change permissions to restrict access to the data directory to the accumulo user:

```
su hdfs
hadoop fs -chmod -R 700 /user/accumulo/data
```

4. Change ownership of the data directory to the Accumulo user and group.

```
su hdfs
hadoop fs -chown -R accumulo:accumulo /user/accumulo/data
```

## 18.3. Validate Accumulo

To validate that Accumulo is set up correctly:

1. Start the Accumulo service:

- a. Initialize Accumulo:

```
/usr/lib/accumulo/bin/accumulo init
```

- b. Enter a instance name and password.

- c. Run the Accumulo start-all.sh script:

```
/usr/lib/accumulo/bin/start-all.sh
```

2. View the Accumulo native UI:

```
http://$accumulo-master:50095
```



# 19. 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. [Install the Falcon RPM](#)
2. [Configure Proxy Settings](#)
3. [Configure Falcon Entites](#)
4. [Configuring Oozie for Falcon](#)
5. [Configuring Hive for Falcon](#)
6. [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.

## 19.1. Install the Falcon RPM

To install the Falcon RPM, use the following command:

- RHEL/CentOS/Oracle Linux:

```
yum install falcon
```

- For SLES:

```
zypper install falcon
```

- For Ubuntu or Debian:

```
apt-get install falcon
```

## 19.2. Configure Proxy Settings

1. [Stop all services.](#)
2. Change the proxy settings for the falcon user in the `core-site.xml` file.

```
<property>  
<name>hadoop.proxyuser.falcon.groups</name>
```

```
<value>users</value>
<description> Proxy group for Hadoop. </description>
</property>

<property>
<name>hadoop.proxyuser.falcon.hosts</name>
<value>*</value>
<description> Proxy host for Hadoop. </description>
</property>
```

3. [Start all services.](#)

## 19.3. 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 in [Defining Data Pipelines](#) or create your own based on the [Falcon Schemas](#).

## 19.4. 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.

Execute these commands on the Oozie host machine.

```
su $OOZIE_USER
/usr/lib/oozie/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, $NameNode: $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 in bold 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-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/lib/oozie/oozie.war`.

This will make sure all existing items in the WAR file are still present after the current update.

```

su root
cp $CATALINA_BASE/webapps/oozie.war /usr/lib/oozie/oozie.war

```

Where `$CATALINA_BASE` is the path for the Oozie web app. By default, `$CATALINA_BASE` is `/var/lib/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/lib/falcon/oozie/ext/falcon-oozie-el-extension-0.5.0.2.1.5.0-695.jar \
/tmp/falcon-oozie-jars/

```

7. Package the Oozie WAR file.

```

su oozie
cd /usr/lib/oozie/bin
./oozie-setup.sh prepare-war -d /tmp/falcon-oozie-jars

```

8. Start the Oozie service on all Falcon clusters.

Execute these commands on the Oozie host machine.

```

su $OOZIE_USER
/usr/lib/oozie/bin/oozie-start.sh

```

Where `$OOZIE_USER` is the Oozie user. For example, `oozie`.

## 19.5. Configuring Hive for Falcon

Falcon-generated Hive actions require changes to `hive-site.xml` to pass the right configuration parameters.



### Warning

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 subdirectory called `action-conf`. Under that directory, 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.

## 19.6. Configuring for Secure Clusters

If you are using secure clusters, verify that `hadoop.security.auth_to_local` in `core-site.xml` is consistent across all clusters.



### Warning

Inconsistencies in rules for `hadoop.security.auth_to_local` can lead to issues with delegation token renewals.

You must also create the following property definitions in your cluster entity or entities:

```
<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>
```



### Note

Replace `$my.internal@EXAMPLE.COM` and `$my.internal` with your own values.

## 19.7. 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 as:

```
falcon/default/Submit successful (process) rawEmailIngestProcess
```

## 20. Installing Apache Knox

Apache Knox Gateway (Apache Knox) is the Web/REST API Gateway solution for Hadoop. It provides a single access point for all of Hadoop resources over REST. It 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 RPM](#)
2. [Validating the Knox Gateway Installation](#)

### 20.1. Install the Knox RPMs on the Knox server

To install the Knox RPM, 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/lib/knox`, which is referred to as `$gateway_home`.
- Knox configuration directory: `/etc/knox/conf`
- Knox log directory: `/var/log/knox`

### 20.2. 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 then test access to your existing cluster with the minimal configuration.



#### Tip

Use the setup 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 are prompted for the master secret, enter the password at the prompts.

2. Start the gateway:

```
su -l Knox -c "$gateway_home/bin/gateway.sh start"
Starting Gateway succeeded with PID 1871.
```

The gateway starts and 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 "$gateway_home/bin/ldap.sh start"
Starting LDAP succeeded with PID 1965.
```



### Note

In a production environment, we recommend using Active Directory or OpenLDAP for authentication. For detailed instructions on configuring 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 gateway host to WebHDFS Service host using telnet:

```
telnet $webhdfs_host $webhdfs_port
```



### Warning

You must successfully be able to reach the internal cluster service from the gateway before continuing.

6. Update the WebHDFS host information:

- a. Open the `$gateway_home/conf/topologies/sandbox.xml` file in an editor, such as `vi`.

- b. Find 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.

c. (Optionally) 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. (Optionally) 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 -ssl3 -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.

## 21. Installing Ganglia

This section describes installing and testing Ganglia, a system for monitoring and capturing metrics from services and components of the Hadoop cluster.

### 21.1. Install the Ganglia RPMs

On the host you have chosen to be the Ganglia server, install the server RPMs.

- For RHEL/CentOS/Oracle Linux:

```
yum install ganglia-gmond-3.5.0-99 ganglia-gmetad-3.5.0-99 ganglia-web-3.5.7-99
```

- For SLES:

```
zypper install ganglia-gmond-3.5.0-99 ganglia-gmetad-3.5.0-99 ganglia-web-3.5.7-99
```

On each host in the cluster, install the client RPMs:

- For RHEL/CentOS/Oracle Linux:

```
yum install ganglia-gmond-3.5.0-99
```

- For SLES:

```
zypper install ganglia-gmond-3.5.0-99
```

### 21.2. Install the Configuration Files

There are several configuration files that need to be set up for Ganglia.

#### 21.2.1. Extract the Ganglia Configuration Files

From the file you downloaded in [Download Companion Files](#), open the `configuration_files.zip` and copy the files in the `ganglia` folder to a temporary directory. The `ganglia` folder contains two sub-folders, `objects` and `scripts`.

#### 21.2.2. Copy the Configuration Files

On each host in the cluster:

1. Grant execute permissions on the following scripts:

- `/usr/libexec/hdp/ganglia/setupGanglia.sh`
- `/usr/libexec/hdp/ganglia/startRrdcached.sh`

2. Change permissions on the RRD base directory to grant access to nobody:

```
chown -R nobody:nobody $RRDCACHED_BASE_DIR  
chmod -R 755 $RRDCACHED_BASE_DIR
```

3. Create the directory for the `objects` folder:

```
mkdir -p /usr/libexec/hdp/ganglia
```

4. Copy the `objects` files:

```
cp <tmp-directory>/ganglia/objects/*.* /usr/libexec/hdp/ganglia/
```

5. Copy the Ganglia monitoring init script to `init.d`

```
cp <tmp-directory>/ganglia/scripts/hdp-gmond /etc/init.d
```

On the Ganglia Server Host:

1. Copy the entire contents of the `scripts` folder to `init.d`

```
cp -R <tmp-directory>/ganglia/scripts/* /etc/init.d/
```

### 21.2.3. Set Up Ganglia Hosts

1. On the Ganglia server, to configure the `gmond` collector:

```
/usr/libexec/hdp/ganglia/setupGanglia.sh -c HDPHistoryServer -m  
/usr/libexec/hdp/ganglia/setupGanglia.sh -c HDPNameNode -m  
/usr/libexec/hdp/ganglia/setupGanglia.sh -c HDPSlaves -m  
/usr/libexec/hdp/ganglia/setupGanglia.sh -t
```

2. If HBase is installed, on the HBase Master:

```
/usr/libexec/hdp/ganglia/setupGanglia.sh -c HDPHBaseMaster -m
```

3. On the NameNode and SecondaryNameNode servers, to configure the `gmond` emitters:

```
/usr/libexec/hdp/ganglia/setupGanglia.sh -c HDPNameNode
```

4. On the ResourceManager server, to configure the `gmond` emitters:

```
/usr/libexec/hdp/ganglia/setupGanglia.sh -c HDPResourceManager
```

5. On all hosts, to configure the `gmond` emitters:

```
/usr/libexec/hdp/ganglia/setupGanglia.sh -c HDPSlaves
```

6. If HBase is installed, on the HBase Master, to configure the `gmond` emitter:

```
/usr/libexec/hdp/ganglia/setupGanglia.sh -c HDPHBaseMaster
```

### 21.2.4. Set Up Configurations

1. On the Ganglia server, use a text editor to open the following master configuration files:

```
/etc/ganglia/hdp/HDPNameNode/conf.d/gmond.master.conf  
/etc/ganglia/hdp/HDPHistoryServer/conf.d/gmond.master.conf  
/etc/ganglia/hdp/HDPResourceManager/conf.d/gmond.master.conf  
/etc/ganglia/hdp/HDPSlaves/conf.d/gmond.master.conf
```

And if HBase is installed:

```
/etc/ganglia/hdp/HDPHBaseMaster/conf.d/gmond.master.conf
```

2. Confirm that the "bind" property in each of these files is set to the Ganglia server hostname.
3. On the Ganglia server, use a text editor to open the gmetad configuration file:

```
/etc/ganglia/hdp/gmetad.conf
```

4. Confirm the "data\_source" properties are set to the Ganglia server hostname. For example:

```
data_source "HDPslaves" my.ganglia.server.hostname:8660
data_source "HDPNameNode" my.ganglia.server.hostname:8661
data_source "HDPResourceManager" my.ganglia.server.hostname:8664
data_source "HDPHistoryServer" my.ganglia.server.hostname:8666
```

And if HBase is installed:

```
data_source "HDPHBaseMaster" my.ganglia.server.hostname:8663
```

5. On all hosts except the Ganglia server, use a text editor to open the slave configuration files:

```
/etc/ganglia/hdp/HDPNameNode/conf.d/gmond.slave.conf
/etc/ganglia/hdp/HDPHistoryServer/conf.d/gmond.slave.conf
/etc/ganglia/hdp/HDPResourceManager/conf.d/gmond.slave.conf
/etc/ganglia/hdp/HDPslaves/conf.d/gmond.slave.conf
```

And if HBase is installed

```
/etc/ganglia/hdp/HDPHBaseMaster/conf.d/gmond.slave.conf
```

6. Confirm that the host property is set to the Ganglia Server hostname.

## 21.2.5. Set Up Hadoop Metrics

On each host in the cluster:

1. Stop the Hadoop services.
2. Change to the Hadoop configuration directory.

```
cd $HADOOP_CONF_DIR
```

3. Copy the Ganglia metrics properties file into place.

```
mv hadoop-metrics2.properties-GANGLIA hadoop-metrics2.properties
```

4. Edit the metrics properties file and set the Ganglia server hostname.

```
namenode.sink.ganglia.servers=my.ganglia.server.hostname:8661
datanode.sink.ganglia.servers=my.ganglia.server.hostname:8660
resourcemanager.sink.ganglia.servers=my.ganglia.server.hostname:8664
nodemanager.sink.ganglia.servers=my.ganglia.server.hostname:8660
historyserver.sink.ganglia.servers=my.ganglia.server.hostname:8666
maptask.sink.ganglia.servers=my.ganglia.server.hostname:8660
reduceserver.sink.ganglia.servers=my.ganglia.server.hostname:8660
```

5. Restart the Hadoop services.

## 21.3. Validate the Installation

Use these steps to validate your installation.

### 21.3.1. Start the Ganglia Server

On the Ganglia server:

```
service httpd restart
/etc/init.d/hdp-gmetad start
```

### 21.3.2. Start Ganglia Monitoring on All Hosts

On all hosts:

```
/etc/init.d/hdp-gmond start
```

### 21.3.3. Confirm that Ganglia is Running

Browse to the Ganglia server:

```
http://{ganglia.server}/ganglia
```

## 22. Installing Nagios

This section describes installing and testing Nagios, a system that monitors Hadoop cluster components and issues alerts on warning and critical conditions.

### 22.1. Install the Nagios RPMs

On the host you have chosen to be the Nagios server, install the RPMs:

```
[For RHEL and CentOS]
yum -y install net-snmp net-snmp-utils php-pecl-json
yum -y install wget httpd php net-snmp-perl perl-Net-SNMP fping nagios nagios-
plugins nagios-www
```

```
[For SLES]
zypper -n --no-gpg-checks install net-snmp
zypper -n --no-gpg-checks install wget apache2 php php-curl perl-SNMP perl-
Net-SNMP fping nagios nagios-plugins nagios-www
```

### 22.2. Install the Configuration Files

There are several configuration files that must be set up for Nagios.

#### 22.2.1. Extract the Nagios Configuration Files

From the file you downloaded in [Download Companion Files](#), open the `configuration_files.zip` and copy the files in the `nagios` folder to a temporary directory. The `nagios` folder contains two sub-folders, `objects` and `plugins`.

#### 22.2.2. Create the Nagios Directories

1. Make the following Nagios directories:

```
mkdir /var/nagios /var/nagios/rw /var/log/nagios /var/log/nagios/spool/
checkresults /var/run/nagios
```

2. Change ownership on those directories to the Nagios user:

```
chown -R nagios:nagios /var/nagios /var/nagios/rw /var/log/nagios /var/log/
nagios/spool/checkresults /var/run/nagios
```

#### 22.2.3. Copy the Configuration Files

1. Copy the contents of the `objects` folder into place:

```
cp <tmp-directory>/nagios/objects/*.* /etc/nagios/objects/
```

2. Copy the contents of the `plugins` folder into place:

```
cp <tmp-directory>/nagios/plugins/*.* /usr/lib64/nagios/plugins/
```

## 22.2.4. Set the Nagios Admin Password

1. Choose a Nagios administrator password, for example, "admin".
2. Set the password. Use the following command:

```
htpasswd -c -b /etc/nagios/htpasswd.users nagiosadmin admin
```

## 22.2.5. Set the Nagios Admin Email Contact Address

1. Open `/etc/nagios/objects/contacts.cfg` with a text editor.
2. Change the `nagios@localhost` value to the admin email address so it can receive alerts.

## 22.2.6. Register the Hadoop Configuration Files

1. Open `/etc/nagios/nagios.cfg` with a text editor.
2. In the section `OBJECT CONFIGURATION FILE(S)`, add the following:

```
# Definitions for hadoop servers
cfg_file=/etc/nagios/objects/hadoop-commands.cfg
cfg_file=/etc/nagios/objects/hadoop-hosts.cfg
cfg_file=/etc/nagios/objects/hadoop-hostgroups.cfg
cfg_file=/etc/nagios/objects/hadoop-services.cfg
cfg_file=/etc/nagios/objects/hadoop-servicegroups.cfg
```

3. Change the `command-file` directive to `/var/nagios/rw/nagios.cmd`:

```
command_file=/var/nagios/rw/nagios.cmd
```

## 22.2.7. Set Hosts

1. Open `/etc/nagios/objects/hadoop-hosts.cfg` with a text editor.
2. Create a "define host { ... }" entry for each host in your cluster using the following format:

```
define host {
    alias @HOST@
    host_name @HOST@
    use linux-server
    address @HOST@
    check_interval 0.25
    retry_interval 0.25
    max_check_attempts 4
    notifications_enabled 1
    first_notification_delay 0 # Send notification soon after
                              # change in the hard state
    notification_interval 0 # Send the notification once
    notification_options d,u,r
}
```

3. Replace the "@HOST@" with the hostname.



## 22.2.8. Set Host Groups

1. Open `/etc/nagios/objects/hadoop-hostgroups.cfg` with a text editor.
2. Create host groups based on all the hosts and services you have installed in your cluster. Each host group entry should follow this format:

```
define hostgroup {
    hostgroup_name @NAME@
    alias           @ALIAS@
    members        @MEMBERS@
}
```

Where

**Table 22.1. Host Group Parameters**

Parameter	Description
@NAME@	The host group name
@ALIAS@	The host group alias
@MEMBERS@	A comma-separated list of hosts in the group

3. The following table lists the core and monitoring host groups:

**Table 22.2. Core and Monitoring Hosts**

Service	Component	Name	Alias	Members
All servers in the cluster		all-servers	All Servers	List all servers in the cluster
HDFS	NameNode	namenode	namenode	The NameNode host
HDFS	SecondaryNameNode	snamenode	snamenode	The Secondary NameNode host
MapReduce	JobTracker	jobtracker	jobtracker	The Job Tracker host
HDFS, MapReduce	Slaves	slaves	slaves	List all hosts running DataNode and TaskTrackers
Nagios		nagios-server	nagios-server	The Nagios server host
Ganglia		ganglia-server	ganglia-server	The Ganglia server host

4. The following table lists the ecosystem project host groups:

**Table 22.3. Ecosystem Hosts**

Service	Component	Name	Alias	Members
HBase	Master	hbasemaster	hbasemaster	List the master server
HBase	Region	regions-servers	region-servers	List all region servers
ZooKeeper		zookeeper-servers	zookeeper-servers	List all ZooKeeper servers
Oozie		oozie-server	oozie-server	The Oozie server
Hive		hiveserver	hiverserver	The Hive metastore server

Service	Component	Name	Alias	Members
WebHCat		webhcat-server	webhcat-server	The WebHCat server
Templeton		templeton-server	templeton-server	The Templeton server

## 22.2.9. Set Services

1. Open `/etc/nagios/objects/hadoop-services.cfg` with a text editor.

This file contains service definitions for the following services: Ganglia, HBase (Master and Region), ZooKeeper, Hive, Templeton and Oozie

2. Remove any services definitions for services you have not installed.
3. Replace the parameter `@NAGIOS_BIN@` and `@STATUS_DAT@` parameters based on the operating system.

```
[For RHEL and CentOS]
@STATUS_DAT@ = /var/nagios/status.dat
@NAGIOS_BIN@ = /usr/bin/nagios
```

```
[For SLES]
@STATUS_DAT@ = /var/lib/nagios/status.dat
@NAGIOS_BIN@ = /usr/sbin/nagios
```

4. If you have installed Hive or Oozie services, replace the parameter `@JAVA_HOME@` with the path to the Java home. For example, `/usr/java/default`.

## 22.2.10. Set Status

1. Open `/etc/nagios/objects/hadoop-commands.cfg` with a text editor.
2. Replace the `@STATUS_DAT@` parameter with the location of the Nagios status file. The file is located:

```
[For RHEL and CentOS]
/var/nagios/status.dat
```

```
[For SLES]
/var/lib/nagios/status.dat
```

## 22.2.11. Add Templeton Status and Check TCP Wrapper Commands

1. Open `/etc/nagios/objects/hadoop-commands.cfg` with a text editor.
2. Add the following commands:

```
define command{
    command_name    check_templeton_status
    command_line    $USER1$/check_wrapper.sh $USER1$/
check_templeton_status.sh $HOSTADDRESS$ $ARG1$ $ARG2$ $ARG3$ $ARG4$ $ARG5$
    $ARG6$ $ARG7$
}

define command{
    command_name    check_tcp_wrapper
    command_line    $USER1$/check_wrapper.sh $USER1$/check_tcp -H
$HOSTADDRESS$ -p $ARG1$ $ARG2$
}
```

## 22.3. Validate the Installation

Use these steps to validate your installation.

### 22.3.1. Validate the Nagios Installation

Validate the installation.

```
nagios -v /etc/nagios/nagios.cfg
```

### 22.3.2. Start Nagios and httpd

Start the Nagios server and httpd.

```
/etc/init.d/nagios start
/etc/init.d/httpd start
```

### 22.3.3. Confirm Nagios is Running

Confirm the server is running.

```
/etc/init.d/nagios status
```

This should return:

```
nagios (pid #) is running...
```

### 22.3.4. Test Nagios Services

Run the following command:

```
/usr/lib64/nagios/plugins/check_hdfs_capacity.php -h namenode_hostname -p
50070 -w 80% -c 90%
```

This should return:

```
OK: DFSUsedGB:<some#>, DFSTotalGB:<some#>
```

### 22.3.5. Test Nagios Access

1. Browse to the Nagios server:

```
http://<nagios.server>/nagios
```

2. Login using the Nagios admin username (nagiosadmin) and password (see [Set the Nagios Admin Password](#)).
3. Click on **hosts** to validate that all the hosts in the cluster are listed.
4. Click on **services** to validate all the Hadoop services are listed for each host.

### 22.3.6. Test Nagios Alerts

1. Login to one of your cluster DataNodes.
2. Stop the TaskTracker service.

```
su -l mapred -c "/usr/lib/hadoop/bin/hadoop-daemon.sh --config /etc/hadoop/conf stop tasktracker"
```

3. Validate that you received an alert at the admin email address and that you have critical state showing on the console.
4. Start the TaskTracker service.

```
su -l mapred -c "/usr/lib/hadoop/bin/hadoop-daemon.sh --config /etc/hadoop/conf start tasktracker"
```

5. Validate that you received an alert at the admin email address and that critical state is cleared on the console.

## 23. Setting Up Security for Manual Installs

This section provides information on enabling security for a manually installed version of HDP.

### 23.1. Preparing Kerberos

This section provides information on setting up Kerberos for an HDP installation.

#### 23.1.1. Kerberos Overview

To create secure communication among its various components, HDP uses Kerberos. Kerberos is a third-party authentication mechanism, in which users and services that users wish to access rely on a the Kerberos server to authenticate each to the other. This mechanism also supports encrypting all traffic between the user and the service. The Kerberos server itself is known as the *Key Distribution Center*, or KDC. At a high level, it has three parts:

- A database of the users and services (known as *principals*) that it knows about and their respective Kerberos passwords
- An *authentication server (AS)* which performs the initial authentication and issues a *Ticket Granting Ticket (TGT)*
- A *Ticket Granting Server (TGS)* that issues subsequent service tickets based on the initial TGT.

A user principal requests authentication from the AS. The AS returns a TGT that is encrypted using the user principal's Kerberos password, which is known only to the user principal and the AS. The user principal decrypts the TGT locally using its Kerberos password, and from that point forward, until the ticket expires, the user principal can use the TGT to get service tickets from the TGS.

Because a service principal cannot provide a password each time to decrypt the TGT, it uses a special file, called a *keytab*, which contains its authentication credentials.

The service tickets are what allow the principal to access various services. The set of hosts, users, and services over which the Kerberos server has control is called a *realm*.



#### Note

Because Kerberos is a time-sensitive protocol, all hosts in the realm must be time-synchronized, for example, by using the Network Time Protocol (NTP). If the local system time of a client differs from that of the KDC by as little as 5 minutes (the default), the client will not be able to authenticate.

## 23.1.2. Installing and Configuring the KDC

To use Kerberos with HDP, either use an existing KDC or install a new one for HDP only. The following gives a very high level description of the installation process. For more information, see [RHEL documentation](#), [CentOS documentation](#), [SLES documentation](#), or [Ubuntu and Debian documentation](#).

### 1. Install the KDC server:

- On RHEL, CentOS, or Oracle Linux, run:

```
yum install krb5-server krb5-libs krb5-auth-dialog krb5-workstation
```

- On SLES, run:

```
zypper install krb5 krb5-server krb5-client
```

- On Ubuntu or Debian, run:

```
apt-get install krb5 krb5-server krb5-client
```



### Note

The host on which you install the KDC must itself be secure.

When the server is installed you must edit the two main configuration files, located by default here:

### 2. Update the KDC configuration by replacing `EXAMPLE.COM` with your domain and `kerberos.example.com` with the FQDN of the KDC host; the configuration files are located:

- On RHEL, CentOS, or Oracle Linux:

- `/etc/krb5.conf`
- `/var/kerberos/krb5kdc/kdc.conf`.

- On SLES:

- `/etc/krb5.conf`
- `/var/lib/kerberos/krb5kdc/kdc.conf`

- On Ubuntu or Debian:

- `/etc/krb5.conf`
- `/var/kerberos/krb5kdc/kdc.conf`.

### 3. Copy the updated `krb5.conf` to every cluster node.

## 23.1.3. Creating the Database and Setting Up the First Administrator

1. Use the utility `kdb5_util` to create the Kerberos database:

- On RHEL, CentOS, or Oracle Linux:

```
/usr/sbin/kdb5_util create -s
```

- On SLES:

```
[on SLES]  
kdb5_util create -s
```

- On Ubuntu or Debian:

```
[on Ubuntu or Debian]  
kdb5_util -s create
```



### Note

The `-s` option stores the master server key for the database in a *stash* file. If the stash file is not present, you must log into the KDC with the master password (specified during installation) each time it starts. This will automatically regenerate the master server key.

2. Set up the KDC Access Control List (ACL):

- On RHEL, CentOS, or Oracle Linux add administrators to `/var/kerberos/krb5kdc/kadm5.acl`.
- On SLES, add administrators to `/var/lib/kerberos/krb5kdc/kadm5.acl`.



### Note

For example, the following line grants full access to the database for users with the `admin` extension:

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

3. Restart `kadmin` for the change to take effect.

4. Create the first user principal. This must be done at a terminal window on the KDC machine itself, while you are logged in as `root`. Notice the `.local`. Normal `kadmin` usage requires that a principal with appropriate access already exist. The `kadmin.local` command can be used even if no principals exist.

```
/usr/sbin/kadmin.local -q "addprinc $username/admin"
```

Now this user can create additional principals either on the KDC machine or through the network. The following instruction assume you are using the KDC machine.

5. On the KDC, start Kerberos:

- On RHEL, CentOS, or Oracle Linux:

```
/sbin/service krb5kdc start
/sbin/service kadmind start
```

- On SLES:

```
rckrb5kdc start
rckadmind start
```

- On Ubuntu or Debian:

```
/etc/init.d/krb5-kdc start
/etc/init.d/kadmind start
```

## 23.1.4. Creating Service Principals and Keytab Files for HDP

Each service in HDP must have its own principal. As services do not login with a password to acquire their tickets, their principal's authentication credentials are stored in a keytab file, which is extracted from the Kerberos database and stored locally with the service principal.

First you must create the principal, using mandatory naming conventions. Then you must create the keytab file with that principal's information and copy the file to the keytab directory on the appropriate service host.

**Step 1:** Create a service principal using the `kadmind` utility:

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

You must have a principal with administrative permissions to use this command. The `randkey` is used to generate the password.

where



### Note

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

- If the Kerberos credentials for one DataNode are compromised, it does not automatically lead to all DataNodes being compromised
- If multiple DataNodes have exactly the same principal and are simultaneously connecting to the NameNode, and if the Kerberos authenticator being sent happens to have same timestamp, then the authentication would be rejected as a replay request.

The `$principal_name` part of the name must match the values in the table below.



### Note

The NameNode, Secondary NameNode, and Oozie require two principals each.





## Note

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

**Table 23.1. Service Principals**

Service	Component	Mandatory Principal Name
HDFS	NameNode	<code>nn/\$FQDN</code>
HDFS	NameNode HTTP	<code>HTTP/\$FQDN</code>
HDFS	SecondaryNameNode	<code>nn/\$FQDN</code>
HDFS	SecondaryNameNode HTTP	<code>HTTP/\$FQDN</code>
HDFS	DataNode	<code>dn/\$FQDN</code>
MR2	History Server	<code>jhs/\$FQDN</code>
MR2	History Server HTTP	<code>HTTP/\$FQDN</code>
YARN	ResourceManager	<code>rm/\$FQDN</code>
YARN	NodeManager	<code>nm/\$FQDN</code>
Oozie	Oozie Server	<code>oozie/\$FQDN</code>
Oozie	Oozie HTTP	<code>HTTP/\$FQDN</code>
Hive	Hive Metastore	<code>hive/\$FQDN</code>
	HiveServer2	
Hive	WebHCat	<code>HTTP/\$FQDN</code>
HBase	MasterServer	<code>hbase/\$FQDN</code>
HBase	RegionServer	<code>hbase/\$FQDN</code>
Hue	Hue Interface	<code>hue/\$FQDN</code>
ZooKeeper	ZooKeeper	<code>zookeeper/\$FQDN</code>
Nagios Server	Nagios	<code>nagios/\$FQDN</code>
JournalNode Server <sup>a</sup>	JournalNode	<code>jn/\$FQDN</code>
Gateway	Knox	<code>knox/\$FQDN</code>

<sup>a</sup>Only required if you are setting up NameNode HA.

**For example:** To create the principal for a DataNode service, issue this command:

```
kadmin: addprinc -randkey dn/$datanode-host@$hadoop.realm
```

**Step 2:** Extract the related keytab file and place it in the keytab directory (by default /`etc/krb5.keytab`) of the appropriate respective components:

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

You must use the mandatory names for the `$keytab_file_name` variable shown in this table.

**Table 23.2. Service Keytab File Names**

Component	Principal Name	Mandatory Keytab File Name
NameNode	nn/\$FQDN	nn.service.keytab
NameNode HTTP	HTTP/\$FQDN	spnego.service.keytab
SecondaryNameNode	nn/\$FQDN	nn.service.keytab
SecondaryNameNode HTTP	HTTP/\$FQDN	spnego.service.keytab
DataNode	dn/\$FQDN	dn.service.keytab
MR2 History Server	jhs/\$FQDN	nm.service.keytab
MR2 History Server HTTP	HTTP/\$FQDN	spnego.service.keytab
YARN	rm/\$FQDN	rm.service.keytab
YARN	nm/\$FQDN	nm.service.keytab
Oozie Server	oozie/\$FQDN	oozie.service.keytab
Oozie HTTP	HTTP/\$FQDN	spnego.service.keytab
Hive Metastore	hive/\$FQDN	hive.service.keytab
HiveServer2		
WebHCat	HTTP/\$FQDN	spnego.service.keytab
HBase Master Server	hbase/\$FQDN	hbase.service.keytab
HBase RegionServer	hbase/\$FQDN	hbase.service.keytab
Hue	hue/\$FQDN	hue.service.keytab
ZooKeeper	zookeeper/\$FQDN	zk.service.keytab
Nagios Server	nagios/\$FQDN	nagios.service.keytab
Journal Server <sup>a</sup>	jn/\$FQDN	jn.service.keytab
Knox Gateway <sup>b</sup>	knox/\$FQDN	knox.service.keytab

<sup>a</sup>Only required if you are setting up NameNode HA.

<sup>b</sup>Only required if you are using a Knox Gateway.

**For example:** To create the keytab files for the NameNode, issue these commands:

```
kadmin: xst -k nn.service.keytab nn/$namenode-host
kadmin: xst -k spnego.service.keytab HTTP/$namenode-host
```

When you have created the keytab files, copy them to the `keytab` directory of the respective service hosts.

**Step 3:** Verify that the correct keytab files and principals are associated with the correct service using the `klist` command. For example, on the NameNode:

```
klist -k -t /etc/security/nn.service.keytab
```

Do this on each respective service in your cluster.

## 23.2. Configuring HDP

This section provides information on configuring HDP for Kerberos.

- [Configuration Overview](#)
- [Creating Mappings Between Principals and UNIX Usernames](#)
- [Creating the Database and Setting Up the First Administrator](#)

- [Creating Principals and Keytab Files for HDP](#)

## 23.2.1. Configuration Overview

Configuring HDP for Kerberos has two parts:

- Creating a mapping between service principals and UNIX usernames.

Hadoop uses group memberships of users at various places, such as to determine group ownership for files or for access control.

A user is mapped to the groups it belongs to using an implementation of the `GroupMappingServiceProvider` interface. The implementation is pluggable and is configured in `core-site.xml`.

By default Hadoop uses `ShellBasedUnixGroupsMapping`, which is an implementation of `GroupMappingServiceProvider`. It fetches the group membership for a username by executing a UNIX shell command. In secure clusters, since the usernames are actually Kerberos principals, `ShellBasedUnixGroupsMapping` will work only if the Kerberos principals map to valid UNIX usernames. Hadoop provides a feature that lets administrators specify mapping rules to map a Kerberos principal to a local UNIX username .

- Adding information to three main service configuration files.

There are several optional entries in the three main service configuration files that must be added to enable security on HDP.

## 23.2.2. Creating Mappings Between Principals and UNIX Usernames

HDP uses a rule-based system to create mappings between service principals and their related UNIX usernames. The rules are specified in the `core-site.xml` configuration file as the value to the optional key `hadoop.security.auth_to_local`.

The default rule is simply named `DEFAULT`. It translates all principals in your default domain to their first component. For example, `myusername@APACHE.ORG` and `myusername/admin@APACHE.ORG` both become `myusername`, assuming your default domain is `APACHE.ORG`.

### 23.2.2.1. Creating Rules

To accommodate more complex translations, you can create a hierarchical set of rules to add to the default. Each rule is divided into three parts: base, filter, and substitution.

#### 23.2.2.1.1. The Base

The base begins with the number of components in the principal name (excluding the realm), followed by a colon, and the pattern for building the username from the sections of the principal name. In the pattern section `$0` translates to the realm, `$1` translates to the first component and `$2` to the second component.

For example:

[1:\$1@\$0] translates myusername@APACHE.ORG to myusername@APACHE.ORG

[2:\$1] translates myusername/admin@APACHE.ORG to myusername

[2:\$1%\$2] translates myusername/admin@APACHE.ORG to "myusername%admin

### 23.2.2.1.2. The Filter

The filter consists of a regex in a parentheses that must match the generated string for the rule to apply.

For example:

(.\*%admin) matches any string that ends in %admin

(.\*@SOME.DOMAIN) matches any string that ends in @SOME.DOMAIN

### 23.2.2.1.3. The Substitution

The substitution is a sed rule that translates a regex into a fixed string.

For example:

s/@ACME\ .COM// removes the first instance of @SOME.DOMAIN.

s/@[A-Z]\*\ .COM// removes the first instance of @ followed by a name followed by COM.

s/X/Y/g replaces all of the X in the name with Y

## 23.2.2.2. Examples

- If your default realm was APACHE.ORG, but you also wanted to take all principals from ACME.COM that had a single component joe@ACME.COM, you would create this rule:

```
RULE:[1:$1@$0](.@ACME.COM)s/@.//
DEFAULT
```

- To also translate names with a second component, you would use these rules:

```
RULE:[1:$1@$0](.@ACME.COM)s/@.//
RULE:[2:$1@$0](.@ACME.COM)s/@.//
DEFAULT
```

- To treat all principals from APACHE.ORG with the extension /admin as admin, your rules would look like this:

```
RULE[2:$1%$2@$0](.%admin@APACHE.ORG)s/./admin/
DEFAULT
```

## 23.2.3. Adding Security Information to Configuration Files

To enable security on HDP, you must add optional information to various configuration files.

Before you begin, set JSVC\_Home in `hadoop-env.sh`.

- For RHEL/CentOS/Oracle Linux:

```
export JSVC_HOME=/usr/libexec/bigtop-utils
```

- For SLES and Ubuntu:

```
export JSVC_HOME=/usr/lib/bigtop-utils
```

### 23.2.3.1. core-site.xml

To the `core-site.xml` file on every host in your cluster, you must add the following information:

**Table 23.3. core-site.xml**

Property Name	Property Value	Description
<code>hadoop.security.authentication</code>	<code>kerberos</code>	Set the authentication type for the cluster. Valid values are: simple or kerberos.
<code>hadoop.rpc.protection</code>	<code>authentication; integrity; privacy</code>	This is an [OPTIONAL] setting. If not set, defaults to authentication.  <code>authentication</code> = authentication only; the client and server mutually authenticate during connection setup.  <code>integrity</code> = authentication and integrity; guarantees the integrity of data exchanged between client and server as well as authentication.  <code>privacy</code> = authentication, integrity, and confidentiality; guarantees that data exchanged between client and server is encrypted and is not readable by a "man in the middle".
<code>hadoop.security.authorization</code>	<code>true</code>	Enable authorization for different protocols.
<code>hadoop.security.auth_to_local</code>	The mapping rules. For example <pre>RULE:[2:\$1@\$0] ([jt]t@.*EXAMPLE.COM)s/.*/ mapred/ RULE:[2:\$1@\$0] ([nd]n@.*EXAMPLE.COM)s/.*/ hdfs/ RULE:[2:\$1@\$0] (hm@.*EXAMPLE.COM)s/.*/ hbase/ RULE:[2:\$1@\$0] (rs@.*EXAMPLE.COM)s/.*/ hbase/ DEFAULT</pre>	The mapping from Kerberos principal names to local OS user names. See <a href="#">Creating Mappings Between Principals and UNIX Usernames</a> for more information.

The XML for these entries:

```
<property>
  <name>hadoop.security.authentication</name>
  <value>kerberos</value>
  <description>    Set the
authentication for the cluster. Valid values are: simple or
kerberos.
  </description>
</property>

<property>
  <name>hadoop.security.authorization</name>
  <value>>true</value>
  <description>    Enable
authorization for different protocols.
```

```

    </description>
</property>

<property>

    <name>hadoop.security.auth_to_local</name>
    <value>
RULE:[2:$1@$0]([jt]t@.*EXAMPLE.COM)s/.*/mapred/
RULE:[2:$1@$0]([nd]n@.*EXAMPLE.COM)s/.*/hdfs/
RULE:[2:$1@$0](hm@.*EXAMPLE.COM)s/.*/hbase/
RULE:[2:$1@$0](rs@.*EXAMPLE.COM)s/.*/hbase/
DEFAULT</value>
<description>The mapping from kerberos principal names
to local OS user names.</description>
</property>

```

When using the Knox Gateway, add the following to the `core-site.xml` file on the *master nodes* host in your cluster:

**Table 23.4. core-site.xml**

Property Name	Property Value	Description
<code>hadoop.proxyuser.knox.groups</code>	<code>users</code>	Grants proxy privileges for Knox user.
<code>hadoop.proxyuser.knox.hosts</code>	<code>\$knox_host_FQDN</code>	Identifies the Knox Gateway host.

When using the Hue, add the following to the `core-site.xml` file on the *master nodes* host in your cluster:

**Table 23.5. core-site.xml**

Property Name	Property Value	Description
<code>hue.kerberos.principal.shortname</code>	<code>hue</code>	Hue Kerberos principal name.
<code>hadoop.proxyuser.hue.groups</code>	<code>*</code>	Group to which all the Hue users belong. Use the wild card character to select multiple groups, for example <code>cli*</code> .
<code>hadoop.proxyuser.hue.hosts</code>	<code>*</code>	
<code>hadoop.proxyuser.knox.hosts</code>	<code>\$hue_host_FQDN</code>	Identifies the Knox Gateway host.

The XML for these entries:

```

<property>
    <name>hadoop.security.authentication</name>
    <value>kerberos</value>
    <description>    Set the
authentication for the cluster. Valid values are: simple or
kerberos.
    </description>
</property>

<property>
    <name>hadoop.security.authorization</name>
    <value>true</value>
    <description>    Enable
authorization for different protocols.
    </description>

```

```

</property>

<property>
  <name>hadoop.security.auth_to_local</name>
  <value>
    RULE:[2:$1@$0]([jt]t@.*EXAMPLE.COM)s/./mapred/
    RULE:[2:$1@$0]([nd]n@.*EXAMPLE.COM)s/./hdfs/
    RULE:[2:$1@$0](hm@.*EXAMPLE.COM)s/./hbase/
    RULE:[2:$1@$0](rs@.*EXAMPLE.COM)s/./hbase/
    DEFAULT</value> <description>The mapping from kerberos principal names
    to local OS user names.</description>
</property>
<property>
  <name>hadoop.proxyuser.knox.groups</name>
  <value>users</value>
</property>
<property>
  <name>hadoop.proxyuser.knox.hosts</name>
  <value>Knox.EXAMPLE.COM</value>
</property>

```

### 23.2.3.2. hdfs-site.xml

To the `hdfs-site.xml` file on every host in your cluster, you must add the following information:

**Table 23.6. hdfs-site.xml**

Property Name	Property Value	Description
<code>dfs.permissions.enabled</code>	<code>true</code>	If <code>true</code> , permission checking in HDFS is enabled. If <code>false</code> , permission checking is turned off, but all other behavior is unchanged. Switching from one parameter value to the other does not change the mode, owner or group of files or directories.
<code>dfs.permissions.supergroup</code>	<code>hdfs</code>	The name of the group of super-users.
<code>dfs.block.access.token.enable</code>	<code>true</code>	If <code>true</code> , access tokens are used as capabilities for accessing DataNodes. If <code>false</code> , no access tokens are checked on accessing DataNodes.
<code>dfs.namenode.kerberos.principal</code>	<code>h/_HOST@EXAMPLE.COM</code>	Kerberos principal name for the NameNode.
<code>dfs.secondary.namenode.kerberos.principal</code>	<code>h/_HOST@EXAMPLE.COM</code>	Kerberos principal name for the secondary NameNode.
<code>dfs.web.authentication.kerberos.principal</code>	<code>HTTP/_HOST@EXAMPLE.COM</code>	The HTTP Kerberos principal used by Hadoop-Auth in the HTTP endpoint.  The HTTP Kerberos principal MUST start with 'HTTP/' per Kerberos HTTP SPNEGO specification.
<code>dfs.web.authentication.kerberos.keytab</code>	<code>etc/krb5.keytab/spnego.service.keytab</code>	The Kerberos keytab file with the credentials for the HTTP Kerberos principal used by Hadoop-Auth in the HTTP endpoint.
<code>dfs.datanode.kerberos.principal</code>	<code>h/_HOST@EXAMPLE.COM</code>	The Kerberos principal that the DataNode runs as. "_HOST" is replaced by the real host name.

Property Name	Property Value	Description
dfs.namenode.keytab.file	/etc/security/keytabs/ nn.service.keytab	Combined keytab file containing the NameNode service and host principals.
dfs.secondary.namenode.keytab.file	/etc/security/keytabs/ nn.service.keytab	Combined keytab file containing the NameNode service and host principals. <question?>
dfs.datanode.keytab.file	/etc/security/keytabs/ dn.service.keytab	The filename of the keytab file for the DataNode.
dfs.https.port	50470	The HTTPS port to which the NameNode binds
dfs.namenode.https-address	Example: ip-10-111-59-170.ec2.internal:50470	The HTTPS address to which the NameNode binds
dfs.datanode.data.dir.perm	750	The permissions that must be set on the dfs.data.dir directories. The DataNode will not come up if all existing dfs.data.dir directories do not have this setting. If the directories do not exist, they will be created with this permission
dfs.cluster.administrators	hdfs	ACL for who all can view the default servlets in the HDFS
dfs.namenode.kerberos.internal.authentication.kerberos.principal	dfs.namenode.kerberos.principal	
dfs.secondary.namenode.kerberos.authentication.kerberos.principal	dfs.secondary.namenode.kerberos.principal	

The XML for these entries:

```

<property>
  <name>dfs.permissions</name>
  <value>>true</value>
  <description> If "true", enable permission checking in
HDFS. If "false", permission checking is turned
off, but all other behavior is
unchanged. Switching from one parameter value to the other does
not change the mode, owner or group of files or
directories. </description>
</property>

<property>
  <name>dfs.permissions.supergroup</name>
  <value>hdfs</value>
  <description>The name of the group of
super-users.</description>
</property>

<property>
  <name>dfs.namenode.handler.count</name>
  <value>100</value>
  <description>Added to grow Queue size so that more
client connections are allowed</description>
</property>

<property>
  <name>ipc.server.max.response.size</name>
  <value>5242880</value>
</property>

<property>
  <name>dfs.block.access.token.enable</name>

```



```
<value>true</value>
<description> If "true", access tokens are used as capabilities
for accessing datanodes. If "false", no access tokens are checked on
accessing datanodes. </description>
</property>

<property>
  <name>dfs.namenode.kerberos.principal</name>
  <value>nn/_HOST@EXAMPLE.COM</value>
  <description> Kerberos principal name for the
  NameNode </description>
</property>

<property>
  <name>dfs.secondary.namenode.kerberos.principal</name>
  <value>nn/_HOST@EXAMPLE.COM</value>
  <description>Kerberos principal name for the secondary NameNode.
  </description>
</property>

<property>
  <!--cluster variant -->
  <name>dfs.secondary.http.address</name>
  <value>ip-10-72-235-178.ec2.internal:50090</value>
  <description>Address of secondary namenode web server</description>
</property>

<property>
  <name>dfs.secondary.https.port</name>
  <value>50490</value>
  <description>The https port where secondary-namenode
  binds</description>
</property>

<property>
  <name>dfs.web.authentication.kerberos.principal</name>
  <value>HTTP/_HOST@EXAMPLE.COM</value>
  <description> The HTTP Kerberos principal used by Hadoop-Auth in the
  HTTP endpoint.
  The HTTP Kerberos principal MUST start with 'HTTP/' per Kerberos HTTP
  SPNEGO specification.
  </description>
</property>

<property>
  <name>dfs.web.authentication.kerberos.keytab</name>
  <value>/etc/security/keytabs/spnego.service.keytab</value>
  <description>The Kerberos keytab file with the credentials for the
  HTTP
  Kerberos principal used by Hadoop-Auth in the HTTP endpoint.
  </description>
</property>

<property>
  <name>dfs.datanode.kerberos.principal</name>
  <value>dn/_HOST@EXAMPLE.COM</value>
  <description>
  The Kerberos principal that the DataNode runs as. "_HOST" is replaced
  by the real
  host name.
```

```
        </description>
</property>

<property>
  <name>dfs.namenode.keytab.file</name>
  <value>/etc/security/keytabs/nm.service.keytab</value>
  <description>
    Combined keytab file containing the namenode service and host
    principals.
  </description>
</property>

<property>
  <name>dfs.secondary.namenode.keytab.file</name>
  <value>/etc/security/keytabs/nm.service.keytab</value>
  <description>
    Combined keytab file containing the namenode service and host
    principals.
  </description>
</property>

<property>
  <name>dfs.datanode.keytab.file</name>
  <value>/etc/security/keytabs/dn.service.keytab</value>
  <description>
    The filename of the keytab file for the DataNode.
  </description>
</property>

<property>
  <name>dfs.https.port</name>
  <value>50470</value>
  <description>The https port where namenode
  binds</description>
</property>

<property>
  <name>dfs.https.address</name>
  <value>ip-10-111-59-170.ec2.internal:50470</value>
  <description>The https address where namenode binds</description>
</property>

<property>
  <name>dfs.datanode.data.dir.perm</name>
  <value>750</value>
  <description>The permissions that should be there on
  dfs.data.dir directories. The datanode will not come up if the
  permissions are different on existing dfs.data.dir directories. If
  the directories don't exist, they will be created with this
  permission.</description>
</property>

<property>
  <name>dfs.access.time.precision</name>
  <value>0</value>
  <description>The access time for HDFS file is precise upto this
  value.The default value is 1 hour. Setting a value of 0
  disables access times for HDFS.
  </description>
</property>
```

```

<property>
  <name>dfs.cluster.administrators</name>
  <value> hdfs</value>
  <description>ACL for who all can view the default
  servlets in the HDFS</description>
</property>

<property>
  <name>ipc.server.read.threadpool.size</name>
  <value>5</value>
  <description></description>
</property>

<property>
  <name>dfs.namenode.kerberos.internal.spnego.principal</name>
  <value>${dfs.web.authentication.kerberos.principal}</value>
</property>

<property>
  <name>dfs.secondary.namenode.kerberos.internal.spnego.principal</name>

  <value>${dfs.web.authentication.kerberos.principal}</value>
</property>

```

In addition, you must set the user on all secure DataNodes:

```

export HADOOP_SECURE_DN_USER=hdfs
export HADOOP_SECURE_DN_PID_DIR=/grid/0/var/run/hadoop/$HADOOP_SECURE_DN_USER

```

### 23.2.3.3. yarn-site.xml

You must add the following information to the `yarn-site.xml` file on every host in your cluster:

**Table 23.7. yarn-site.xml**

Property Name	Property Value	Description
<code>yarn.resourcemanager.principal</code>	<code>yarn/localhost@EXAMPLE.COM</code>	The Kerberos principal for the ResourceManager.
<code>yarn.resourcemanager.keytab</code>	<code>/etc/krb5.keytab</code>	The keytab for the ResourceManager.
<code>yarn.nodemanager.principal</code>	<code>yarn/localhost@EXAMPLE.COM</code>	The Kerberos principal for the NodeManager.
<code>yarn.nodemanager.keytab</code>	<code>/etc/krb5.keytab</code>	The keytab for the NodeManager.
<code>yarn.nodemanager.container-executor.class</code>	<code>org.apache.hadoop.yarn.server</code>	The class that will execute (launch) the containers.
<code>yarn.nodemanager.linux-container-executor.path</code>	<code>hadoop-3.0.0-SNAPSHOT/bin/container-executor</code>	The path to the Linux container executor.
<code>yarn.nodemanager.linux-container-executor.group</code>	<code>hadoop</code>	A special group (e.g. <code>hadoop</code> ) with executable permissions for the container executor, of which the NodeManager Unix user is the group member and no ordinary application user is. If any application user belongs to this special group, security will be compromised. This special group name should be specified for the configuration property.

Property Name	Property Value	Description
yarn.timeline-service.principal	yarn/localhost@EXAMPLE.COM	The Kerberos principal for the Timeline Server.
yarn.timeline-service.keytab	/etc/krb5.keytab	The Kerberos keytab for the Timeline Server.
yarn.resourcemanager.webapp.delegation-token-auth-filter.enabled		Flag to enable override of the default Kerberos authentication filter with the RM authentication filter to allow authentication using delegation tokens (fallback to Kerberos if the tokens are missing). Only applicable when the http authentication type is Kerberos.
yarn.timeline-service.http-authentication.type	kerberos	Defines authentication used for the Timeline Server HTTP endpoint. Supported values are: simple   kerberos   \$AUTHENTICATION_HANDLER_CLASSNAME
yarn.timeline-service.http-authentication.kerberos.principal	HTTP/localhost@EXAMPLE.COM	The Kerberos principal to be used for the Timeline Server HTTP endpoint.
yarn.timeline-service.http-authentication.kerberos.keytab	/etc/krb5.keytab	The Kerberos keytab to be used for the Timeline Server HTTP endpoint.

The XML for these entries:

```
<property>
  <name>yarn.resourcemanager.principal</name>
  <value>yarn/localhost@EXAMPLE.COM</value>
</property>

<property>
  <name>yarn.resourcemanager.keytab</name>
  <value>/etc/krb5.keytab</value>
</property>

<property>
  <name>yarn.nodemanager.principal</name>
  <value>yarn/localhost@EXAMPLE.COM</value>
</property>

<property>
  <name>yarn.nodemanager.keytab</name>
  <value>/etc/krb5.keytab</value>
</property>

<property>
  <name>yarn.nodemanager.container-executor.class</name>
  <value>org.apache.hadoop.yarn.server.nodemanager.LinuxContainerExecutor</value>
</property>

<property>
  <name>yarn.nodemanager.linux-container-executor.path</name>
  <value>hadoop-3.0.0-SNAPSHOT/bin/container-executor</value>
</property>

<property>
  <name>yarn.nodemanager.linux-container-executor.group</name>
  <value>hadoop</value>
</property>
```

```

<property>
  <name>yarn.timeline-service.principal</name>
  <value>yarn/localhost@EXAMPLE.COM</value>
</property>

<property>
  <name>yarn.timeline-service.keytab</name>
  <value>/etc/krb5.keytab</value>
</property>

<property>
  <name>yarn.resourcemanager.webapp.delegation-token-auth-filter.enabled</name>
  <value>>true</value>
</property>

<property>
  <name>yarn.timeline-service.http-authentication.type</name>
  <value>kerberos</value>
</property>

<property>
  <name>yarn.timeline-service.http-authentication.kerberos.principal</name>
  <value>HTTP/localhost@EXAMPLE.COM</value>
</property>

<property>
  <name>yarn.timeline-service.http-authentication.kerberos.keytab</name>
  <value>/etc/krb5.keytab</value>
</property>

```

### 23.2.3.4. mapred-site.xml

To the `mapred-site.xml` file on every host in your cluster, you must add the following information:

**Table 23.8. mapred-site.xml**

Property Name	Property Value	Description
<code>mapreduce.jobhistory.keytab</code>	<code>/etc/security/keytabs/jhs.service.keytab</code>	Kerberos keytab file for the MapReduce JobHistory Server.
<code>mapreduce.jobhistory.principal</code>	<code>jhs/_HOST@TODO-KERBEROS-DOMAIN</code>	Kerberos principal name for the MapReduce JobHistory Server.
<code>mapreduce.jobhistory.webapp.address</code>	<code>TODO-SOBHISTORYNODE-HOSTNAME:19888</code>	MapReduce JobHistory Server Web UI host:port
<code>mapreduce.jobhistory.webapp.https.address</code>	<code>TODO-SOBHISTORYNODE-HOSTNAME:19889</code>	MapReduce JobHistory Server HTTPS Web UI host:port
<code>mapreduce.jobhistory.webapp.spnego.keytab-file</code>	<code>/etc/security/keytabs/spnego.service.keytab</code>	Kerberos keytab file for the spnego service.
<code>mapreduce.jobhistory.webapp.spnego.principal</code>	<code>spnego/_HOST@TODO-KERBEROS-DOMAIN</code>	Kerberos principal name for the spnego service.

The XML for these entries:

```

<property>
  <name>mapreduce.jobhistory.keytab</name>
  <value>/etc/security/keytabs/jhs.service.keytab</value>
</property>

```

```

<property>
  <name>mapreduce.jobhistory.principal</name>
  <value>jhs/_HOST@TODO-KERBEROS-DOMAIN</value>
</property>

<property>
  <name>mapreduce.jobhistory.webapp.address</name>
  <value>TODO-JOBHISTORYNODE-HOSTNAME:19888</value>
</property>

<property>
  <name>mapreduce.jobhistory.webapp.https.address</name>
  <value>TODO-JOBHISTORYNODE-HOSTNAME:19889</value>
</property>

<property>
  <name>mapreduce.jobhistory.webapp.spnego-keytab-file</name>
  <value>/etc/security/keytabs/spnego.service.keytab</value>
</property>

<property>
  <name>mapreduce.jobhistory.webapp.spnego-principal</name>
  <value>HTTP/_HOST@TODO-KERBEROS-DOMAIN</value>
</property>

```

### 23.2.3.5. hbase-site.xml

For HBase to run on a secured cluster, HBase must be able to authenticate itself to HDFS. To the `hbase-site.xml` file on your HBase server, you must add the following information. There are no default values; the following are all only examples:

**Table 23.9. hbase-site.xml**

Property Name	Property Value	Description
<code>hbase.master.keytab.file</code>	<code>/etc/security/keytabs/hm.service.keytab</code>	The keytab for the HMaster service principal
<code>hbase.master.kerberos.principal</code>	<code>h/_HOST@EXAMPLE.COM</code>	The Kerberos principal name that should be used to run the HMaster process. If <code>_HOST</code> is used as the hostname portion, it will be replaced with the actual hostname of the running instance.
<code>hbase.regionserver.keytab.file</code>	<code>/etc/security/keytabs/rs.service.keytab</code>	The keytab for the HRegionServer service principal
<code>hbase.regionserver.kerberos.principal</code>	<code>r/_HOST@EXAMPLE.COM</code>	The Kerberos principal name that should be used to run the HRegionServer process. If <code>_HOST</code> is used as the hostname portion, it will be replaced with the actual hostname of the running instance.
<code>hbase.superuser</code>	<code>hbase</code>	Comma-separated List of users or groups that are allowed full privileges, regardless of stored ACLs, across the cluster. Only used when HBase security is enabled.
<code>hbase.coprocessor.region.classes</code>		Comma-separated list of Coprocessors that are loaded by default on all tables. For any override coprocessor

Property Name	Property Value	Description
		method, these classes will be called in order. After implementing your own Coprocessor, just put it in HBase's classpath and add the fully qualified class name here. A coprocessor can also be loaded on demand by setting HTableDescriptor.
hbase.coprocessor.master.classes		Comma-separated list of org.apache.hadoop.hbase.coprocessor.MasterObserver coprocessors that are loaded by default on the active HMaster process. For any implemented coprocessor methods, the listed classes will be called in order. After implementing your own MasterObserver, just put it in HBase's classpath and add the fully qualified class name here.

The XML for these entries:

```

<property>
  <name>hbase.master.keytab.file</name>
  <value>/etc/security/keytabs/hm.service.keytab</value>
  <description>Full path to the kerberos keytab file to use for logging
  in the configured HMaster server principal.
  </description>
</property>

<property>
  <name>hbase.master.kerberos.principal</name>
  <value>hm/_HOST@EXAMPLE.COM</value>
  <description>Ex. "hbase/_HOST@EXAMPLE.COM".
  The kerberos principal name that
  should be used to run the HMaster process. The
  principal name should be in
  the form: user/hostname@DOMAIN. If "_HOST" is used
  as the hostname portion, it will be replaced with the actual hostname
  of the running
  instance.
  </description>
</property>

<property>
  <name>hbase.regionserver.keytab.file</name>
  <value>/etc/security/keytabs/rs.service.keytab</value>
  <description>Full path to the kerberos keytab file to use for logging
  in the configured HRegionServer server principal.
  </description>
</property>

<property>
  <name>hbase.regionserver.kerberos.principal</name>
  <value>rs/_HOST@EXAMPLE.COM</value>
  <description>Ex. "hbase/_HOST@EXAMPLE.COM".
  The kerberos principal name that
  should be used to run the HRegionServer process. The
  principal name should be in the form:
  user/hostname@DOMAIN. If _HOST
  is used as the hostname portion, it will be replaced
  with the actual hostname of the running

```

```

instance. An entry for this principal must exist
in the file specified in hbase.regionserver.keytab.file
</description>
</property>

<!--Additional configuration specific to HBase security -->

<property>
  <name>hbase.superuser</name>
  <value>hbase</value>
  <description>List of users or groups (comma-separated), who are
allowed full privileges, regardless of stored ACLs, across the
cluster. Only
used when HBase security is enabled.
</description>
</property>

<property>
  <name>hbase.coprocessor.region.classes</name>
  <value></value>
  <description>A comma-separated list of Coprocessors that are loaded
by default on all tables. For any override coprocessor method, these
classes
will be called in order. After implementing your own Coprocessor,
just put it in HBase's classpath and add the fully qualified class
name here. A
coprocessor can also be loaded on demand by setting HTableDescriptor.

</description>
</property>

<property>
  <name>hbase.coprocessor.master.classes</name>
  <value></value>
  <description>A comma-separated list of
org.apache.hadoop.hbase.coprocessor.MasterObserver coprocessors that
are loaded by default on the active HMaster process. For any
implemented
coprocessor methods, the listed classes will be called in order.
After implementing your own MasterObserver, just put it in HBase's
classpath and add the fully qualified class name here.
</description>
</property>

```

### 23.2.3.6. hive-site.xml

Hive Metastore supports Kerberos authentication for Thrift clients only. HiveServer does not support Kerberos authentication for any clients:

**Table 23.10. hive-site.xml**

Property Name	Property Value	Description
hive.metastore.sasl.enabled	true	If true, the Metastore Thrift interface will be secured with SASL and clients must authenticate with Kerberos
hive.metastore.kerberos.keytab	file:security/keytabs/ hive.service.keytab	The keytab for the Metastore Thrift service principal
hive.metastore.kerberos.principal	hive/_HOST@EXAMPLE.COM	The service principal for the Metastore Thrift server. If _HOST is used as the



Property Name	Property Value	Description
		hostname portion, it will be replaced with the actual hostname of the running instance.
hive.metastore.cache.pinobjtypes	Table,Database,Type,FieldSchema,Order	Comma-separated Metastore object types that should be pinned in the cache

The XML for these entries:

```
<property>
  <name>hive.metastore.sasl.enabled</name>
  <value>true</value>
  <description>If true, the metastore thrift interface will be secured
with
  SASL.
  Clients must authenticate with Kerberos.</description>
</property>

<property>
  <name>hive.metastore.kerberos.keytab.file</name>
  <value>/etc/security/keytabs/hive.service.keytab</value>
  <description>The path to the Kerberos Keytab file containing the
metastore thrift server's service principal.</description>
</property>

<property>
  <name>hive.metastore.kerberos.principal</name>
  <value>hive/_HOST@EXAMPLE.COM</value>
  <description>The service principal for the metastore thrift server.
The
  special string _HOST will be replaced automatically with the correct
hostname.</description>
</property>

<property>
  <name>hive.metastore.cache.pinobjtypes</name>
  <value>Table,Database,Type,FieldSchema,Order</value>
  <description>List of comma separated metastore object types that
should be pinned in
  the cache</description>
</property>
```

### 23.2.3.6.1. oozie-site.xml

To the oozie-site.xml file, you must add the following information:

**Table 23.11. oozie-site.xml**

Property Name	Property Value	Description
oozie.service.AuthorizationService.security.enabled	true	Specifies whether security (user name/admin role) is enabled or not. If it is disabled any user can manage the Oozie system and manage any job.
oozie.service.HadoopAccessorService.kerberos.enabled	true	Indicates if Oozie is configured to use Kerberos
local.realm	EXAMPLE.COM	Kerberos Realm used by Oozie and Hadoop. Using local.realm to be aligned with Hadoop configuration.

Property Name	Property Value	Description
oozie.service.HadoopAccessorService.keytab	keytabs/oozie.service.keytab	The keytab for the Oozie service principal.
oozie.service.HadoopAccessorService.kerberos.principal	oozie.service.kerberos.principal	Kerberos principal for Oozie service
oozie.authentication.type	kerberos	
oozie.authentication.kerberos.http.host	HTTP_HOST@EXAMPLE.COM	Whitelisted job tracker for Oozie service
oozie.authentication.kerberos.keytab	keytabs/security/keytabs/spnego.service.keytab	Location of the Oozie user keytab file.
oozie.service.HadoopAccessorService.nameNode.whitelist		
oozie.authentication.kerberos.rules	RULE:[2:\$1@\$0]([jt]t@.*EXAMPLE.COM)s/.*mapred/ RULE:[2:\$1@\$0]([nd]n@.*EXAMPLE.COM)s/.*hdfs/ RULE:[2:\$1@\$0](hm@.*EXAMPLE.COM)s/.*hbase/ RULE:[2:\$1@\$0](rs@.*EXAMPLE.COM)s/.*hbase/ DEFAULT	The mapping from Kerberos principal names to local OS user names. See <a href="#">Creating Mappings Between Principals and UNIX Usernames</a> for more information.
oozie.service.ProxyUserService.proxyuser.knox.groups	proxyuser.knox.groups	Grant proxy privileges to the Knox user. Note only required when using a Knox Gateway.
oozie.service.ProxyUserService.proxyuser.knox.hosts	knoxuser.FQDN	Identifies the Knox Gateway. Note only required when using a Knox Gateway.

### 23.2.3.6.2. webhcat-site.xml

To the webhcat-site.xml file, you must add the following information:

**Table 23.12. webhcat-site.xml**

Property Name	Property Value	Description
templeton.kerberos.principal	HTTP_HOST@EXAMPLE.COM	
templeton.kerberos.keytab	keytabs/security/keytabs/spnego.service.keytab	
templeton.kerberos.secret	secret	
hadoop.proxyuser.knox.groups	proxyuser.knox.groups	Grant proxy privileges to the Knox user. Note only required when using a Knox Gateway.
hadoop.proxyuser.knox.knox_host_FQDN	knox_host_FQDN	Identifies the Knox Gateway. Note only required when using a Knox Gateway.

## 23.3. Configure Secure HBase and ZooKeeper

Use the following instructions to set up secure HBase and ZooKeeper:

### 1. Configure HBase Master

2. [Create JAAS configuration files](#)
3. [Start HBase and ZooKeeper services](#)
4. [Configure secure client side access for HBase](#)
5. [Optional: Configure client-side operation for secure operation - Thrift Gateway](#)
6. [Optional: Configure client-side operation for secure operation - REST Gateway](#)
7. [Configure HBase for Access Control Lists \(ACL\)](#)

### 23.3.1. Configure HBase Master

Edit `$HBASE_CONF_DIR/hbase-site.xml` file on your HBase Master server to add the following information (`$HBASE_CONF_DIR` is the directory to store the HBase configuration files. For example, `/etc/hbase/conf`) :



#### Note

There are no default values. The following are all examples.

```
<property>
  <name>hbase.master.keytab.file</name>
  <value>/etc/security/keytabs/hbase.service.keytab</value>
  <description>Full path to the kerberos keytab file to use
    for logging in the configured HMaster server principal.
  </description>
</property>
```

```
<property>
  <name>hbase.master.kerberos.principal</name>
  <value>hbase/_HOST@EXAMPLE.COM</value>
  <description>Ex. "hbase/_HOST@EXAMPLE.COM".
    The kerberos principal name that should be used to run the HMaster
    process.
    The principal name should be in the form: user/hostname@DOMAIN. If
    "_HOST" is used as the hostname portion,
    it will be replaced with the actual hostname of the running instance.
  </description>
</property>
```

```
<property>
  <name>hbase.regionserver.keytab.file</name>
  <value>/etc/security/keytabs/hbase.service.keytab</value>
  <description>Full path to the kerberos keytab file to use for logging
    in the configured HRegionServer server principal.
  </description>
</property>
```

```
<property>
  <name>hbase.regionserver.kerberos.principal</name>
  <value>hbase/_HOST@EXAMPLE.COM</value>
  <description>Ex. "hbase/_HOST@EXAMPLE.COM".The kerberos principal name
  that should be used to run the HRegionServer process.
  The principal name should be in the form: user/hostname@DOMAIN.
  If _HOST is used as the hostname portion, it will be replaced with the actual
  hostname of the running instance.
  An entry for this principal must exist in the file specified in hbase.
  regionserver.keytab.file
</description>
</property>
```

```
<!--Additional configuration specific to HBase security -->
```

```
<property>
  <name>hbase.superuser</name>
  <value>hbase</value>
  <description>List of users or groups (comma-separated), who are
  allowed full privileges, regardless of stored ACLs, across the cluster.
  Only used when HBase security is enabled.
</description>
</property>
```

```
<property>
  <name>hbase.coprocessor.region.classes</name>
  <value>org.apache.hadoop.hbase.security.token.TokenProvider,org.
  apache.hadoop.hbase.security.access.SecureBulkLoadEndpoint,org.apache.hadoop.
  hbase.security.access.AccessController </value>
  <description>A comma-separated list of Coprocessors that are loaded by
  default on all tables.
</description>
</property>
```

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

```
<property>
  <name>hbase.rpc.engine</name>
  <value>org.apache.hadoop.hbase.ipc.SecureRpcEngine</value>
</property>
```

```
<property>
  <name>hbase.security.authorization</name>
  <value>true</value>
  <description>Enables HBase authorization. Set the value of this
  property to false to disable HBase authorization.
</description>
</property>
```

```
<property>
  <name>hbase.coprocessor.master.classes</name>
  <value>org.apache.hadoop.hbase.security.access.AccessController</
  value>
</property>
```

```
<property>
  <name>hbase.bulkload.staging.dir</name>
  <value>/apps/hbase/staging</value>
  <description>Directory in the default filesystem, owned by the hbase
  user, and has permissions(-rwx--x--x, 711) </description>
</property>
```

For more information on bulk loading in secure mode, see [HBase Secure BulkLoad](#). Note that the `hbase.bulkload.staging.dir` is created by HBase.

## 23.3.2. Create JAAS configuration files

1. Create the following JAAS configuration files on the HBase Master, RegionServer, and HBase client host machines.

These files must be created under the `$HBASE_CONF_DIR` directory:

where `$HBASE_CONF_DIR` is the directory to store the HBase configuration files. For example, `/etc/hbase/conf`.

- On your HBase Master host machine, create the `hbase-server.jaas` file under the `/etc/hbase/conf` directory and add the following content:

```
Server {
  com.sun.security.auth.module.Krb5LoginModule required
  useKeyTab=true
  storeKey=true
  useTicketCache=false
  keyTab="/etc/security/keytabs/hbase.service.keytab"
  principal="hbase/$HBase.Master.hostname";
};
```

- On each of your RegionServer host machine, create the `regionserver.jaas` file under the `/etc/hbase/conf` directory and add the following content:

```
Server {
  com.sun.security.auth.module.Krb5LoginModule required
  useKeyTab=true
  storeKey=true
  useTicketCache=false
  keyTab="/etc/security/keytabs/hbase.service.keytab"
  principal="hbase/$RegionServer.hostname";
};
```

- On HBase client machines, create the `hbase-client.jaas` file under the `/etc/hbase/conf` directory and add the following content:

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

2. Create the following JAAS configuration files on the ZooKeeper Server and client host machines.

These files must be created under the `$ZOOKEEPER_CONF_DIR` directory, where `$ZOOKEEPER_CONF_DIR` is the directory to store the HBase configuration files. For example, `/etc/zookeeper/conf`:

- On ZooKeeper server host machines, create the `zookeeper-server.jaas` file under the `/etc/zookeeper/conf` directory and add the following content:

```
Server {
  com.sun.security.auth.module.Krb5LoginModule required
  useKeyTab=true
  storeKey=true
  useTicketCache=false
  keyTab="/etc/security/keytabs/zookeeper.service.keytab"
  principal="zookeeper/$ZooKeeper.Server.hostname" ;
};
```

- On ZooKeeper client host machines, create the `zookeeper-client.jaas` file under the `/etc/zookeeper/conf` directory and add the following content:

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

3. Edit the `hbase-env.sh` file on your HBase server to add the following information:

```
export HBASE_OPTS="-Djava.security.auth.login.config=$HBASE_CONF_DIR/hbase-client.jaas"
export HBASE_MASTER_OPTS="-Djava.security.auth.login.config=$HBASE_CONF_DIR/hbase-server.jaas"
export HBASE_REGIONSERVER_OPTS="-Djava.security.auth.login.config=$HBASE_CONF_DIR/regionserver.jaas"
```

where `HBASE_CONF_DIR` is the HBase configuration directory. For example, `/etc/hbase/conf`.

4. Edit `zoo.cfg` file on your ZooKeeper server to add the following information:

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

5. Edit `zookeeper-env.sh` file on your ZooKeeper server to add the following information:

```
export SERVER_JVMFLAGS="-Djava.security.auth.login.config=$ZOOKEEPER_CONF_DIR/zookeeper-server.jaas"
export CLIENT_JVMFLAGS="-Djava.security.auth.login.config=$ZOOKEEPER_CONF_DIR/zookeeper-client.jaas"
```

where `$ZOOKEEPER_CONF_DIR` is the ZooKeeper configuration directory. For example, `/etc/zookeeper/conf`.

### 23.3.3. Start HBase and ZooKeeper services

Start the HBase and ZooKeeper services using the instructions provided [here](#).

If the configuration is successful, you should see the following in your ZooKeeper server logs:

```
11/12/05 22:43:39 INFO zookeeper.Login: successfully logged in.
11/12/05 22:43:39 INFO server.NIOServerCnxnFactory: binding to port 0.0.0.0/0.0.0.0:2181
11/12/05 22:43:39 INFO zookeeper.Login: TGT refresh thread started.
11/12/05 22:43:39 INFO zookeeper.Login: TGT valid starting at: Mon Dec 05 22:43:39 UTC 2011
11/12/05 22:43:39 INFO zookeeper.Login: TGT expires: Tue Dec 06 22:43:39 UTC 2011
11/12/05 22:43:39 INFO zookeeper.Login: TGT refresh sleeping until: Tue Dec 06 18:36:42 UTC 2011
..
11/12/05 22:43:59 INFO auth.SaslServerCallbackHandler:
  Successfully authenticated client: authenticationID=hbase/ip-10-166-175-249.us-west-1.compute.internal@HADOOP.LOCALDOMAIN;
  authorizationID=hbase/ip-10-166-175-249.us-west-1.compute.internal@HADOOP.LOCALDOMAIN.
11/12/05 22:43:59 INFO auth.SaslServerCallbackHandler: Setting authorizedID: hbase
11/12/05 22:43:59 INFO server.ZooKeeperServer: adding SASL authorization for authorizationID: hbase
```

### 23.3.4. Configure secure client side access for HBase

HBase configured for secure client access is expected to be running on top of a secure HDFS cluster. HBase must be able to authenticate to HDFS services.

1. Provide a Kerberos principal to the HBase client user using the instructions provided [here](#).

- **Option I:** Provide Kerberos principal to normal HBase clients.

For normal HBase clients, Hortonworks recommends setting up a password to the principal.

- Set `maxrenewlife`.

The client principal's `maxrenewlife` should be set high enough so that it allows enough time for the HBase client process to complete. Client principals are not renewed automatically.

For example, if a user runs a long-running HBase client process that takes at most three days, we might create this user's principal within `kadmin` with the following command:

```
addprinc -maxrenewlife 3days
```

- **Option II:** Provide Kerberos principal to long running HBase clients.

- a. Set-up a keytab file for the principal and copy the resulting keytab files to where the client daemon will execute.

Ensure that you make this file readable only to the user account under which the daemon will run.

2. On every HBase client, add the following properties to the `$HBASE_CONF_DIR/hbase-site.xml` file:

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



### Note

The client environment must be logged in to Kerberos from KDC or keytab via the `kinit` command before communication with the HBase cluster is possible. Note that the client will not be able to communicate with the cluster if the `hbase.security.authentication` property in the client- and server-side site files fails to match.

```
<property>
  <name>hbase.rpc.engine</name>
  <value>org.apache.hadoop.hbase.ipc.SecureRpcEngine</value>
</property>
```

## 23.3.5. Optional: Configure client-side operation for secure operation - Thrift Gateway

Add the following to the `$HBASE_CONF_DIR/hbase-site.xml` file for every Thrift gateway:

```
<property>
  <name>hbase.thrift.keytab.file</name>
  <value>/etc/hbase/conf/hbase.keytab</value>
</property>
<property>
  <name>hbase.thrift.kerberos.principal</name>
  <value>${USER}/_HOST@HADOOP.LOCALDOMAIN</value>
</property>
```

Substitute the appropriate credential and keytab for `USER` and `KEYTAB` respectively.

The Thrift gateway will authenticate with HBase using the supplied credential. No authentication will be performed by the Thrift gateway itself. All client access via the Thrift gateway will use the Thrift gateway's credential and have its privilege.



## 23.3.6. Optional: Configure client-side operation for secure operation - REST Gateway

Add the following to the `$HBASE_CONF_DIR/hbase-site.xml` file for every REST gateway:

```
<property>
  <name>hbase.rest.keytab.file</name>
  <value>$KEYTAB</value>
</property>
<property>
  <name>hbase.rest.kerberos.principal</name>
  <value>${USER}/_HOST@HADOOP.LOCALDOMAIN</value>
</property>
```

Substitute the appropriate credential and keytab for `$USER` and `$KEYTAB` respectively.

The REST gateway will authenticate with HBase using the supplied credential. No authentication will be performed by the REST gateway itself. All client access via the REST gateway will use the REST gateway's credential and have its privilege.

## 23.3.7. Configure HBase for Access Control Lists (ACL)

Use the following instructions to configure HBase for ACL:

1. Open `kinit` as HBase user.
  - a. Create a keytab for principal `hbase@REALM` and store it in the `hbase.headless.keytab` file. See instructions provided [here](#) for creating principal and keytab file.
  - b. Open `kinit` as HBase user. Execute the following command on your HBase Master:

```
kinit -kt hbase.headless.keytab hbase
```

2. Start the HBase shell. On the HBase Master host machine, execute the following command:

```
hbase shell
```

3. Set ACLs using HBase shell:

```
grant '$USER', '$permissions'
```

where

- `$USER` is any user responsible for create/update/delete operations in HBase.



### Note

You must set the ACLs for all those users who will be responsible for create/update/delete operations in HBase.

- *\$permissions* is zero or more letters from the set "RWCA": READ('R'), WRITE('W'), CREATE('C'), ADMIN('A').

## 23.4. Configure Hue for a Secure Cluster

To enable Hue to work with a HDP cluster configured for Kerberos, make the following changes to Hue and Kerberos.

1. Configure Kerberos as described in [Setting Up Security for Manual Installs](#).
2. Create a principal for the Hue Server.

```
addprinc -randkey hue/$FQDN@EXAMPLE.COM
```

where *\$FQDN* is the hostname of the Hue Server and *EXAMPLE.COM* is the Hadoop realm.

3. Generate a keytab for the Hue principal.

```
xst -k hue.service.keytab hue/$FQDN@EXAMPLE.COM
```

4. Place the keytab file on the Hue Server. Set the permissions and ownership of the keytab file.

```
/etc/security/keytabs/hue.service.keytab
chown hue:hadoop /etc/security/keytabs/hue.service.keytab
chmod 600 /etc/security/keytabs/hue.service.keytab
```

6. Confirm the keytab is accessible by testing kinit.

```
su - hue
kinit -k -t /etc/security/keytabs/hue.service.keytab hue/$FQDN@EXAMPLE.COM
```

7. In the `[kerberos]` section in the `/etc/hue/conf/hue.ini` configuration file.

```
[[kerberos]]
# Path to Hue's Kerberos keytab file
hue_keytab=/etc/security/keytabs/hue.service.keytab
# Kerberos principal name for Hue
hue_principal=hue/$FQDN@EXAMPLE.COM
```

8. Set the path to the kinit based on the OS.

```
# Path to kinit
# For RHEL/CentOS 5.x, kinit_path is /usr/kerberos/bin/kinit
# For RHEL/CentOS 6.x, kinit_path is /usr/bin/kinit
kinit_path=/usr/kerberos/bin/kinit
```

9. Set `security_enabled=true` for every component in hue.ini.

```
[[hdfs_clusters]], [[yarn_clusters]], [[liboozie]], [[hcatalog]]
```

- 10 Save the hue.ini file.

- 11 Restart Hue.

```
# /etc/init.d/hue restart
```

## 23.5. Setting up One-Way Trust with Active Directory

In environments where users from Active Directory (AD) need to access Hadoop Services, set up one-way trust between Hadoop Kerberos realm and the AD (Active Directory) domain.



### Warning

Hortonworks recommends setting up one-way trust after fully configuring and testing your Kerberized Hadoop Cluster.

### 23.5.1. Configure Kerberos Hadoop Realm on the AD DC

Configure the Hadoop realm on the AD DC server and set up the one-way trust.

1. Add the Hadoop Kerberos realm and KDC host to the DC:

```
ksetup /addkdc $hadoop.realm $KDC-host
```

2. Establish one-way trust between the AD domain and the Hadoop realm:

```
netdom trust $hadoop.realm /Domain:$AD.domain /add /realm /  
passwordt:$trust_password
```

3. (Optional) If Windows clients within the AD domain need to access Hadoop Services, and the domain does not have a search route to find the services in Hadoop realm, run the following command to create a hostmap for Hadoop service host:

```
ksetup /addhosttorealmmap $hadoop-service-host $hadoop.realm
```



### Note

Run the above for each *\$hadoop-host* that provides services that need to be accessed by Windows clients. For example, Oozie host, WebHCat host, etc.

4. (Optional) define the encryption type:

```
ksetup /SetEncTypeAttr $hadoop.realm $encryption_type
```

Set encryption types based on your security requirements. Mismatching encryption types causes problems.



### Note

Run `ksetup /GetEncTypeAttr $krb_realm` to list the available encryption types. Verify that the encryption type is configured for the Hadoop realm in the `krb5.conf`.

## 23.5.2. Configure the AD Domain on the KDC and Hadoop Cluster Hosts

Add the AD domain as a realm to the `krb5.conf` on the Hadoop cluster hosts. Optionally configure encryption types and UDP preferences.

1. Open the `krb5.conf` file with a text editor and make the following changes:

a. To `libdefaults`, add the following properties:

Sets the Hadoop realm as default:

```
[libdefaults]
default_domain = $hadoop.realm
```

Set the encryption type:

```
[libdefaults]
default_tkt_enctypes = $encryption_types
default_tgs_enctypes = $encryption_types
permitted_enctypes = $encryption_types
```

where the `$encryption_types` match the type supported by your environment.

For example:

```
default_tkt_enctypes = aes256-cts aes128-cts rc4-hmac arcfour-hmac-md5
des-cbc-md5 des-cbc-crc
default_tgs_enctypes = aes256-cts aes128-cts rc4-hmac arcfour-hmac-md5
des-cbc-md5 des-cbc-crc
permitted_enctypes = aes256-cts aes128-cts rc4-hmac arcfour-hmac-md5 des-
cbc-md5 des-cbc-crc
```

If TCP is open on the KDC and AD Server:

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

b. Add a realm for the AD domain:

```
[realms]
$AD.DOMAIN = {
  kdc = $AD-host-FQDN
  admin_server = $AD-host-FQDN
  default_domain = $AD-host-FQDN
}
```

c. Save the `krb5.conf` the changes to all Hadoop Cluster hosts.

2. Add the trust principal for the AD domain to the Hadoop MIT KDC:

```
kadmin
kadmin: addprinc krbtgt/$hadoop.realm@$AD.domain
```

This command will prompt you for the trust password, use the same password as the earlier step.



## Note

If the encryption type was defined, then use the following command to configure the AD principal:

```
kadmin: addprinc -e "$encryption_type" krbtgt/$hadoop.  
realm@$AD.domain
```

## 24. Upgrade from HDP 1.3 to HDP 2.1 Manually

Use the following instructions to upgrade to the latest release of HDP from HDP 1.3:

1. [Getting Ready to Upgrade](#)
2. [Upgrade Hadoop](#)
3. [Migrate the HDP Configurations](#)
4. [Create Local Directories](#)
5. [Start HDFS](#)
6. [Upgrade Apache ZooKeeper](#)
7. [Upgrade Apache HBase](#)
8. [Upgrade Apache Hive and Apache HCatalog](#)
9. [Upgrade Apache Oozie](#)
10. [Upgrade Apache WebHCat \(Templeton\)](#)
11. [Upgrade Apache Pig](#)
12. [Upgrade Apache Sqoop](#)
13. [Upgrade vFlume](#)
14. [Upgrade Apache Mahout](#)
15. [Upgrade Hue](#)
16. [Finalize Upgrade](#)
17. [Install New HDP 2.1 Services](#)

### 24.1. Getting Ready to Upgrade

HDP Stack upgrade involves removing HDP 1.x MapReduce and replacing it with HDP 2.x YARN and MapReduce2. Before you begin, review the upgrade process and complete the backup steps.

1. Back up the following HDP 1.x directories:
  - `/etc/hadoop/conf`
  - `/etc/hbase/conf`
  - `/etc/hcatalog/conf`



## Note

With HDP 2.1, `/etc/hcatalog/conf` is divided into `/etc/hive-hcatalog/conf` and `/etc/hive-webhcat/conf`. You cannot use `/etc/hcatalog/conf` in HDP 2.1.

- `/etc/hive/conf`
  - `/etc/pig/conf`
  - `/etc/sqoop/conf`
  - `/etc/flume/conf`
  - `/etc/mahout/conf`
  - `/etc/oozie/conf`
  - `/etc/hue/conf`
  - `/etc/zookeeper/conf`
  - Optional - Back up your userlogs directories, `${mapred.local.dir}/userlogs`.
2. Run the `fsck` command as the HDFS Service user and fix any errors. (The resulting file contains a complete block map of the file system.) For example:

```
su $HDFS_USER
hadoop fsck / -files -blocks -locations > dfs-old-fsck-1.log
```

where `$HDFS_USER` is the HDFS Service user. For example, `hdfs`.



## Note

This example is for unsecure clusters. In secure mode, your cluster requires kerberos credentials the HDFS user.

3. Use the following instructions to compare status before and after the upgrade:



## Note

The following commands must be executed by the user running the HDFS service (by default, the user is `hdfs`).

- a. Capture the complete namespace of the file system. (The following command does a recursive listing of the root file system.)

```
su $HDFS_USER
hadoop dfs -lsr / > dfs-old-lsr-1.log
```

where `$HDFS_USER` is the HDFS Service user. For example, `hdfs`.

- b. Run the `report` command to create a list of DataNodes in the cluster.

```
su $HDFS_USER
```

```
hadoop dfsadmin -report > dfs-old-report-1.log
```

where `$HDFS_USER` is the HDFS Service user. For example, `hdfs`.

- c. Optional. You can copy all or unrecoverable only data stored in HDFS to a local file system or to a backup instance of HDFS.
  - d. Optional. You can also repeat the steps 3 (a) through 3 (c) and compare the results with the previous run to ensure the state of the file system remained unchanged.
4. Check for HFiles in V1 format. HBase 0.96.0 discontinues support for HFileV1. Before the actual upgrade, install the HBase 0.96 binaries on a separate host using the `hbase-site.xml` configuration file from the running HBase 0.94 binaries. Then, run the following command against the HBase 0.96 binaries to check if there are HFiles in V1 format:

```
hbase upgrade -check
```

HFileV1 was a common format prior to HBase 0.94. You may see output similar to:

```
Tables Processed:
hdfs://localhost:41020/myHBase/.META.
hdfs://localhost:41020/myHBase/usertable
hdfs://localhost:41020/myHBase/TestTable
hdfs://localhost:41020/myHBase/t

Count of HFileV1: 2
HFileV1:
hdfs://localhost:41020/myHBase/usertable/fa02dac1f38d03577bd0f7e666f12812/family/249450144068442524
hdfs://localhost:41020/myHBase/usertable/ecdd3eaae2d2fcf8184ac025555bb2af/family/249450144068442512

Count of corrupted files: 1
Corrupted Files:
hdfs://localhost:41020/myHBase/usertable/fa02dac1f38d03577bd0f7e666f12812/family/1
Count of Regions with HFileV1: 2
Regions to Major Compact:
hdfs://localhost:41020/myHBase/usertable/fa02dac1f38d03577bd0f7e666f12812
hdfs://localhost:41020/myHBase/usertable/ecdd3eaae2d2fcf8184ac025555bb2af
```

When you run the upgrade check, if “Count of HFileV1” returns any files, start the `hbase` shell to use major compaction for regions that have HFileV1 format. For example in the sample output above, you must compact the `fa02dac1f38d03577bd0f7e666f12812` and `ecdd3eaae2d2fcf8184ac025555bb2af` regions.

5. Optional. If you are upgrading HBase on a secure cluster, flush the ACL table by running the following HBase shell command as the `$HBase_User`.

```
flush '_acl_'
```

6. Stop all HDP 1.3 services (including MapReduce) except HDFS:
  - a. Stop Nagios. On the Nagios host machine, execute the following command:



```
service nagios stop
```

b. Stop Ganglia.

- i. Execute this command on the Ganglia server host machine:

```
/etc/init.d/hdp-gmetad stop
```

- ii. Execute this command on all the nodes in your Hadoop cluster:

```
/etc/init.d/hdp-gmond stop
```

c. Stop Oozie. On the Oozie server host machine, execute the following command:

```
sudo su -l $OOZIE_USER -c "cd $OOZIE_LOG_DIR; /usr/lib/oozie/bin/oozie-stop.sh"
```

where:

- `$OOZIE_USER` is the Oozie Service user. For example, `oozie`
- `$OOZIE_LOG_DIR` is the directory where Oozie log files are stored (for example: `/var/log/oozie`).

d. Stop WebHCat. On the WebHCat host machine, execute the following command:

```
su -l $WEBHCAT_USER -c "/usr/lib/hcatalog/sbin/webhcat_server.sh stop"
```

where:

- `$WEBHCAT_USER` is the WebHCat Service user. For example, `hcat`.

e. Stop Hive. On the Hive Metastore host machine and Hive Server2 host machine, execute the following command:

```
ps aux | awk '{print $1,$2}' | grep hive | awk '{print $2}' | xargs kill >/dev/null 2>&1
```

This will stop Hive Metastore and HCatalog services.

f. Stop ZooKeeper. On the ZooKeeper host machine, execute the following command:

```
su - $ZOOKEEPER_USER -c "export ZOOCFGDIR=/etc/zookeeper/conf ; export ZOOCFG=zoo.cfg ;source /etc/zookeeper/conf/zookeeper-env.sh ; /usr/lib/zookeeper/bin/zkServer.sh stop"
```

where `$ZOOKEEPER_USER` is the ZooKeeper Service user. For example, `zookeeper`.

g. Stop HBase.

- i. Execute these commands on all RegionServers:

```
su -l $HBASE_USER -c "/usr/lib/hbase/bin/hbase-daemon.sh --config /etc/hbase/conf stop regionserver"
```

- ii. Execute these commands on the HBase Master host machine:

```
su -l $HBASE_USER -c "/usr/lib/hbase/bin/hbase-daemon.sh --config /etc/hbase/conf stop master"
```

where `$HBASE_USER` is the HBase Service user. For example, `hbase`.

#### h. Stop MapReduce

##### i. Execute these commands on all TaskTrackers slaves:

```
su -l $MAPRED_USER -c "/usr/lib/hadoop/bin/hadoop-daemon.sh --config /etc/hadoop/conf stop tasktracker"
```

##### ii. Execute these commands on the HistoryServer host machine:

```
su -l $MAPRED_USER -c "/usr/lib/hadoop/bin/hadoop-daemon.sh --config /etc/hadoop/conf stop historyserver"
```

##### iii. Execute these commands on the node running the JobTracker host machine:

```
su -l $MAPRED_USER -c "/usr/lib/hadoop/bin/hadoop-daemon.sh --config /etc/hadoop/conf stop jobtracker"
```

where `$MAPRED_USER` is the MapReduce Service user. For example, `mapred`.

#### 7. As the HDFS user, save the namespace by executing the following command:

```
su $HDFS_USER
hadoop dfsadmin -safemode enter
hadoop dfsadmin -saveNamespace
```

#### 8. Backup your NameNode metadata.

##### a. Copy the following checkpoint files into a backup directory:

- `dfs.name.dir/edits`
- `dfs.name.dir/image/fsimage`
- `dfs.name.dir/current/fsimage`

##### b. Store the layoutVersion of the namenode.

```
${dfs.name.dir}/current/VERSION
```

#### 9. If you have any prior HDFS upgrade in-progress, finalize it if you have not done so already.

```
su $HDFS_USER
hadoop dfsadmin -finalizeUpgrade
```

#### 10. Optional - Backup the Hive Metastore database.



### Note

These instructions are provided for your convenience. Please check your database documentation for the latest back up instructions.

**Table 24.1. Hive Metastore Database Backup and Restore**

Database Type	Backup	Restore
MySQL	mysqldump \$dbname > \$outputfilename.sql For <b>example:</b> mysqldump hive > / tmp/mydir/backup_hive.sql	mysql \$dbname < \$inputfilename.sql For <b>example:</b> mysql hive < /tmp/mydir/ backup_hive.sql
Postgres	sudo -u \$username pg_dump \$databasename > \$outputfilename.sql For <b>example:</b> sudo -u postgres pg_dump hive > /tmp/mydir/ backup_hive.sql	sudo -u \$username psql \$databasename < \$inputfilename.sql For <b>example:</b> sudo -u postgres psql hive < /tmp/mydir/ backup_hive.sql
Oracle	Connect to the Oracle database using sqlplus export the database: exp username/ password@database full=yes file=output_file.dmp	Import the database: imp username/password@database ile=input_file.dmp

**11.Optional - Backup the Oozie Metastore database.****Note**

These instructions are provided for your convenience. Please check your database documentation for the latest back up instructions.

**Table 24.2. Oozie Metastore Database Backup and Restore**

Database Type	Backup	Restore
MySQL	mysqldump \$dbname > \$outputfilename.sql For <b>example:</b> mysqldump oozie > / tmp/mydir/backup_oozie.sql	mysql \$dbname < \$inputfilename.sql For <b>example:</b> mysql oozie < /tmp/mydir/ backup_oozie.sql
Postgres	sudo -u \$username pg_dump \$databasename > \$outputfilename.sql For <b>example:</b> sudo -u postgres pg_dump oozie > /tmp/mydir/ backup_oozie.sql	sudo -u \$username psql \$databasename < \$inputfilename.sql For <b>example:</b> sudo -u postgres psql oozie < /tmp/mydir/ backup_oozie.sql

**12Stop HDFS****a. Execute these commands on all DataNodes:**

```
su -l $HDFS_USER -c "/usr/lib/hadoop/bin/hadoop-daemon.sh --config /etc/hadoop/conf stop datanode"
```

If you are running a secure cluster, stop the DataNode as root:

```
su -c "/usr/lib/hadoop/bin/hadoop-daemon.sh --config /etc/hadoop/conf stop datanode"
```

**b. Execute these commands on the Secondary NameNode host machine:**

```
su -l $HDFS_USER -c "/usr/lib/hadoop/bin/hadoop-daemon.sh --config /etc/hadoop/conf stop secondarynamenode"
```

**c. Execute these commands on the NameNode host machine:**

```
su -l $HDFS_USER -c "/usr/lib/hadoop/bin/hadoop-daemon.sh --config /etc/hadoop/conf stop namenode"
```

where `$HDFS_USER` is the HDFS Service user. For example, `hdfs`.

13. Verify that edit logs in `${dfs.name.dir}/name/current/edits*` are empty. These log files should have only 4 bytes of data, which contain the edit logs version. If the edit logs are not empty, start the existing version NameNode and then shut it down after a new fsimage has been written to disks so that the edit log becomes empty.

## 24.2. Upgrade Hadoop

1. On all nodes, clean the yum repository.

- For RHEL/CentOS:

```
yum clean all
```

- For SLES:

```
zypper clean --all
```

- For Ubuntu or Debian:

```
apt-get clean all
```

2. Uninstall the HDP 1.x packages.

- For RHEL/CentOS:

```
yum erase hadoop-pipes hadoop-sbin hadoop-native oozie
```

- For SLES:

```
zypper rm hadoop-pipes hadoop-sbin hadoop-native oozie hbase hadoop*
```

- For Ubuntu or Debian:

```
apt-get remove hadoop-pipes hadoop-sbin hadoop-native oozie hbase hadoop*
```

3. Configure your repository.

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 [Deployment Strategies for Data Centers with](#)

[Firewalls](#), a separate document in this set.

- a. For each node in your cluster, download the yum repo configuration file `hdp.repo`. From a terminal window, enter the following `wget` command.

- For RHEL/CentOS/Oracle Linux 5  
:

```
wget http://public-repo-1.hortonworks.com/HDP/centos5/2.x/updates/2.1.15.0/hdp.repo -O /etc/yum.repos.d/hdp.repo
```

- For RHEL/CentOS/Oracle Linux 6:

```
wget http://public-repo-1.hortonworks.com/HDP/centos6/2.x/updates/2.1.15.0/hdp.repo -O /etc/yum.repos.d/hdp.repo
```

- For SLES 11 SP1:

```
wget http://public-repo-1.hortonworks.com/HDP/suse11sp3/2.x/updates/2.1.15.0/hdp.repo -O /etc/zypp/repos.d/hdp.repo
```

- For SLES 11 SP3:

```
wget http://public-repo-1.hortonworks.com/HDP/sles11sp1/2.x/updates/2.1.15.0/hdp.repo -O /etc/zypp/repos.d/hdp.repo
```

- For Ubuntu 12.04

```
wget http://public-repo-1.hortonworks.com/HDP/ubuntu12/2.x/updates/2.1.15.0/hdp.list -O /etc/apt-get/repos.d/hdp.list
```

- For Debian 6:

```
wget http://public-repo-1.hortonworks.com/HDP/debian6/2.x/updates/2.1.15.0/hdp.list -O /etc/apt-get/repos.d/hdp.list
```

- b. Confirm the HDP repository is configured by checking the repo list.

- For RHEL/CentOS/Oracle Linux:

```
yum repolist
```

- For SLES:

```
zypper repos
```

- For Ubuntu or Debian:

```
apt-get list
```

4. Use the [HDP Utility script](#) to calculate memory configuration settings.

5. Install Hadoop

- For RHEL/CentOS/Oracle Linux:

```
yum upgrade hadoop*
```

- For SLES:

```
zypper install hadoop* hadoop-hdfs hadoop-lzo
```

- For Ubuntu or Debian:

```
apt-get update
apt-get install hadoop hadoop-hdfs libhdfs0 libhdfs0-dev hadoop-yarn
hadoop-mapreduce hadoop-client opensslliblzo2-2 liblzo2-dev hadoop-lzo
```

6. Install YARN

- For RHEL/CentOS/Oracle Linux:

```
yum install hadoop-mapreduce hadoop-yarn
```

- For SLES:

```
zypper install hadoop-mapreduce hadoop-yarn
```

- For Ubuntu or Debian:

```
apt-get install hadoop-mapreduce hadoop-yarn
```

7. Verify HDP 2.x packages have installed successfully.

- For RHEL/CentOS/Oracle Linux:

```
yum list hadoop* | grep HDP-2
```

- For SLES:

```
zypper pa | grep HDP-2
```

Verify that you have HDP 2.x installed:

```
hadoop version
```

You may need to add `/etc/hadoop/conf/hadoop-env.sh` in `/usr/bin/hadoop` for `$JAVA_HOME`.

- For Ubuntu or Debian:

```
dpkg -s HDP-2 | grep Status
```

## 24.3. Migrate the HDP Configurations

Configurations and configuration file names have changed between HDP 1.3.2 (Hadoop 1.2.x) and HDP 2.1 (Hadoop 2.4). To successfully upgrade to HDP 2.x, back up your current configuration files, download the new HDP 2.1 files, and compare. The following tables provide mapping information to make the comparison between releases easier.

To migrate the HDP Configurations

1. Back up the following HDP 1.x configurations on all nodes in your clusters.

- `/etc/hadoop/conf`
- `/etc/hbase/conf`
- `/etc/hcatalog/conf`



### Note

With HDP 2.1, `/etc/hcatalog/conf` is divided into `/etc/hive-hcatalog/conf` and `/etc/hive-webhcat`. You cannot use `/etc/hcatalog/conf` in HDP 2.1.

- `/etc/hive/conf`
  - `/etc/pig/conf`
  - `/etc/sqoop/conf`
  - `/etc/flume/conf`
  - `/etc/mahout/conf`
  - `/etc/oozie/conf`
  - `/etc/zookeeper/conf`
2. Edit `/etc/hadoop/conf/core-site.xml` and set `hadoop.rpc.protection` from `none` to `authentication`.
3. Copy your `/etc/hcatalog/conf` configurations to `/etc/hive-hcatalog/conf` and `/etc/hive-webhcat` as appropriate.
4. Copy `log4j.properties` from the `hadoop` config directory of the companion files to `/etc/hadoop/conf`. The file should have owners and permissions similar to other files in `/etc/hadoop/conf`.
5. Download the your HDP 2.x companion files from [Download Companion Files](#) and migrate your HDP 1.x configuration.
6. Copy these configurations to all nodes in your clusters.
- `/etc/hadoop/conf`

- /etc/hbase/conf
- /etc/hcatalog/conf
- /etc/hive/conf
- /etc/pig/conf
- /etc/sqoop/conf
- /etc/flume/conf
- /etc/mahout/conf
- /etc/oozie/conf
- /etc/zookeeper/conf



### Note

Upgrading the repo using yum or zypper resets all configurations. Prepare to replace these configuration directories each time you perform a yum or zypper upgrade.

7. Review the following HDP 1.3.2 Hadoop Core configurations and the new configurations or locations in HDP 2.x

**Table 24.3. HDP 1.3.2 Hadoop Core Site (core-site.xml)**

HDP 1.3.2 config	HDP 1.3.2 config file	HDP 2.1 config	HDP 2.1 config file
fs.default.name	core-site.xml	fs.defaultFS	core-site.xml
fs.checkpoint.dir	core-site.xml	dfs.namenode.checkpoint.dir	hdfs-site.xml
fs.checkpoint.edits.dir	core-site.xml	dfs.namenode.checkpoint.edits.dir	hdfs-site.xml
fs.checkpoint.period	core-site.xml	dfs.namenode.checkpoint.period	hdfs-site.xml
io.bytes.per.checksum	core-site.xml	dfs.bytes-per-checksum	hdfs-site.xml
dfs.df.interval	hdfs-site	fs.df.interval	core-site.xml
hadoop.native.lib	core-site.xml	io.native.lib.available	core-site.xml
hadoop.configured.node.mapping	core-site.xml	net.topology.configured.node.mapping	core-site.xml
topology.node.switch.mapping.enabled	core-site.xml	net.topology.node.switch.mapping.enabled	core-site.xml
topology.script.file.name	core-site.xml	net.topology.script.file.name	core-site.xml
topology.script.number.args	core-site.xml	net.topology.script.number.args	core-site.xml



### Note

The `hadoop.rpc.protection` configuration property in `core-site.xml` needs to specify authentication, integrity and/or privacy. No value defaults to authentication, but an invalid value such as "none" causes an error.

8. Review the following 1.3.2 HDFS site configurations and their new configurations and files in HDP 2.x.



**Table 24.4. HDP 1.3.2 Hadoop Core Site (hdfs-site.xml)**

HDP 1.3.2 config	HDP 1.3.2 config file	HDP 2.1 config	HDP 2.1 config file
dfs.block.size	hdfs-site.xml	dfs.blocksize	hdfs-site.xml
dfs.write.packet.size	hdfs-site.xml	dfs.client-write-packet-size	hdfs-site.xml
dfs.https.client.keystore.resource	hdfs-site.xml	dfs.client.https.keystore.resource	hdfs-site.xml
dfs.https.need.client.auth	hdfs-site.xml	dfs.client.https.need-auth	hdfs-site.xml
dfs.read.prefetch.size	hdfs-site.xml	dfs.bytes-per-checksum	hdfs-site.xml
dfs.socket.timeout	hdfs-site.xml	dfs.client.socket.timeout	hdfs-site.xml
dfs.balance.bandwidthPerSec	hdfs-site.xml	dfs.datanode.balance.bandwidthPerSec	hdfs-site.xml
dfs.data.dir	hdfs-site.xml	dfs.datanode.data.dir	hdfs-site.xml
dfs.datanode.max.xcievers	hdfs-site.xml	dfs.datanode.max.transfer.rate	hdfs-site.xml
session.id	hdfs-site.xml	dfs.metrics.session-id	hdfs-site.xml
dfs.access.time.precision	hdfs-site.xml	dfs.namenode.accesstime.precision	hdfs-site.xml
dfs.backup.address	hdfs-site.xml	dfs.namenode.backup.address	hdfs-site.xml
dfs.backup.http.address	hdfs-site.xml	dfs.namenode.backup.http-address	hdfs-site.xml
fs.checkpoint.dir	hdfs-site.xml	dfs.namenode.checkpoint.dir	hdfs-site.xml
fs.checkpoint.edits.dir	hdfs-site.xml	dfs.namenode.checkpoint.edits.dir	hdfs-site.xml
fs.checkpoint.period	hdfs-site.xml	dfs.namenode.checkpoint.period	hdfs-site.xml
dfs.name.edits.dir	hdfs-site.xml	dfs.namenode.edits.dir	hdfs-site.xml
heartbeat.recheck.interval	hdfs-site.xml	dfs.namenode.heartbeat.recheck-interval	hdfs-site.xml
dfs.http.address	hdfs-site.xml	dfs.namenode.http-address	hdfs-site.xml
dfs.https.address	hdfs-site.xml	dfs.namenode.https-address	hdfs-site.xml
dfs.max.objects	hdfs-site.xml	dfs.namenode.max.objects	hdfs-site.xml
dfs.name.dir	hdfs-site.xml	dfs.namenode.name.dir	hdfs-site.xml
dfs.name.dir.restore	hdfs-site.xml	dfs.namenode.name.dir.restore	hdfs-site.xml
dfs.replication.considerLoad	hdfs-site.xml	dfs.namenode.replication.considerload	hdfs-site.xml
dfs.replication.interval	hdfs-site.xml	dfs.namenode.replication.interval	hdfs-site.xml
dfs.max-repl-streams	hdfs-site.xml	dfs.namenode.replication.max-streams	hdfs-site.xml
dfs.replication.min	hdfs-site.xml	dfs.namenode.replication.min	hdfs-site.xml
dfs.replication.pending.time	hdfs-site.xml	dfs.namenode.replication.pending-timeout-sec	hdfs-site.xml
dfs.safemode.extension	hdfs-site.xml	dfs.namenode.safemode.extension	hdfs-site.xml
dfs.safemode.threshold.pct	hdfs-site.xml	dfs.namenode.safemode.threshold.pct	hdfs-site.xml
dfs.secondary.http.address	hdfs-site.xml	dfs.namenode.secondary.http-address	hdfs-site.xml
dfs.permissions	hdfs-site.xml	dfs.permissions.enabled	hdfs-site.xml
dfs.permissions.supergroup	hdfs-site.xml	dfs.permissions.superusergroup	hdfs-site.xml
dfs.df.interval	hdfs-site.xml	fs.df.interval	core-site.xml
dfs.umaskmode	hdfs-site.xml	fs.permissions.umask-mode	hdfs-site.xml

9. Review the following HDP 1.3.2 MapReduce Configs and their new HDP 2.x Mappings

**Table 24.5. HDP 1.3.2 Configs now in Capacity Scheduler for HDP 2.x (mapred-site.xml)**

HDP 1.3.2 config	HDP 1.3.2 config file	HDP 2.1 config	HDP 2.1 config file
mapred.map.child.java.opts	mapred-site.xml	mapreduce.map.java.opts	mapred-site.xml
mapred.job.map.memory.mb	mapred-site.xml	mapreduce.map.memory.mb	mapred-site.xml
mapred.reduce.child.java.opts	mapred-site.xml	mapreduce.reduce.java.opts	mapred-site.xml
mapred.job.reduce.memory.mb	mapred-site.xml	mapreduce.reduce.memory.mb	mapred-site.xml
security.task.umbilical.protocol.acl	mapred-site.xml	security.job.task.protocol.acl	mapred-site.xml

10. Review the following HDP 1.3.2 Configs and their new HDP 2.x Capacity Scheduler mappings.

**Table 24.6. HDP 1.3.2 Configs now in Capacity Scheduler for HDP 2.x (capacity-scheduler.xml)**

HDP 1.3.2 config	HDP 1.3.2 config file	HDP 2.1 config	HDP 2.1 config file
mapred.queue.names	mapred-site.xml	yarn.scheduler.capacity.root.capacity	capacity-scheduler.xml
mapred.queue.default.acl-submit-job	mapred-queue-acls.xml	yarn.scheduler.capacity.root.default.submit_jobs	capacity-scheduler.xml
mapred.queue.default.acl-administer-jobs	mapred-queue-acls.xml	yarn.scheduler.capacity.root.default.administer_jobs	capacity-scheduler.xml
mapred.capacity-scheduler.queue.default.capacity	capacity-scheduler.xml	yarn.scheduler.capacity.root.default.capacity	capacity-scheduler.xml
mapred.capacity-scheduler.queue.default.user-limit-factor	capacity-scheduler.xml	yarn.scheduler.capacity.root.default.user-limit-factor	capacity-scheduler.xml
mapred.capacity-scheduler.queue.default.maximum-capacity	capacity-scheduler.xml	yarn.scheduler.capacity.root.default.maximum-capacity	capacity-scheduler.xml
mapred.queue.default.state	capacity-scheduler.xml	yarn.scheduler.capacity.root.default.state	capacity-scheduler.xml

11. Compare the following HDP 1.3.2 configs in `hadoop-env.sh` with the new configs in HDP 2.x

**Table 24.7. HDP 1.3.2 Configs and HDP 2.x for `hadoop-env.sh`**

HDP 1.3.2 config	HDP 2.1 config	Description
JAVA_HOME	JAVA_HOME	Java implementation to use
HADOOP_HOME_WARN_SUPPRESS	HADOOP_HOME_WARN_SUPPRESS	
HADOOP_CONF_DIR	HADOOP_CONF_DIR	Hadoop Configuration Directory
Not in <code>hadoop-env.sh</code> .	HADOOP_HOME	
Not in <code>hadoop-env.sh</code> .	HADOOP_LIBEXEC_DIR	
HADOOP_NAMENODE_INIT_HEAPSIZE	HADOOP_NAMENODE_INIT_HEAPSIZE	
HADOOP_OPTS	HADOOP_OPTS	Extra Java runtime options. Empty by default.
HADOOP_NAMENODE_OPTS	HADOOP_NAMENODE_OPTS	Command specific options appended to HADOOP_OPTS.
HADOOP_JOBTRACKER_OPTS	Not in <code>hadoop-env.sh</code> .	Command specific options appended to HADOOP_OPTS.

HDP 1.3.2 config	HDP 2.1 config	Description
HADOOP_TASKTRACKER_OPTS	Not in hadoop-env.sh.	Command specific options appended to HADOOP_OPTS.
HADOOP_DATANODE_OPTS	HADOOP_DATANODE_OPTS	Command specific options appended to HADOOP_OPTS.
HADOOP_BALANCER_OPTS	HADOOP_BALANCER_OPTS	Command specific options appended to HADOOP_OPTS.
HADOOP_SECONDARYNAMENODE_OPTS	HADOOP_SECONDARYNAMENODE_OPTS	Command specific options appended to HADOOP_OPTS.
HADOOP_CLIENT_OPTS	HADOOP_CLIENT_OPTS	Applies to multiple commands (fs, dfs, fsck, distcp etc).
HADOOP_SECURE_DN_USER	Not in hadoop-env.sh.	Secure datanodes, user to run the datanode as
HADOOP_SSH_OPTS	HADOOP_SSH_OPTS	Extra ssh options.
HADOOP_LOG_DIR	HADOOP_LOG_DIR	Where log files are stored. \$HADOOP_HOME/logs by default.
HADOOP_SECURE_DN_LOG_DIR	HADOOP_SECURE_DN_LOG_DIR	Where log files are stored in the secure data environment.
HADOOP_PID_DIR	HADOOP_PID_DIR	Directory where pid files are stored, /tmp by default.
HADOOP_SECURE_DN_PID_DIR	HADOOP_SECURE_DN_PID_DIR	Directory where pid files are stored, /tmp by default.
HADOOP_IDENT_STRING	HADOOP_IDENT_STRING	String representing this instance of hadoop. \$USER by default.
Not in hadoop-env.sh.	HADOOP_MAPRED_LOG_DIR	
Not in hadoop-env.sh.	HADOOP_MAPRED_PID_DIR	
Not in hadoop-env.sh.	JAVA_LIBRARY_PATH	
Not in hadoop-env.sh.	JSVC_HOME	For starting the datanode on secure cluster.



## Note

Some of the configuration settings refer to the variable `HADOOP_HOME`. The value of `HADOOP_HOME` is automatically inferred from the location of the startup scripts. `HADOOP_HOME` is the parent directory of the `bin` directory that holds the Hadoop scripts. In many instances this is `$HADOOP_INSTALL/hadoop`.

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

```
<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.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.nodemanager.admin-env</name>
  <value>MALLOC_ARENA_MAX=$MALLOC_ARENA_MAX</value>
  <description>Restrict the number of memory arenas to prevent excessive VMEM
  use by the glib arena allocator.
  For example, MALLOC_ARENA_MAX=4</description>
</property>
```

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

```
<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>
```

```
<property>
  <name>mapreduce.shuffle.port</name>
  <value>13562</value>
</property>
```

```
<property>
  <name>mapreduce.framework.name</name>
  <value>yarn</value>
</property>
```

14 For a secure cluster, add the following properties to `mapred-site.xml`:

```
<property>
  <name>mapreduce.jobhistory.principal</name>
  <value>jhs/_PRINCIPAL@$REALM.ACME.COM</value>
  <description>Kerberos principal name for the MapReduce JobHistory
  Server.</description>
</property>
<property>
  <name>mapreduce.jobhistory.keytab</name>
  <value>/etc/security/keytabs/jhs.service.keytab</value>
  <description>Kerberos keytab file for the MapReduce JobHistory Server.</
  description>
</property>
```

15 For a secure cluster, you must also update `hadoop.security.auth_to_local` in `core-site.xml` to include a rule regarding the `mapreduce.jobhistory.principal` value you set in the previous step.

```
RULE: [ 2:$1@$0 ] ( PRINCIPAL@$REALM.ACME.COM ) s / . * / mapred /
```

where `PRINCIPAL` and `REALM` are the kerberos principal and realm you specified in `mapreduce.jobhistory.principal`.

16 Delete any remaining HDP1 properties in the `mapred-site.xml` file.

17 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](#).

## 24.4. Create Local Directories

You must create local directories for YARN on each NodeManager host in your cluster (in HDP-2, the NodeManager replaces the TaskTracker) and set the appropriate permissions

for the YARN log directories. If these directories do not exist, you can create them using the instructions on [this page](#).

1. Set the permissions in the `yarn.nodemanager.local-dirs` directories. Run these commands on all DataNodes in your cluster.

```
chown -R yarn:hadoop ${yarn.nodemanager.local-dirs}
chmod 755 ${yarn.nodemanager.local-dirs}
```

where `${yarn.nodemanager.local-dirs}` is your local directory.

2. Change the permissions of the directories in `yarn.nodemanager.log-dirs`. If these directories do not exist, you can create them using the instructions on [this page](#). Run these commands on all DataNodes in your cluster.

```
chown -R yarn:hadoop ${yarn.nodemanager.log-dirs}
chmod 755 ${yarn.nodemanager.log-dirs}
```

where `${yarn.nodemanager.log-dirs}` is your log directory.

3. Create directories for `YARN_LOG_DIR` and `YARN_PID_DIR`.

- a. Open `/etc/hadoop/conf/yarn-env.sh`

- b. Write down your values for `YARN_LOG_DIR` and `YARN_PID_DIR` as the following instructions require values for the `${YARN_LOG_DIR}` and `${YARN_PID_DIR}`. For example in `yarn-env.sh`:

```
YARN_LOG_DIR=/grid/0/var/log/hadoop/yarn
YARN_PID_DIR=/grid/0/var/run/hadoop/yarn
```

4. Make directories for `${YARN_LOG_DIR}` and `${YARN_PID_DIR}` and set the appropriate permissions for them.

```
mkdir ${YARN_LOG_DIR}
chown yarn:hadoop ${YARN_LOG_DIR}
chmod 755 ${YARN_LOG_DIR}

mkdir ${YARN_PID_DIR}
chown yarn:hadoop ${YARN_PID_DIR}
chmod 755 ${YARN_PID_DIR}
```

## 24.5. Start HDFS

Start HDFS.

To start HDFS, run commands as the `$HDFS_USER`.

1. Start the NameNode. On the NameNode host machine, execute the following command:

```
su $HDFS_USER
export HADOOP_LIBEXEC_DIR=/usr/lib/hadoop/libexec
/usr/lib/hadoop/sbin/hadoop-daemon.sh start namenode -upgrade
```

On a large system, this can take a long time to complete.



## Note

Run this command with the `-upgrade` option only once. After you have completed this step, you can bring up the NameNode using this command without including the `-upgrade` option.

2. Verify that the NameNode is up and running:

```
ps -ef | grep -i NameNode
```

3. Start the Secondary NameNode. On the Secondary NameNode host machine, execute the following command:

```
su $HDFS_USER
export HADOOP_LIBEXEC_DIR=/usr/lib/hadoop/libexec
/usr/lib/hadoop/sbin/hadoop-daemon.sh start secondarynamenode
```

4. Verify that the Secondary NameNode is up and running:

```
ps -ef | grep SecondaryNameNode
```

- 5.



## Note

If you are working on a non-secure DataNode, use `$HDFS_USER`. For a secure DataNode, use `root`.

Start DataNodes. On all the DataNodes, execute the following command:

```
export HADOOP_LIBEXEC_DIR=/usr/lib/hadoop/libexec
/usr/lib/hadoop/sbin/hadoop-daemon.sh start datanode
```

6. Verify that the DataNode process is up and running:

```
ps -ef | grep DataNode
```

7. Verify that Namenode can go out of safe mode.

```
hdfs dfsadmin -safemode wait
Safemode is OFF
```

In general, it takes 5-10 minutes to get out of safemode. For thousands of nodes with millions of data blocks, getting out of safemode could take up to 45 minutes.

## 24.5.1. Verify HDFS Filesystem Health

Analyze if the filesystem is healthy.

1. Run the `fsck` command on namenode as `$HDFS_USER`:

```
hadoop fsck / -files -blocks -locations > dfs-new-fsck-1.log
```

2. Run `hdfs namespace` and report.

- List directories.

```
hadoop dfs -lsr / > dfs-new-lsr-1.log
```

- Run report command to create a list of DataNodes in the cluster.

```
hadoop dfsadmin -report > dfs-new-report-1.log
```

3. Compare the namespace report before the upgrade and after the upgrade. Verify that user files exist after upgrade.

```
dfs-old-fsck-1.log < -- > dfs-new-fsck-1.log
dfs-old-lsr-1.log < -- > dfs-new-lsr-1.log
```



### Note

You must do this comparison manually to catch all errors.

4. From the Namenode WebUI, see if all DataNodes are up and running.

```
http://<namenode>:50070
```

## 24.5.2. Create HDFS Directories

You must create the following HDFS directories after you upgrade:

- YARN NodeManager remote applications log
- HDFS Job History

To create the YARN NodeManager remote applications log

1. Open `/etc/hadoop/conf/yarn-site.xml`.
2. Write down the value of the `yarn.nodemanager.remote-app-log-dir` so that you can use it in place of the `${yarn.nodemanager.remote-app-log-dir}` variable in later examples. For example: `${yarn.nodemanager.remote-app-log-dir}`  
= `/app-logs`
3. Create the `${yarn.nodemanager.remote-app-log-dir}` in HDFS.

```
hdfs dfs -mkdir ${yarn.nodemanager.remote-app-log-dir}
hdfs dfs -chown -R yarn:hadoop ${yarn.nodemanager.remote-app-log-dir}
hdfs dfs -chmod -R 777 ${yarn.nodemanager.remote-app-log-dir}
```

4. Create a JobHistory directory in HDFS.
  - a. Open `mapred-site.xml`.
  - b. Write down the value of the `mapreduce.jobhistory.done-dir` so that you can use it in place of the `${mapreduce.jobhistory.done-dir}` variable in later examples.
  - c. Write down the value of the `mapreduce.jobhistory.intermediate-done-dir` so that you can use it in place of the `${mapreduce.jobhistory.intermediate-done-dir}` variable in later examples.
  - d. Create the JobHistory directories in HDFS.



```

hadoop dfs -mkdir ${mapreduce.jobhistory.done-dir}
hadoop dfs -mkdir ${mapreduce.jobhistory.intermediate-done-dir}
hadoop dfs -chown -R mapred:hadoop ${mapreduce.jobhistory.done-dir}
hadoop dfs -chown -R mapred:hadoop ${mapreduce.jobhistory.intermediate-
done-dir}
hadoop dfs -chmod -R 777 ${mapreduce.jobhistory.done-dir}
hadoop dfs -chmod -R 777 ${mapreduce.jobhistory.intermediate-done-dir}

```



### Note

You have to create the parent directories in HDFS by yourself. Grant the parent directories the same permissions.

## 24.5.3. Start YARN/MapReduce Services

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

The keys are defined as follows:

- `yarn.nodemanager.linux-container-executor.group` - the configured value of `yarn.nodemanager.linux-container-executor.group`. This must match the value of `yarn.nodemanager.linux-container-executor.group` in `yarn-site.xml`.
- `banned.users` - a comma separated list of users who cannot run `container-executor`.
- `min.user.id` - the minimum value of user id, this is to prevent system users from running `container-executor`.
- `allowed.system.users` - a comma separated list of allowed system users.

To start YARN, run commands as a YARN user. To start MapReduce, run commands as a MapReduce user.

1. If you have a secure cluster, create the following principals and keytabs for YARN before you start the YARN service:

```

yarn.resourcemanager.principal
yarn.resourcemanager.keytab
yarn.nodemanager.principal
yarn.nodemanager.keytab
yarn.resourcemanager.webapp.spnego-principal
yarn.nodemanager.webapp.spnego-principal
mapreduce.jobhistory.webapp.spnego-principal
yarn.resourcemanager.webapp.spnego-keytab-file
yarn.nodemanager.webapp.spnego-keytab-file
mapreduce.jobhistory.webapp.spnego-keytab-file

```

2. Start the ResourceManager on your previous JobTracker host.

```
su $YARN_USER
```

```
export HADOOP_LIBEXEC_DIR=/usr/lib/hadoop/libexec
/usr/lib/hadoop-yarn/sbin/yarn-daemon.sh start resourcemanager
ps -ef | grep -i resourcemanager
```

### 3. Prepare the NodeManager hosts.

- a. Change permissions for `/usr/lib/hadoop-yarn/bin/container-executor.cfg`

```
chown yarn:hadoop /usr/lib/hadoop-yarn/bin/container-executor
chmod -R 650 /usr/lib/hadoop-yarn/bin/container-executor
```

- b. On all NodeManager hosts, add the yarn user to the hadoop group.

For example if you are using CentOS6:

```
usermod -a -G hadoop yarn
```

### 4. Start the NodeManager on your previous TaskTracker hosts.

```
su $YARN_USER
export HADOOP_LIBEXEC_DIR=/usr/lib/hadoop/libexec
/usr/lib/hadoop-yarn/sbin/yarn-daemon.sh start nodemanager
ps -ef | grep -i nodemanager
```

### 5. To start MapReduce, run the following commands as MapReduce user:

```
su $MAPREDUCE_USER
export HADOOP_LIBEXEC_DIR=/usr/lib/hadoop/libexec
/usr/lib/hadoop-mapreduce/sbin/mr-jobhistory-daemon.sh --config /etc/hadoop/conf start historyserver
ps -ef | grep -i jobhistoryserver
```

## 24.5.4. Run Hadoop Smoke Tests

To smoke test your Hadoop upgrade, you can run the following MapReduce job.

Run this command as regular user. The job uses MapReduce to write 100MB of data into HDFS with RandomWriter. `hadoop jar /usr/lib/hadoop-mapreduce/*examples*.jar randomwriter -Dtest.randomwrite.total_bytes=100000000 test-after-upgrade` You should see messages similar to:

```
map 0% reduce 0%
...
map 100% reduce 100%
Job ... completed successfully
```

You successfully submitted your first MapReduce job in HDP 2.x. The next steps are to upgrade your other components to 2.x.

Basic troubleshooting:

1. To find the number of active nodes and NodeManagers, access the ResourceManager web UI:

```
http://<resource manager host>:8088/cluster/nodes
```

The number of active nodes should be equal to the number of nodemanagers.

2. Error messages. Access the ApplicationMaster WebUI to view the container logs.

a. Looking at your console logs for MapReduce job, there is a line in this format:

```
13/10/02 17:57:21 INFO mapreduce.Job: The url to track the job: http://<resource manager host>:8088/proxy/application_1380673658357_0007/
```

b. Go to the URL and select the job link.

c. Select the logs link under ApplicationMaster table. It will redirect you to the container logs. Error messages display here.

## 24.6. Upgrade Apache ZooKeeper

1. Execute the following command on all the Apache ZooKeeper nodes:

- For RHEL/CentOS/Oracle Linux:

```
yum upgrade zookeeper
```

- For SLES:

Run the following commands:

```
zypper rm zookeeper  
zypper install zookeeper
```

- For Ubuntu or Debian:

```
apt-get update zookeeper
```

2. Replace your configuration after upgrading. Replace the ZooKeeper template configuration in `/etc/zookeeper/conf`.

3. Start ZooKeeper. On all the ZooKeeper host machines, execute the following command:

```
sudo su -l $ZOOKEEPER_USER -c "source /etc/zookeeper/conf/zookeeper-env.sh;  
export ZOOCFGDIR=/etc/zookeeper/conf; /usr/lib/zookeeper/bin/zkServer.sh  
start >> $ZOOKEEPER_LOG_DIR/zoo.out\"
```

where

- `$ZOOKEEPER_USER` is the ZooKeeper Service user. For example, `zookeeper`.
- `$ZOOKEEPER_LOG_DIR` is the directory where ZooKeeper server logs are stored. For example, `/var/log/zookeeper`.

## 24.7. Upgrade Apache HBase

1. Start the Zookeeper zkServer and NameNode services.

2. Upgrade Apache HBase.

Run the following commands on both the HBase Master and the RegionServers hosts.

- For RHEL/CentOS/Oracle Linux:

```
yum upgrade hbase
```

- For SLES:

Run the following commands:

```
zypper rm hbase  
zypper install hbase
```

- For Ubuntu or Debian:

```
apt-get install hbase
```

3. Replace your configuration after upgrading. Replace the HBase template configuration in `/etc/hbase/conf`.
4. As the HBase user, run an upgrade:

```
sudo su -l $HBASE_USER -c "hbase upgrade -execute"
```

You should see a completed Znode upgrade with no errors.

5. Start services. Run as root:

```
Suppose $HBASE_USER = hbase  
sudo su -l hbase -c "/usr/lib/hbase/bin/hbase-daemon.sh --config /etc/hbase/  
conf start master"  
sudo su -l hbase -c "/usr/lib/hbase/bin/hbase-daemon.sh --config /etc/hbase/  
conf start regionserver"
```

6. Check processes.

```
ps -ef | grep -i hmaster  
ps -ef | grep -i hregion
```

## 24.8. Upgrade Hive and HCatalog

In HDP 2.1 (Apache Hive 0.13.0) the Decimal data type is now treated as the type `Decimal(10,0)`: 10 digits of precision and 0 scale. This is a change from the variable precision and scale that was available in Hive 0.11.0 and Hive 0.12.0, which allowed up to 38 digits of precision and unlimited scale.

To avoid unintended "rounding" of decimal data, sites that were previously running Hive 0.11.0 and Hive 0.12.0 may need to migrate tables with Decimal columns after upgrading to Hive 0.13.0. For details, see the [Apache Hive wiki](#). For assistance with upgrades that involve Decimal data, please contact Hortonworks Support.

1. Stop the Hive Metastore, if you have not done so already.
2. Upgrade Hive and HCatalog. On the Hive and HCatalog host machines, execute the following commands:
  - For RHEL/CentOS:

```
yum upgrade hive
yum erase hcatalog
yum install hive-hcatalog
```

- For SLES:

Run the following commands:

```
zypper up hive
zypper erase hcatalog
zypper install hive-hcatalog
```

- For Ubuntu or Debian:

```
apt-get update hive hcatalog
```

3. Upgrade the Hive Metastore database schema by running the upgrade scripts included in HDP for your metastore database. HDP includes upgrade scripts for the following databases:

- MySQL
- Postgres
- Oracle
- MS SQL Server
- Derby

### Upgrading MySQL Hive Metastore

Run the following scripts as the root user to upgrade a MySQL Hive Metastore from 1.3.x to 2.1.x:

```
> cd /usr/lib/hive/scripts/metastore/upgrade/mysql
> mysql hive
mysql> source upgrade-0.11.0-to-0.12.0.mysql.sql
mysql> source upgrade-0.12.0-to-0.13.0.mysql.sql
```

### Upgrading Postgres Hive Metastore

Run the following scripts as the root user to upgrade a Postgres Hive Metastore from 1.3.x to 2.1.x:

```
cd /usr/lib/hive/scripts/metastore/upgrade/postgres
psql -d hive -a -f upgrade-0.11.0-to-0.12.0.postgres.sql
psql -d hive -a -f upgrade-0.12.0-to-0.13.0.postgres.sql
```

### Upgrading Oracle Hive Metastore

Run the following scripts as the root user to upgrade an Oracle Hive Metastore from 1.3.x to 2.1.x:

```
cd /usr/lib/hive/scripts/metastore/upgrade/oracle
sqlplus
SQL> @upgrade-0.11.0-to-0.12.0.oracle.sql
```

```
SQL> @upgrade-0.12.0-to-0.13.0.oracle.sql
```

#### 4. Edit hive-env.sh to point to the new hive-hcatalog.jar:

```
if [ "${HIVE_AUX_JARS_PATH}" != "" ]; then
export HIVE_AUX_JARS_PATH=/usr/lib/hive-hcatalog/share/hcatalog/hive-
hcatalog-core.jar:${HIVE_AUX_JARS_PATH}
else
  export HIVE_AUX_JARS_PATH=/usr/lib/hive-hcatalog/share/hcatalog/hive-
hcatalog-core.jar
fi
```

#### 5. Download and extract the HDP [companion files](#). Copy the hive-site.xml file in the configuration\_files/hive directory of the extracted companion files to the etc/hive/conf directory on your Hive host machine. This new version of the hive-site.xml file contains new properties for HDP-2.1 features.

#### 6. Edit the hive-site.xml file and modify the properties based on your environment. Search for TODO in the file for the properties to replace.

##### a. Edit the connection properties for your Hive metastore database in hive-site.xml:

```
<property>
  <name>javax.jdo.option.ConnectionURL</name>
  <value>jdbc:mysql://TODO-HIVE-METASTORE-DB-SERVER:TODO-HIVE-
METASTORE-DB-PORT/TODO-HIVE-METASTORE-DB-NAME?createDatabaseIfNotExist=
true</value>
  <description>Enter your Hive Metastore Connection URL, for example if
MySQL: jdbc:mysql://localhost:3306/mysql?createDatabaseIfNotExist=true</
description>
</property>

<property>
  <name>javax.jdo.option.ConnectionUserName</name>
  <value>TODO-HIVE-METASTORE-DB-USER-NAME</value>
  <description>Enter your Hive Metastore database user name.</
description>
</property>

<property>
  <name>javax.jdo.option.ConnectionPassword</name>
  <value>TODO-HIVE-METASTORE-DB-PASSWORD</value>
  <description>Enter your Hive Metastore database password.</
description>
</property>

<property>
  <name>javax.jdo.option.ConnectionDriverName</name>
  <value>TODO-HIVE-METASTORE-DB-CONNECTION-DRIVER-NAME</value>
  <description>Enter your Hive Metastore Connection Driver Name, for
example if MySQL: com.mysql.jdbc.Driver</description>
</property>
```

Optional: If you want Hive Authorization, set the following Hive authorization parameters in the hive-site.xml file:

```
<property>
  <name>hive.security.authorization.enabled</name>
```

```

    <value>true</value>
  </property>

  <property>
    <name>hive.security.authorization.manager</name>
    <value>org.apache.hadoop.hive.ql.security.authorization.
StorageBasedAuthorizationProvider</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>

```

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. To enable HiveServer2, leave this property value empty.

```

<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>

```



## Note

You can also use the [HDP utility script](#) to fine-tune your configuration settings based on node hardware specifications.

7. If you are using a MySQL database for your Hive Metastore, run the following scripts to upgrade the Metastore:

- `/usr/lib/hive/scripts/metastore/upgrade/mysql/upgrade-0.11.0-to-0.12.0.mysql.sql`
- `/usr/lib/hive/scripts/metastore/upgrade/mysql/upgrade-0.12.0-to-0.13.0.mysql.sql`

8. Edit `hive-site.xml` to set the value of `datanucleus.autoCreateSchema` to `true`:

```

<property>
  <name>datanucleus.autoCreateSchema</name>
  <value>true</value>
  <description>Creates necessary schema on a startup if one doesn't exist</
description>
</property>

```

9. Edit `hive-site.xml` to update the value of `hive.metadata.export.location` to the new, joint `hive-hcatalog jar` (previously `hcatalog-core.jar`):

```
<property>
  <name>hive.metadata.export.location</name>
  <value>export HIVE_AUX_JARS_PATH=/usr/lib/hive-hcatalog/share/hcatalog/
hive-hcatalog-core.jar</value>
</property>
```

10 Start the Hive Metastore service.

```
Login as $HIVE_USER
nohup hive --service metastore>$HIVE_LOG_DIR/hive.out 2>$HIVE_LOG_DIR/hive.
log &
```

11 Start HiveServer2. On the Hive Metastore host machine, execute the following command:

```
sudo su -l $HIVE_USER -c "nohup /usr/lib/hive/bin/hiveserver2 -hiveconf
hive.metastore.uris=' ' -hiveconf hive.log.file=hs2.log -hiveconf hive.log.
dir=/grid/0/var/log/hive > /grid/0/var/log/hive/hive.out 2> /grid/0/var/log/
hive/hive.log &"
```

where

- `$HIVE_USER` is the Hive Service user. For example, `hive`.
- `$HIVE_LOG_DIR` is the directory where Hive server logs are stored (example: `/var/log/hive`).

## 24.9. Upgrade Apache Oozie

1. Before you upgrade, stop any job in a RUNNING or SUSPENDED state before you upgrade:

```
oozie job -oozie http://localhost:11000/oozie -kill 14-20090525161321-oozie-
joe
```

2. Execute the following command on the Apache Oozie server and client machines:

- For RHEL/CentOS:

```
rm -rf /usr/lib/oozie/
rm -rf /var/lib/oozie/
yum install oozie
```

- For SLES:

Run the following commands:

```
zypper rm oozie
zypper install oozie
```

- For Ubuntu or Debian:

```
apt-get install oozie
```

3. Remove your old Oozie configuration. First change permissions on `oozie-tomcat-conf` and then remove the `/usr/lib/oozie/conf` directory.



```
chmod -R 777 /etc/alternatives/oozie-tomcat-conf/conf
rm /usr/lib/oozie/conf
```

4. Create a symlink for `/usr/lib/oozie/conf` to `/etc/oozie/conf`.

```
ln -s /etc/oozie/conf /usr/lib/oozie/conf
```

5. You must replace your configuration after upgrading. Copy `/etc/oozie/conf` from the template to the `conf` directory on each oozie server and client.
6. Change the JDBC config to match your Oozie database. The entries to edit are:

```
oozie.service.JPAService.jdbc.driver
oozie.service.JPAService.jdbc.url
```

For example, for MySQL, use:

```
oozie.service.JPAService.jdbc.driver = com.mysql.jdbc.Driver
oozie.service.JPAService.jdbc.url = jdbc:mysql://$my_server:$my_port/oozie?
createDatabaseIfNotExist=true
```

7. Copy the JDBC jar to `libext-customer`.
  - a. Create the `/usr/lib/oozie/libext-customer` directory.

```
cd /usr/lib/oozie
mkdir libext-customer
```

- b. Grant read/write/execute access to all users for the `libext-customer` directory.

```
chmod -R 777 /usr/lib/oozie/libext-customer
```

8. Copy the JDBC jar of your Oozie database to the `libext-customer` directory. For example, if you are using MySQL, copy your `mysql-connector-java.jar` to `/usr/lib/oozie/libext-customer` and `/usr/lib/oozie/libtools`.



### Note

HDP 2.1 does not provide the MySQL jar. You can download one from MySQL, when you download `mysql-connector-java` [here](#).

9. Copy these files to the `libext-customer` directory

```
cp /usr/lib/hadoop/lib/hadoop-lzo*.jar /usr/lib/oozie/libext-customer
cp /usr/share/HDP-oozie/ext-2.2.zip /usr/lib/oozie/libext-customer/
```

10. Extract share-lib.

```
cd /usr/lib/oozie
tar xzvf /usr/lib/oozie//oozie-sharelib.tar.gz
su -l hdfs -c "hdfs dfs -rmdir /user/oozie" <!--remove your old oozdie user dir-->
su -l hdfs -c "hdfs dfs -mkdir -p /user/oozie" <!--create new oozie user dir-->
su -l hdfs -c "hdfs dfs -copyFromLocal /usr/lib/oozie/share /user/oozie/."
```

You may see complaints that some files exist. This is an expected behavior.

```
su -l hdfs -c "hdfs dfs -chown oozie:hadoop /user/oozie"
```

```
su -l hdfs -c "hdfs dfs -chmod -R 755 /user/oozie"
```

11 Run upgrade as the Oozie user. Do not run as the root user to execute this.

```
su $OOZIE_USER
/usr/lib/oozie/bin/ooziedb.sh upgrade -run
```

12 Prepare the Oozie WAR file. Run as root:

```
sudo su -l oozie -c "/usr/lib/oozie/bin/oozie-setup.sh prepare-war -d /usr/lib/oozie/libext-customer"
```

Look for console output to indicate success. For example, if you are using MySQL you should see something similar to:

```
INFO: Adding extension: libext-customer/mysql-connector-java.jar
New Oozie WAR file with added 'JARs' at /var/lib/oozie/oozie-server/webapps/oozie.war
```

13 Replace the content of /user/oozie/share in HDFS. On the Oozie server host:

a. Extract the Oozie sharelib into a tmp folder.

```
mkdir -p /tmp/oozie_tmp
cp /usr/lib/oozie/oozie-sharelib.tar.gz /tmp/oozie_tmp
cd /tmp/oozie_tmp
tar xzvf oozie-sharelib.tar.gz
```

b. Back up the /user/oozie/share folder in HDFS and then delete it. If you have any custom files in this folder back them up separately and then add them back after the share folder is updated.

```
su -l hdfs -c "hdfs dfs -copyToLocal /user/oozie/share /tmp/oozie_tmp/oozie_share_backup"
su -l hdfs -c "hdfs dfs -rm -r /user/oozie/share"
```

c. Add the latest share libs that you extracted in step 1. After you have added the files, modify ownership and ACL.

```
su -l hdfs -c "hdfs dfs -copyFromLocal /tmp/oozie_tmp/share /user/oozie/"
su -l hdfs -c "hdfs dfs -chown -R oozie:hadoop /user/oozie"
su -l hdfs -c "hdfs dfs -chmod -R 755 /user/oozie"
```

14 Set the `oozie.service.WorkflowAppService.system.libpath` in `oozie-site.xml` to the right path of sharelib in hdfs.

```
<property>
  <name>oozie.service.WorkflowAppService.system.libpath</name>
  <value>/user/${
    {user.name}
  }/share/lib</value>
  <description>
    System library path to use for workflow applications.
    This path is added to workflow application if their job properties sets
    the property 'oozie.use.system.libpath' to true.
  </description>
</property>
```

15 Start Oozie. Run as root.

```
sudo su -l oozie -c "cd /grid/0/var/log/oozie; /usr/lib/oozie/bin/oozie-start.sh"
```

16. Check processes.

```
ps -ef | grep -i oozie
```

## 24.10. Upgrade Apache WebHCat (Templeton)

1. Install Apache WebHCat.

- For RHEL/CentOS:

```
yum install hive-webhcat webhcat-tar-hive webhcat-tar-pig
```

- For SLES:

Run the following command:

```
zypper install hive-webhcat webhcat-tar-hive webhcat-tar-pig
```

- For Ubuntu or Debian:

```
apt-get install webhcat-tar-hive webhcat-tar-pig
```

Also see the instructions on manually deploying the WebHCat instance provided [here](#).

2. Copy the appropriate configurations from `/etc/hcatalog/conf` to `/etc/hive-webhcat/conf/`.

3. Copy the new Pig, Hive and Hadoop-streaming jars to HDFS using the path you specified in `/etc/hive-webhcat/conf/` and change ownership to the hcat user with 755 permissions. For example:

```
hdfs dfs-copyFromLocal /usr/share/HDP-webhcat/hive.tar.gz /usr/share/HDP-webhcat/pig.tar.gz
/usr/lib/hadoop-mapreduce/hadoop-streaming.jar hdfs:///apps/webhcat/
hdfs dfs -chmod -R 755 hdfs:///apps/webhcat/*
hdfs dfs -chown -R hcat hdfs:///apps/webhcat/*
```

4. Replace your WebHCat configuration after upgrading. Copy your modified `/etc/webhcat/conf` from the template to the configuration directory in all your WebHCat hosts.

5. Start WebHCat:

```
sudo su -l $WEBHCAT_USER -c "/usr/lib/hive-hcatalog/sbin/webhcat_server.sh start"
```

6. Smoke test WebHCat. On the WebHCat host machine, execute the following command:

```
http://$WEBHCAT_HOST_MACHINE:50111/templeton/v1/status
```

If you are using a secure cluster, execute the following command:

```
curl --negotiate -u: http://cluster.$PRINCIPAL.$REALM:50111/templeton/v1/status
{"status":"ok","version":"v1"}[machine@acme]$
```

7. Remove shared libraries from old Templeton installation. On the WebHCat host machine, execute the following command:

```
sudo su -l $HDFS_USER -c "hadoop dfs -rmr -skipTrash /apps/templeton"
rm -rf /usr/share/HDP-templeton
```

where

- `$WEBHCAT_USER` is the WebHCat Service user. For example, `hcat`.
- `$HDFS_USER` is the HDFS Service user. For example, `hdfs`.

## 24.11. Upgrade Apache Pig

1. On all the Apache Pig clients, execute the following command:

- For RHEL/CentOS:

```
yum upgrade pig
```

- For SLES:

Run the following commands:

```
zypper rm pig
zypper install pig
```

- For Ubuntu or Debian:

```
apt-get install pig
```

2. You must replace `/etc/hive-webhcat/conf/` your configuration after upgrading. Copy `/etc/pig/conf` from the template to the conf directory in pig hosts.

## 24.12. Upgrade Apache Sqoop

Upgrade Apache Sqoop. On the Sqoop host machine, execute the following command:

- For RHEL/CentOS/Oracle Linux:

```
yum upgrade sqoop
```

- For SLES:

Run the following commands:

```
zypper rm sqoop
zypper install sqoop
```

- For Ubuntu or Debian:

```
apt-get install sqoop
```

- You must replace your configuration after upgrading. Copy `/etc/sqoop/conf` from the template to the conf directory in sqoop hosts.

## 24.13. Upgrade Apache Flume

Upgrade Apache Flume. On the Flume host machine, execute the following command:

- For RHEL/CentOS/Oracle Linux:

```
yum upgrade flume
```

- For SLES:

```
zypper update flume
zypper remove flume
zypper se -s flume
```

You should see Flume in the output. Install Flume:

```
zypper install flume
```



### Important

When removing and installing packages, rename those files the `/conf` directory that have `.rpm` extension to original to retain the customized configs. Alternatively, you can also use the configuration files (under the `/conf` directory) you backed up before upgrading.

- You must replace your configuration after upgrading. Copy `/etc/flume/conf` from the template to the `conf` directory in Flume hosts.
- For Ubuntu or Debian:

```
apt-get install flume
```

### 24.13.1. Validate Flume

By default on installation Flume does not start running immediately. To validate, replace your default `conf/flume.conf` with the provided `flume.conf`, restart Flume, and see if the data is flowing by examining the destination.

Use this `flume.conf` file:

```
1. Name the components on this agent
  a1.sources = r1
  a1.sinks = k1
  a1.channels = c1
2. Describe/configure the source
  a1.sources.r1.type = seq
3. Describe the sink
  a1.sinks.k1.type = file_roll
  a1.sinks.k1.channel = c1
  a1.sinks.k1.sink.directory = /tmp/flume
4. Use a channel which buffers events in memory
  a1.channels.c1.type = memory
5. Bind the source and sink to the channel
  a1.sources.r1.channels = c1
  a1.sinks.k1.channel = c1
```

After starting Flume, check `/tmp/flume` to see if there are any files there. The files should contain simple sequential numbers. After validating, stop Flume and revert changes to `flume.conf` to prevent your disk from filling up.

## 24.14. Upgrade Apache Mahout

Upgrade Apache Mahout. On the Mahout client machines, execute the following command:

- For RHEL/CentOS/Oracle Linux:

```
yum upgrade mahout
```

- For SLES:

```
zypper remove mahout
zypper se -s mahout
```

You should see Mahout in the output. Install Mahout:

```
zypper install mahout
```



### Important

When removing and installing packages, rename those files the `/conf` directory that have `.rpm` extension to original to retain the customized configs. Alternatively, you can also use the configuration files (under the `/conf` directory) you backed up before upgrading.

- For Ubuntu or Debian:

```
apt-get install mahout
```

- You must replace your configuration after upgrading. Copy `/etc/mahout/conf` from the template to the `conf` directory in mahout hosts.

### 24.14.1. Mahout Validation

To validate mahout:

1. Create a test user:

```
hadoop fs -put /tmp/sample-test.txt /user/testuser
```

2. Set up 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/sample-test.txt --output /user/testuser/mahouttest --charset utf-8
```

## 24.15. Upgrade Hue

For HDP 2.1, use the Hue version shipped with HDP 2.1. If you have a previous version of Hue, the following steps to upgrade Hue.



### Warning

If you are using the embedded SQLite database, you must perform a backup of the database before you upgrade Hue to prevent data loss. To make a backup copy of the database, simply do a "dump" and redirect the results to a file.

```
su $HUE_USER
cd /var/lib/hue
sqlite3 desktop.db .dump > ~/desktop.bak
```

Execute the following command on all Hue Server host machines:

- For RHEL/CentOS/Oracle Linux:

```
yum upgrade hue
```

- For SLES:

```
zypper update hue
```



### Note

If you are using the embedded SQLite database, remember to restore your database after upgrade.

To restore the database from a backup, make sure the destination database is empty before copying. If necessary, rename or remove the current destination database. Then, copy your backup to the destination database. For example:

```
su $HUE_USER
cd /var/lib/hue
mv desktop.db desktop.db.old
sqlite3 desktop.db < ~/desktop.bak
```

## 24.16. Finalize Upgrade

You can start HDFS without finalizing the upgrade. When you are ready to discard your backup, you can finalize the upgrade.



### Warning

You must verify your filesystem health before finalizing the upgrade. After you finalize an upgrade, you cannot roll back.

Run the following command as the \$HDFS\_USER:

```
hadoop dfsadmin -finalizeUpgrade
```

## 24.17. Install New HDP 2.1 Services

Install new HDP 2.1 Services:

- **Tez** – Apache Tez is a YARN-based processing framework that greatly improves query response times for Hive and other YARN applications.

- [Phoenix](#) – Apache Phoenix is a SQL skin over HBase that makes it easier and faster to build HBase applications.
- [Storm](#) – A real-time event stream processing platform that provides fixed, continuous, & low latency processing for very high frequency streaming data.
- [Falcon](#) – Apache Falcon provides a framework for simplifying the development of data management applications in Apache Hadoop.
- [Knox](#) – Apache Knox is the Web/REST API Gateway solution for Hadoop. It provides a single access point for all of Hadoop resources over REST.



## 25. Upgrade from HDP 2.0 to HDP 2.1 Manually

This document provides instructions on how to upgrade to HDP 2.1 from the HDP 2.0 release.

Use the following instructions to upgrade to the latest release of HDP 2.1 from HDP 2.0:

1. [Getting Ready to Upgrade](#)
2. [Upgrade Hadoop](#)
3. [Start HDFS](#)
4. [Upgrade Apache ZooKeeper](#)
5. [Upgrade Apache HBase](#)
6. [Upgrade Apache Hive and Apache HCatalog](#)
7. [Upgrade Apache Oozie](#)
8. [Upgrade Apache WebHCat \(Templeton\)](#)
9. [Upgrade Apache Pig](#)
10. [Upgrade Apache Sqoop](#)
11. [Upgrade Apache Flume](#)
12. [Upgrade Apache Mahout](#)
13. [Upgrade Hue](#)
14. [Finalize the Upgrade](#)
15. [Install New HDP 2.1 Services](#)



### Note

If you need to do a maintenance release to maintenance release upgrade, check the latest version of the release notes in the [Hortonworks Documentation](#).

### 25.1. Getting Ready to Upgrade

HDP Stack upgrade involves upgrading from HDP 2.0 to HDP 2.1 versions and adding the new HDP 2.1 services.



### Warning

Rollback to HDP 2.0 requires an update to HDP 2.0. Contact Support for the patch.

The first step is to ensure you keep your HDP 2.0 configurations:

1. Back up the following HDP directories:

- /etc/hadoop/conf
- /etc/hbase/conf
- /etc/hive-hcatalog/conf
- /etc/hive-webhcat/conf
- /etc/hive/conf
- /etc/pig/conf
- /etc/sqoop/conf
- /etc/flume/conf
- /etc/mahout/conf
- /etc/oozie/conf
- /etc/hue/conf
- /etc/zookeeper/conf
- Optional - Back up your userlogs directories, `${mapred.local.dir}/userlogs`.

2. Run the `fsck` command as the HDFS Service user and fix any errors. (The resulting file contains a complete block map of the file system.)

```
su $HDFS_USER
hdfs fsck / -files -blocks -locations > dfs-old-fsck-1.log
```

where `$HDFS_USER` is the HDFS Service user. For example, `hdfs`.

3. Use the following instructions to compare status before and after the upgrade:



### Note

The following commands must be executed by the user running the HDFS service (by default, the user is `hdfs`).

a. Capture the complete namespace of the file system. (The following command does a recursive listing of the root file system.)

```
su $HDFS_USER
hadoop dfs -lsr / > dfs-old-lsr-1.log
```

where `$HDFS_USER` is the HDFS Service user. For example, `hdfs`.



### Note

In secure mode you must have kerberos credentials for the `hdfs` user.

- b. Run the report command to create a list of DataNodes in the cluster.

```
su $HDFS_USER
hadoop dfsadmin -report > dfs-old-report-1.log
```

where `$HDFS_USER` is the HDFS Service user. For example, `hdfs`.

- c. Optional - You can copy all or unrecoverable only data storelibext-customer directory in HDFS to a local file system or to a backup instance of HDFS.
- d. Optional - You can also repeat the steps 3 (a) through 3 (c) and compare the results with the previous run to ensure the state of the file system remained unchanged.

4. As the HDFS user, save the namespace by executing the following command:

```
su $HDFS_USER
hadoop dfsadmin -safemode enter
hadoop dfsadmin -saveNamespace
```

5. Backup your NameNode metadata.

- a. Copy the following checkpoint files into a backup directory:

- `dfs.name.dir/edits`
- `dfs.name.dir/image/fsimage`
- `dfs.name.dir/current/fsimage`

- b. Store the layoutVersion of the namenode.

```
${dfs.name.dir}/current/VERSION
```

6. Finalize any prior HDFS upgrade, if you have not done so already.

```
su $HDFS_USER
hdfs dfsadmin -finalizeUpgrade
```

7. Optional - Backup the Hive Metastore database.



### Note

These instructions are provided for your convenience. Please check your database documentation for the latest back up instructions.

**Table 25.1. Hive Metastore Database Backup and Rstore**

Database Type	Backup	Restore
MySQL	<code>mysqldump \$dbname &gt; \$outputfilename.sql</code> For example: <code>mysqldump hive &gt; /tmp/mydir/backup_hive.sql</code>	<code>mysql \$dbname &lt; \$inputfilename.sql</code> For example: <code>mysql hive &lt; /tmp/mydir/backup_hive.sql</code>
Postgres	<code>sudo -u \$username pg_dump \$databasename &gt; \$outputfilename.sql</code> For example: <code>sudo -u postgres</code>	<code>sudo -u \$username psql \$databasename &lt; \$inputfilename.sql</code> For example: <code>sudo -u postgres</code>

Database Type	Backup	Restore
	<code>pg_dump hive &gt; /tmp/mydir/backup_hive.sql</code>	<code>psql hive &lt; /tmp/mydir/backup_hive.sql</code>
Oracle	Connect to the Oracle database using sqlplus export the database: <code>exp username/password@database full=yes file=output_file.dmp</code>	Import the database: <code>imp username/password@database file=input_file.dmp</code>

#### 8. Optional - Backup the Oozie Metastore database.



### Note

These instructions are provided for your convenience. Please check your database documentation for the latest back up instructions.

**Table 25.2. Oozie Metastore Database Backup and Restore**

Database Type	Backup	Restore
MySQL	<code>mysqldump \$dbname &gt; \$outputfilename.sql</code> For example: <code>mysqldump oozie &gt; /tmp/mydir/backup_oozie.sql</code>	<code>mysql \$dbname &lt; \$inputfilename.sql</code> For example: <code>mysql oozie &lt; /tmp/mydir/backup_oozie.sql</code>
Postgres	<code>sudo -u \$username pg_dump \$databasename &gt; \$outputfilename.sql</code> For example: <code>sudo -u postgres pg_dump oozie &gt; /tmp/mydir/backup_oozie.sql</code>	<code>sudo -u \$username psql \$databasename &lt; \$inputfilename.sql</code> For example: <code>sudo -u postgres psql oozie &lt; /tmp/mydir/backup_oozie.sql</code>

#### 9. Stop all services (including MapReduce) and client applications deployed on HDFS using the instructions provided [here](#).

10. Verify that edit logs in `/${dfs.name.dir}/name/current/edits*` are empty. These log files should have only 4 bytes of data, which contain the edit logs version. If the edit logs are not empty, start the existing version NameNode and then shut it down after a new fsimage has been written to disks so that the edit log becomes empty.

## 25.2. Upgrade Hadoop

#### 1. Download the HDP 2.1 using a [local repository](#) or a [remote repository](#).

#### 2. On all nodes, clean the yum repository.

- For RHEL/CentOS:

```
yum clean all
```

- For SLES:

```
zypper clean -a
```

- For Ubuntu or Debian:

```
apt-get clean all
```

#### 3. Use the [HDP Utility script](#) to calculate memory configuration settings.

#### 4. Upgrade Hadoop

- For RHEL/CentOS/Oracle Linux:

```
yum upgrade hadoop*
```

- For SLES:

```
zypper up hadoop* hadoop-hdfs hadoop-lzo hadoop-mapreduce hadoop-yarn
```

- For Ubuntu or Debian:

```
apt-get update
apt-get install hadoop hadoop-hdfs libhdfs0 libhdfs0-dev hadoop-yarn
hadoop-mapreduce hadoop-client opensslliblzo2-2 liblzo2-dev hadoop-lzo
hadoop-mapreduce hadoop-yarn
```

#### 5. Verify HDP 2.1 packages have installed successfully.

- For RHEL/CentOS/Oracle Linux:

```
yum list hadoop* | grep HDP-2
```

- For SLES:

```
zypper pa | grep HDP-2
```

Verify that you have HDP 2.1 installed:

```
hadoop version
```

You may need to add `/etc/hadoop/conf/hadoop-env.sh` in `/usr/bin/hadoop` for `$JAVA_HOME`.

- For Ubuntu or Debian:

```
dpkg -s HDP-2 | grep Status
```

## 25.3. Start HDFS

To start HDFS, run commands as the `$HDFS_USER`.

1. Start the NameNode. On the NameNode host machine, execute the following command:

```
su $HDFS_USER
export HADOOP_LIBEXEC_DIR=/usr/lib/hadoop/libexec
/usr/lib/hadoop/sbin/hadoop-daemon.sh start namenode -upgrade
```

On a large system, this can take a long time to complete.



### Note

Run this command with the `-upgrade` option only once. After you have completed this step, you can bring up the NameNode using this command without including the `-upgrade` option.

2. Verify that the NameNode is up and running:

```
ps -ef|grep -i NameNode
```

3. Start the Secondary NameNode. On the Secondary NameNode host machine, execute the following command:

```
su $HDFS_USER
export HADOOP_LIBEXEC_DIR=/usr/lib/hadoop/libexec
/usr/lib/hadoop/sbin/hadoop-daemon.sh start secondarynamenode
```

4. Verify that the Secondary NameNode is up and running:

```
ps -ef|grep SecondaryNameNode
```

- 5.



### Note

If you are working on a non-secure DataNode, use \$HDFS\_USER. For a secure DataNode, use root.

Start DataNodes. On all the DataNodes, execute the following command:

```
export HADOOP_LIBEXEC_DIR=/usr/lib/hadoop/libexec
/usr/lib/hadoop/sbin/hadoop-daemon.sh start datanode
```

6. Verify that the DataNode process is up and running:

```
ps -ef|grep DataNode
```

7. Verify that NameNode can go out of safe mode.

```
hdfs dfsadmin -safemode wait
Safemode is OFF
```

In general, it takes 5-10 minutes to get out of safemode. For thousands of nodes with millions of data blocks, getting out of safemode can take up to 45 minutes.

## 25.3.1. Verify HDFS Filesystem Health

Analyze if the filesystem is healthy.

1. Run the fsck command on namenode as \$HDFS\_USER:

```
hdfs fsck / -files -blocks -locations > dfs-new-fsck-1.log
```

2. Run hdfs namespace and report.

- List directories.

```
hdfs dfs -lsr / > dfs-new-lsr-1.log
```

- Run report command to create a list of DataNodes in the cluster.

```
hdfs dfsadmin -report > dfs-new-report-1.log
```

3. Compare the namespace report before the upgrade and after the upgrade. Verify that user files exist after upgrade.

```
dfs-old-fsck-1.log < -- > dfs-new-fsck-1.log
```

```
dfs-old-lsr-1.log < -- > dfs-new-lsr-1.log
```



## Note

You must do this comparison manually to catch all errors.

4. From the Namenode WebUI, see if all DataNodes are up and running.

```
http://<namenode>:50070
```

## 25.3.2. Start YARN/MapReduce Services

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

The keys are defined as follows:

- `yarn.nodemanager.linux-container-executor.group` - the configured value of `yarn.nodemanager.linux-container-executor.group`. This must match the value of `yarn.nodemanager.linux-container-executor.group` in `yarn-site.xml`.
- `banned.users` - a comma separated list of users who cannot run `container-executor`.
- `min.user.id` - the minimum value of user id, this is to prevent system users from running `container-executor`.
- `allowed.system.users` - a comma separated list of allowed system users.

To start YARN, run commands as a YARN user. To start MapReduce, run commands as a MapReduce user.

1. Start the ResourceManager on all your ResourceManager hosts.

```
su $YARN_USER
export HADOOP_LIBEXEC_DIR=/usr/lib/hadoop/libexec
/usr/lib/hadoop-yarn/sbin/yarn-daemon.sh start resourcemanager
ps -ef | grep -i resourcemanager
```

2. Start the NodeManager on all your NodeManager hosts.

```
su $YARN_USER
export HADOOP_LIBEXEC_DIR=/usr/lib/hadoop/libexec
/usr/lib/hadoop-yarn/sbin/yarn-daemon.sh start nodemanager
ps -ef | grep -i nodemanager
```

3. To start MapReduce, run the following commands as MapReduce user:

```
su $MAPREDUCE_USER
export HADOOP_LIBEXEC_DIR=/usr/lib/hadoop/libexec
```

```
/usr/lib/hadoop-mapreduce/sbin/mr-jobhistory-daemon.sh --config /etc/hadoop/  
conf start historyserver  
ps -ef | grep -i jobhistoryserver
```

### 25.3.3. Run Hadoop Smoke Tests

To smoke test your Hadoop upgrade, you can run the following MapReduce job.

Run this command as regular user. The job uses MapReduce to write 100MB of data into HDFS with RandomWriter `hadoop jar /usr/lib/hadoop-mapreduce/hadoop-mapreduce-examples- $\langle$ version $\rangle$ .jar randomwriter -Dtest.randomwrite.total_bytes=10000000 test-after-upgrade`. You should see messages similar to:

```
map 0% reduce 0%  
...  
map 100% reduce 100%  
Job ... completed successfully
```

MapReduce works successfully. You can now upgrade your other components.

Basic troubleshooting:

1. To find the number of active nodes and NodeManagers, access the ResourceManager web UI:

```
http://<resource manager host>:8088/cluster/nodes
```

The number of active nodes should be equal to the number of nodemanagers.

2. Error messages. Access the ApplicationMaster WebUI to view the container logs.
  - a. Looking at your console logs for MapReduce job, there is a line in this format:

```
13/10/02 17:57:21 INFO mapreduce.Job: The url to track the job: http://  
<resource manager host>:8088/proxy/application_1380673658357_0007/
```

- b. Go to the URL and select the job link.
- c. Select the logs link under ApplicationMaster table. It will redirect you to the container logs. Error messages display here.

## 25.4. Upgrade Apache ZooKeeper

1. Execute the following command on all the Apache ZooKeeper nodes:

- For RHEL/CentOS/Oracle Linux:

```
yum upgrade zookeeper
```

- For SLES:

Run the following commands:

```
zypper up zookeeper
```



- For Ubuntu or Debian:

```
apt-get update zookeeper
```

2. Replace your configuration after upgrading. Replace the ZooKeeper template configuration in `/etc/zookeeper/conf`.
3. Start ZooKeeper. On all the ZooKeeper host machines, execute the following command:

```
sudo su -l $ZOOKEEPER_USER -c "source /etc/zookeeper/conf/zookeeper-env.sh;  
export ZOOCFGDIR=/etc/zookeeper/conf; /usr/lib/zookeeper/bin/zkServer.sh  
start >> $ZOOKEEPER_LOG_DIR/zoo.out\"
```

where

- `$ZOOKEEPER_USER` is the ZooKeeper Service user. For example, `zookeeper`.
- `$ZOOKEEPER_LOG_DIR` is the directory where ZooKeeper server logs are stored. For example, `/var/log/zookeeper`.

## 25.5. Upgrade Apache HBase

1. Start the Zookeeper zkServer and NameNode services.
2. Upgrade Apache HBase.

Run the following commands on both the HBase Master and the RegionServers hosts.

- For RHEL/CentOS/Oracle Linux:

```
yum upgrade hbase
```

- For SLES:

Run the following commands:

```
zypper up hbase
```

- For Ubuntu or Debian:

```
apt-get install hbase
```

3. Replace your configuration after upgrading. Replace the HBase template configuration in `/etc/hbase/conf`.
4. As the HBase user, run an upgrade:

```
sudo su -l $HBASE_USER -c "hbase upgrade -execute"
```

You should see a completed Znode upgrade with no errors.

5. Start services. Run as root:

```
Suppose $HBASE_USER = hbase  
sudo su -l hbase -c "/usr/lib/hbase/bin/hbase-daemon.sh --config /etc/hbase/  
conf start master"
```

```
sudo su -l hbase -c "/usr/lib/hbase/bin/hbase-daemon.sh --config /etc/hbase/conf start regionserver"
```

6. Check processes.

```
ps -ef | grep -i hmaster
ps -ef | grep -i hregion
```

## 25.6. Upgrade Apache Hive and Apache HCatalog

In HDP 2.1 (Apache Hive 0.13.0) the Decimal data type is now treated as the type Decimal(10,0): 10 digits of precision and 0 scale. This is a change from the variable precision and scale that was available in Hive 0.11.0 and Hive 0.12.0, which allowed up to 38 digits of precision and unlimited scale.

In order to avoid unintended "rounding" of decimal data, sites that were previously running Hive 0.11.0 and Hive 0.12.0 may need to migrate tables with Decimal columns after upgrading to Hive 0.13.0. For details, see the [Apache Hive wiki](#). For assistance with upgrades that involve Decimal data, please contact Hortonworks Support.

1. Stop the Hive Metastore service, if you have not done so already.



### Note

Make sure that the Hive metastore **database** is running.

2. Upgrade Hive and HCatalog. On the Hive and HCatalog host machines, execute the following commands:

- For RHEL/CentOS:

```
yum upgrade hive
yum erase hcatalog
yum install hive-hcatalog
```

- For SLES:

Run the following commands:

```
zypper rm hive hcatalog
zypper install hive-hcatalog
zypper install bigtop-tomcat
```

- For Ubuntu or Debian:

```
apt-get update hive hcatalog
```

3. Upgrade the Hive Metastore database schema.

```
$HIVE_HOME/bin/schematool -upgradeSchema -dbType <$databaseType>
```

The value for *\$databaseType* can be derby, mysql, oracle, or postgres.

4. Download and extract the HDP [companion files](#). Copy the `hive-site.xml` file in the `configuration_files/hive` directory of the extracted companion files to the

etc/hive/conf directory on your Hive host machine. This new version of the hive-site.xml file contains new properties for HDP-2.1 features.

5. Edit the hive-site.xml file and modify the properties based on your environment. Search for TODO in the file for the properties to replace.
  - a. Edit the connection properties for your Hive metastore database in hive-site.xml:

```
<property>
  <name>javax.jdo.option.ConnectionURL</name>
  <value>jdbc:mysql://TODO-HIVE-METASTORE-DB-SERVER:TODO-HIVE-
METASTORE-DB-PORT/TODO-HIVE-METASTORE-DB-NAME?createDatabaseIfNotExist=
true</value>
  <description>Enter your Hive Metastore Connection URL, for example if
MySQL: jdbc:mysql://localhost:3306/mysql?createDatabaseIfNotExist=true</
description>
</property>

<property>
  <name>javax.jdo.option.ConnectionUserName</name>
  <value>TODO-HIVE-METASTORE-DB-USER-NAME</value>
  <description>Enter your Hive Metastore database user name.</
description>
</property>

<property>
  <name>javax.jdo.option.ConnectionPassword</name>
  <value>TODO-HIVE-METASTORE-DB-PASSWORD</value>
  <description>Enter your Hive Metastore database password.</
description>
</property>

<property>
  <name>javax.jdo.option.ConnectionDriverName</name>
  <value>TODO-HIVE-METASTORE-DB-CONNECTION-DRIVER-NAME</value>
  <description>Enter your Hive Metastore Connection Driver Name, for
example if MySQL: com.mysql.jdbc.Driver</description>
</property>
```

Optional: If you want Hive Authorization, set the following Hive authorization parameters in the hive-site.xml file:

```
<property>
  <name>hive.security.authorization.enabled</name>
  <value>>true</value>
</property>

<property>
  <name>hive.security.authorization.manager</name>
  <value>org.apache.hadoop.hive.ql.security.authorization.
StorageBasedAuthorizationProvider</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>
```

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. To enable HiveServer2, leave this property value empty.

```
<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>
```



### Note

You can also use the [HDP utility script](#) to fine-tune your configuration settings based on node hardware specifications.

6. Disable autocreation of schemas to match HDP 2.1 configurations.

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>
```

7. Start Hive. On the Hive Metastore host machine, execute the following command:

```
sudo su -l $HIVE_USER -c "nohup hive --service metastore > $HIVE_LOG_DIR/
hive.out 2> $HIVE_LOG_DIR/hive.log &"
```

8. Start Hive Server2. On the Hive Server2 host machine, execute the following command:

```
sudo su -l $HIVE_USER -c "nohup /usr/lib/hive/bin/hiveserver2 -hiveconf
hive.metastore.uris=\" \" > $HIVE_LOG_DIR/hiveserver2.out 2> $HIVE_LOG_DIR/
hiveserver2.log &"
```

where

- `$HIVE_USER` is the Hive Service user. For example, `hive`.
- `$HIVE_LOG_DIR` is the directory where Hive server logs are stored (example: `/var/log/hive`).

## 25.7. Upgrade Apache Oozie

1. Before you upgrade, stop any job in a RUNNING or SUSPENDED state before you upgrade.



### Note

Proceeding with an Apache Oozie upgrade when you have running or suspended jobs might cause the upgrade to fail or result in data corruption.

- a. Check for running and suspended jobs using the following commands

```
oozie jobs -oozie http://localhost:11000/oozie -filter status=SUSPENDED
oozie jobs -oozie http://localhost:11000/oozie -filter status=RUNNING
```

- b. If both commands return results showing that there are no jobs matching the criteria, you can proceed with the upgrade:

```
oozie jobs -oozie http://localhost:11000/oozie -filter status=SUSPENDED
No Jobs match your criteria!
```

- c. If either of the commands returns a list of jobs similar to the following example, you should terminate each job before proceeding:

```
oozie jobs -oozie http://localhost:11000/oozie -filter status=SUSPENDED
Job ID App Name Status User Group Started Ended
-----
0000005-150710151956050-oozie-oozi-W Spark SUSPENDED oozie - 2015-09-16
16:47 GMT 2015-09-16 16:47 GMT
-----
0000004-150710151956050-oozie-oozi-W Pig1 SUSPENDED oozie - 2015-09-16
16:46 GMT 2015-09-16 16:46 GMT
-----
0000003-150710151956050-oozie-oozi-W Pig1 SUSPENDED oozie - 2015-09-11
00:02 GMT 2015-09-11 00:02 GMT
-----

oozie jobs -oozie http://localhost:11000/oozie -filter status=RUNNING
Job ID App Name Status User Group Started Ended
-----
0000007-150710151956050-oozie-oozi-W Spark RUNNING oozie - 2015-09-16
16:52 GMT 2015-09-16 16:52 GMT
-----
0000006-150710151956050-oozie-oozi-W Fork_Example RUNNING oozie -
2015-09-16 16:52 GMT 2015-09-16 16:52 GMT
-----
```

- d. Terminate each running or suspended job using the following command:

```
oozie job -oozie http://localhost:11000/oozie -kill
0000007-150710151956050-oozie-oozi-W
```

2. Execute the following command on the Oozie server and client machines:

- For RHEL/CentOS:

```
yum upgrade oozie
```

- For SLES:

Run the following commands:

```
zypper up oozie
```

- For Ubuntu or Debian:

```
apt-get install oozie
```

3. You must replace your configuration after upgrading. Copy `/etc/oozie/conf` from the template to the conf directory on each oozie server and client.

4. Change the JDBC config to match your Oozie database. The entries to edit are:

```
oozie.service.JPAService.jdbc.driver
oozie.service.JPAService.jdbc.url
```

For example, for MySQL, use:

```
oozie.service.JPAService.jdbc.driver = com.mysql.jdbc.Driver
oozie.service.JPAService.jdbc.url = jdbc:mysql://$my_server:$my_port/oozie?
createDatabaseIfNotExist=true
```

5. Copy the JDBC jar to libext-customer.

a. Create the `/usr/lib/oozie/libext-customer` directory.

```
cd /usr/lib/oozie
mkdir libext-customer
```

b. Grant read/write/execute access to all users for the libext-customer directory.

```
chmod -R 777 /usr/lib/oozie/libext-customer
```

6. Copy the JDBC jar of your Oozie database to the libext-customer directory. For example, if you are using MySQL, copy your `mysql-connector-java.jar` to `/usr/lib/oozie/libext-customer` and `/usr/lib/oozie/libtools`.



### Note

HDP 2.1 does not provide the MySQL jar. You can download one from MySQL, when you download `mysql-connector-java` [here](#).

7. Copy these files to the libext-customer directory

```
cp /usr/lib/hadoop/lib/hadoop-lzo*.jar /usr/lib/oozie/libext-customer
```

```
cp /usr/share/HDP-oozie/ext-2.2.zip /usr/lib/oozie/libext-customer/
```

## 8. Extract share-lib.

```
cd /usr/lib/oozie
tar xzvf /usr/lib/oozie/oozie-sharelib.tar.gz
su -l hdfs -c "hdfs dfs -mkdir -p /user/oozie"
su -l hdfs -c "hdfs dfs -copyFromLocal /usr/lib/oozie/share /user/oozie/."
```

You may see complaints that some files exist. This is an expected behavior. Delete any existing `/oozie/share` and replace it with the newly extracted files.

```
su -l hdfs -c "hdfs dfs -chown oozie:hadoop /user/oozie"
su -l hdfs -c "hdfs dfs -chmod -R 755 /user/oozie"
```

## 9. Run upgrade as the Oozie user. Do not run as the root user to execute this.

```
su $OOZIE_USER
/usr/lib/oozie/bin/ooziedb.sh upgrade -run
```

## 10. Prepare the Oozie WAR file. Run as root:

```
sudo su -l oozie -c "/usr/lib/oozie/bin/oozie-setup.sh prepare-war -d /usr/lib/oozie/libext-customer"
```

Look for console output to indicate success. For example, if you are using MySQL you should see something similar to:

```
INFO: Adding extension: libext-customer/mysql-connector-java.jar
New Oozie WAR file with added 'JARS' at /var/lib/oozie/oozie-server/webapps/oozie.war
```

## 11. Replace the content of `/user/oozie/share` in HDFS. On the Oozie server host:

- a. Verify that all the Oozie jobs have been successfully stopped by running the following commands:

```
oozie jobs -oozie http://localhost:11000/oozie -filter status=SUSPENDED
oozie jobs -oozie http://localhost:11000/oozie -filter status=RUNNING
```

If either of these commands indicates suspended or running jobs, you should repeat step 1 before proceeding.

- b. Extract the Oozie sharelib into a `tmp` folder.

```
mkdir -p /tmp/oozie_tmp
cp /usr/lib/oozie/oozie-sharelib.tar.gz /tmp/oozie_tmp
cd /tmp/oozie_tmp
tar xzvf oozie-sharelib.tar.gz
```

- c. Back up the `/user/oozie/share` folder in HDFS and then delete it. If you have any custom files in this folder back them up separately and then add them back after the share folder is updated.

```
su -l hdfs -c "hdfs dfs -copyToLocal /user/oozie/share /tmp/oozie_tmp/oozie_share_backup"
su -l hdfs -c "hdfs dfs -rm -r /user/oozie/share"
```

- d. Add the latest share libs that you extracted in step 1. After you have added the files, modify ownership and ACL.

```
su -l hdfs -c "hdfs dfs -copyFromLocal /tmp/oozie_tmp/share /user/oozie/.
"
su -l hdfs -c "hdfs dfs -chown -R oozie:hadoop /user/oozie"
su -l hdfs -c "hdfs dfs -chmod -R 755 /user/oozie"
```

- 12 Set the `oozie.service.WorkflowAppService.system.libpath` in `oozie-site.xml` to the right path of `sharelib` in `hdfs`.

```
<property>
  <name>oozie.service.WorkflowAppService.system.libpath</name>
  <value>/user/${
    {user.name}
  }/share/lib</value>
  <description>
    System library path to use for workflow applications.
    This path is added to workflow application if their job properties sets
    the property 'oozie.use.system.libpath' to true.
  </description>
</property>
```

- 13 Start Oozie. Run as root.

```
sudo su -l oozie -c "cd /grid/0/var/log/oozie; /usr/lib/oozie/bin/oozie-
start.sh"
```

- 14 Check processes.

```
ps -ef | grep -i oozie
```

## 25.8. Upgrade Apache WebHCat (Templeton)

1. Upgrade Apache WebHCat.

- For RHEL/CentOS:

```
yum upgrade hive-webhcat webhcat-tar-hive webhcat-tar-pig
```

- For SLES:

Run the following command:

```
zypper up hive-webhcat webhcat-tar-hive webhcat-tar-pig
```

- For Ubuntu or Debian:

```
apt-get install webhcat-tar-hive webhcat-tar-pig
```

Also see the instructions on manually deploying WebHCat instance provided [here](#).

2. You must replace your configuration after upgrading. Copy `/etc/webhcat/conf` from the template to the `conf` directory in `webhcat` hosts.

3. Start WebHCat:

```
sudo su -l $WEBHCAT_USER -c "/usr/lib/hive-hcatalog/sbin/webhcat_server.sh
start"
```



4. Smoke test WebHCat. On the WebHCat host machine, execute the following command:

```
http://$WEBHCAT_HOST_MACHINE:50111/templeton/v1/status
```

If you are using a secure cluster, execute the following command:

```
curl --negotiate -u: http://cluster.$PRINCIPAL.$REALM:50111/templeton/v1/status
{"status":"ok","version":"v1"}[machine@acme]$
```

## 25.9. Upgrade Apache Pig

1. On all the Apache Pig clients, execute the following command:

- For RHEL/CentOS:

```
yum upgrade pig
```

- For SLES:

Run the following commands:

```
zypper up pig
```

- For Ubuntu or Debian:

```
apt-get install pig
```

2. You must replace your configuration after upgrading. Copy `/etc/pig/conf` from the template to the conf directory in pig hosts.

## 25.10. Upgrade Apache Sqoop

Upgrade Apache Sqoop. On the Sqoop host machine, execute the following command:

- For RHEL/CentOS/Oracle Linux:

```
yum upgrade sqoop
```

- For SLES:

Run the following commands:

```
zypper up sqoop
```

- For Ubuntu or Debian:

```
apt-get install sqoop
```

- You must replace your configuration after upgrading. Copy `/etc/sqoop/conf` from the template to the conf directory in sqoop hosts.

## 25.11. Upgrade Apache Flume

Upgrade Apache Flume. On the Flume host machine, execute the following command:

- For RHEL/CentOS/Oracle Linux:

```
yum upgrade flume
```

- For SLES:

```
zypper update flume
zypper remove flume
zypper se -s flume
```

You should see Flume in the output. Install Flume:

```
zypper install flume
```



### Important

When removing and installing packages, rename those files the `/conf` directory that have `.rpm` extension to original to retain the customized configs. Alternatively, you can also use the configuration files (under the `/conf` directory) you backed up before upgrading.

- You must replace your configuration after upgrading. Copy `/etc/flume/conf` from the template to the `conf` directory in Flume hosts.
- For Ubuntu or Debian:

```
apt-get install flume
```

### 25.11.1. Validate Flume

By default on installation Flume does not start running immediately. To validate, replace your default `conf/flume.conf` with the provided `flume.conf`, restart Flume, and see if the data is flowing by examining the destination.

Use this `flume.conf` file:

```
1. Name the components on this agent
a1.sources = r1
a1.sinks = k1
a1.channels = c1
2. Describe/configure the source
a1.sources.r1.type = seq
3. Describe the sink
a1.sinks.k1.type = file_roll
a1.sinks.k1.channel = c1
a1.sinks.k1.sink.directory = /tmp/flume
4. Use a channel which buffers events in memory
a1.channels.c1.type = memory
5. Bind the source and sink to the channel
a1.sources.r1.channels = c1
a1.sinks.k1.channel = c1
```

After starting Flume, check `/tmp/flume` to see if there are any files there. The files should contain simple sequential numbers. After validating, stop Flume and revert changes to `flume.conf` to prevent your disk from filling up.

## 25.12. Upgrade Apache Mahout

Upgrade Apache Mahout. On the Mahout client machines, execute the following command:

- For RHEL/CentOS/Oracle Linux:

```
yum upgrade mahout
```

- For SLES:

```
zypper remove mahout  
zypper se -s mahout
```

You should see Mahout in the output. Install Mahout:

```
zypper install mahout
```



### Important

When removing and installing packages, rename those files the `/conf` directory that have `.rpmsave` extension to original to retain the customized configs. Alternatively, you can also use the configuration files (under the `/conf` directory) you backed up before upgrading.

- For Ubuntu or Debian:

```
apt-get install mahout
```

- You must replace your configuration after upgrading. Copy `/etc/mahout/conf` from the template to the `conf` directory in mahout hosts.

### 25.12.1. Mahout Validation

To validate mahout:

1. Create a test user:

```
hadoop fs -put /tmp/sample-test.txt /user/testuser
```

2. Set up 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/sample-test.txt --output /user/  
testuser/mahouttest --charset utf-8
```

## 25.13. Upgrade Hue

For HDP 2.1, use the Hue version shipped with HDP 2.1. If you have a previous version of Hue, the following steps to upgrade Hue.



## Warning

If you are using the embedded SQLite database, you must perform a backup of the database before you upgrade Hue to prevent data loss. To make a backup copy of the database, simply do a "dump" and redirect the results to a file.

```
su $HUE_USER
cd /var/lib/hue
sqlite3 desktop.db .dump > ~/desktop.bak
```

Execute the following command on all Hue Server host machines:

- For RHEL/CentOS/Oracle Linux:

```
yum upgrade hue hue-common hue-beeswax hue-hcatalog hue-pig hue-oozie
```

- For SLES:

```
zypper up hue hue-common hue-beeswax hue-hcatalog hue-pig hue-oozie
```



## Note

If you are using the embedded SQLite database, remember to restore your database after upgrade.

To restore the database from a backup, make sure the destination database is empty before copying. If necessary, rename or remove the current destination database. Then, copy your backup to the destination database. For example:

```
su $HUE_USER
cd /var/lib/hue
mv desktop.db desktop.db.old
sqlite3 desktop.db .dump < ~/desktop.bak
```

## 25.14. Finalize the Upgrade

You can start HDFS without finalizing the upgrade. When you are ready to discard your backup, you can finalize the upgrade.



## Warning

You must verify your filesystem health before finalizing the upgrade. After you finalize an upgrade, you cannot roll back.

Run the following command as the \$HDFS\_USER:

```
hdfs dfsadmin -finalizeUpgrade
```

## 25.15. Install New HDP 2.1 Services

Install new HDP 2.1 Services:

- **Tez** – Apache Tez is a YARN-based processing framework that greatly improves query response times for Hive and other YARN applications.

- [Phoenix](#) – Apache Phoenix is a SQL skin over HBase that makes it easier and faster to build HBase applications.
- [Storm](#) – A real-time event stream processing platform that provides fixed, continuous, & low latency processing for very high frequency streaming data.
- [Falcon](#) – Apache Falcon provides a framework for simplifying the development of data management applications in Apache Hadoop.
- [Knox](#) – Apache Knox is the Web/REST API Gateway solution for Hadoop. It provides a single access point for all of Hadoop resources over REST.

## 26. Uninstalling HDP

Use the following instructions to uninstall HDP:

1. [Stop](#) all the installed HDP services.
2. If HCatalog is installed, execute the following command on all the cluster nodes:

- For RHEL/CentOS/Oracle Linux:

```
yum remove hcatalog\*
```

- SLES:

```
zypper remove hcatalog\*
```

- Ubuntu:

```
sudo apt-get remove hcatalog\*
```

3. If Hive is installed, execute the following command on all the cluster nodes:

- For RHEL/CentOS/Oracle Linux:

```
yum remove hive\*
```

- SLES:

```
zypper remove hive\*
```

- Ubuntu:

```
sudo apt-get remove hive\*
```

4. If HBase is installed, execute the following command on all the cluster nodes:

- For RHEL/CentOS/Oracle Linux:

```
yum remove hbase\*
```

- SLES:

```
zypper remove hbase\*
```

- Ubuntu:

```
sudo apt-get remove hbase\*
```

5. If ZooKeeper is installed, execute the following command on all the cluster nodes:

- For RHEL/CentOS/Oracle Linux:

```
yum remove zookeeper\*
```

- SLES:

```
zypper remove zookeeper\*
```

- Ubuntu:

```
sudo apt-get remove zookeeper\*
```

6. If Oozie is installed, execute the following command on all the cluster nodes:

- For RHEL/CentOS/Oracle Linux:

```
yum remove oozie\*
```

- SLES:

```
zypper remove oozie\*
```

- Ubuntu:

```
sudo apt-get remove oozie\*
```

7. If Pig is installed, execute the following command on all the cluster nodes:

- For RHEL/CentOS/Oracle Linux:

```
yum remove pig\*
```

- SLES:

```
zypper remove pig\*
```

- Ubuntu:

```
sudo apt-get remove pig\*
```

8. If compression libraries are installed, execute the following command on all the cluster nodes:

```
yum remove snappy\*  
yum remove hadoop-lzo\*
```

9. If Knox is installed, execute the following command on all the gateway host:

- For RHEL/CentOS/Oracle Linux:

```
yum remove knox\*
```

- SLES:

```
zypper remove knox\*
```

- Ubuntu:

```
sudo apt-get remove knox\*
```

10. Uninstall Hadoop. Execute the following command on all the cluster nodes:

```
yum remove hadoop\*
```

11. Uninstall ExtJS libraries and MySQL connector. Execute the following command on all the cluster nodes:

```
yum remove extjs-2.2-1 mysql-connector-java-5.0.8-1\*
```