cloudera
Ask Bigger Questions

Apache Accumulo Installation Guide

for using Cloudera's packaging of Accumulo for CDH

Important Notice

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Table of Contents

About this Guide

This guide describes how to install Cloudera's packaging of Apache Accumulo for use with CDH.

Introducing Apache Accumulo

Apache Accumulo™ is an ideal solution for government agencies looking for a secure, distributed NoSQL data store to serve their most performance-intensive Big Data applications. Accumulo is an open source project integrated with Hadoop and provides the ability to store data in massive tables (billions of rows / millions of columns) for fast, random access. Accumulo was created and contributed to the Apache Software Foundation by the National Security Agency (NSA). It has quickly gained adoption as a Hadoop-based key/value store for applications that have unique and stringent information security requirements.

Known Issues

——Feedback loop on trace table

Under certain circumstances, a tablet server with a small in-memory map can get into a feedback loop where flushes of a tablet for the trace table cause additional tracer entries about the flush.

Bug: ACCUMULO-2014

Severity: Low

Workaround: Increase the amount of memory available for the in-memory map.

——Spurious warnings when using Cloudera Manager

When executing certain utilities, including the Accumulo shell, against a Cloudera Manager installed Accumulo cluster, you will see warnings about missing configuration files.

Severity: Low

Workaround: Ignore warnings.

Resolution: To be fixed in a future release.

——Accumulo 1.4.4-cdh4.5.0 installed on top of CDH parcels cannot use LZO-compressed tables

Because of changes in the way that native libraries are located, Accumulo 1.4.4-cdh4.5.0 installed over a CDH parcel-based installation with optional LZO support enabled cannot locate libraries required for LZO compression support.

Bug: ACCUMULO-1677

Severity: Low

Workaround: Use Snappy compression, or install over a CDH package-based installation.

Resolution: To be fixed in a future release

Prerequisites

Accumulo depends on Hadoop (HDFS & MapReduce) and ZooKeeper libraries and configuration information. TabletServers and Loggers should be collocated with DataNodes. These DataNodes do not require TaskTrackers.

The current release of the Cloudera packaging of Apache Accumulo is tested for use with CDH 4.5.0 or later, either in parcel (Cloudera Manager 5b2 or later) or package (RPM/DEB) form.

For full cluster installations, Cloudera strongly recommends following the Tips and Guidelines found in the CDH4 Installation Guide.

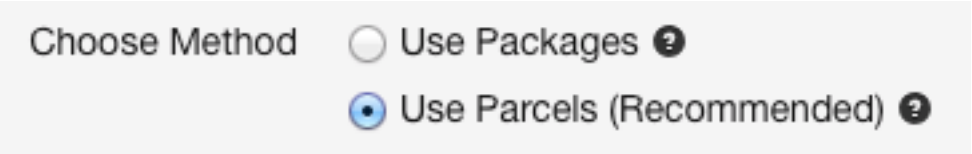
Install Apache Accumulo by using Cloudera Manager

This section describes how to install Cloudera's packaging of Accumulo by using Cloudera Manager 5 Beta 2 or later. If you prefer to install Accumulo from packages, skip this section and see the Install Apache Accumulo from the Distribution Packages section on page 4.

Step 1: Install and Configure Cloudera Manager 5 and CDH4.5

Follow the documentation to install and configure Cloudera Manager 5 with CDH4.5. During the installation of CDH, you must choose the CDH4.5 parcel when going through the wizard.

1. Be sure the **Use Parcels** option is checked.



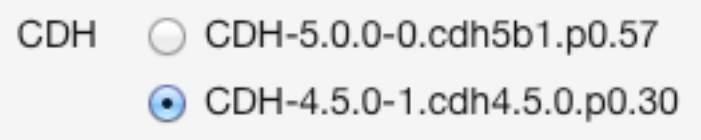
Note:

You may also use Cloudera Manager to manage the Accumulo service when installing with packages. To do so, follow Steps 1 and 2 under Install Apache Accumulo from the Distribution

Packages. During the package installation sub-step of Step 2, only follow the instructions for **All client hosts**. In particular, do **not** install any of the role-specific packages such as accumulo-master, accumulo-monitor, etc.

Following the package installation, return to Step 3: Add the Accumulo Service below to configure the Accumulo service.

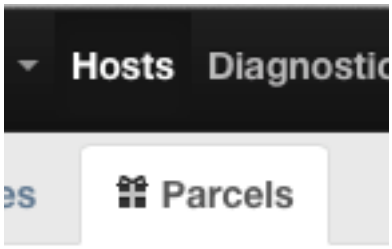
2. Select version **CDH-4.5.0-1.cdh4.5.0.p0.30** for the CDH parcel.



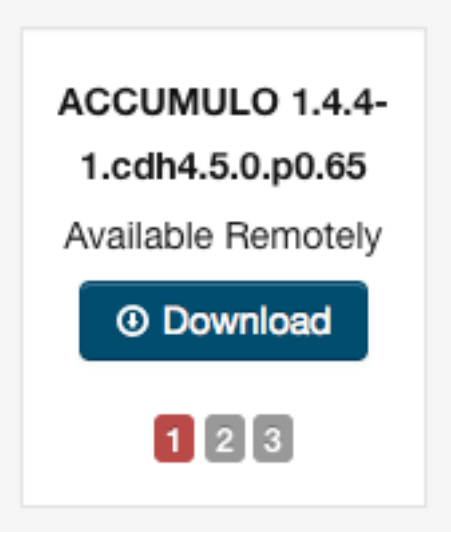
3. Click **Continue** and follow the rest of the installation steps as described in the documentation. Accumulo requires that you setup the HDFS, Zookeeper, and MapReduce services (only MRv1 is currently supported). Other services are optional.

Step 2: Install the Accumulo Parcel

1. From the **Hosts** tab, select **Parcels.**



2. Under the **ACCUMULO 1.4.4-1.cdh4.5.0.p0.65** parcel, click **Download.**



3. Under the **ACCUMULO 1.4.4-1.cdh4.5.0.p0.65** parcel for the cluster you want to install on (e.g. Cluster 1), click **Distribute.**
4. Under the **ACCUMULO 1.4.4-1.cdh4.5.0.p0.65** parcel for the cluster you want to install on (e.g. Cluster 1), click **Activate.**

You will be prompted to restart the cluster. Since the Accumulo parcel was not previously in use, you can safely skip this step and click **Close.**

Step 3: Add the Accumulo Service

1. Click the **Home** tab.
2. Click the actions menu for the cluster you want to add the Accumulo service to (e.g. Cluster 1), select **Add a Service.**

3. Select **Accumulo** and click **Continue.**
4. Select the dependent services and click **Continue.**
5. Assign the Accumulo roles to the hosts in your cluster. Cloudera recommends assigning a **Logger** and **Tablet Server** role on each host that is assigned the **DataNode** role. The **Monitor**, **Garbage Collector**, **Tracer**, and **Master** roles should all be assigned to **non-DataNodes**. The **Gateway** role should be assigned to any hosts where you want to use Accumulo that don't already have any other Accumulo roles assigned.
6. Click **Continue.**
7. Configure the **Trace User** and **Trace Password** settings. It is strongly recommended that you **not** leave the **Trace User** set to **root** as this is not a secure configuration.
8. Click **Continue.**
9. Click **Continue.**
10. Click **Continue.**

Verify your installation by proceeding to the Test the Accumulo Shell section.

Install Apache Accumulo from the Distribution Packages

This section describes how to install Cloudera's packaging of Accumulo from packages (RPM or DEB) instead of using Cloudera Manager. If you prefer to install Accumulo from a tarball, skip this section and see the Install Apache Accumulo from the Distribution Tarball section on page 13.

Step 1: Add or Build the Accumulo Repository

- If you are installing Accumulo on a Red Hat system, you can download the Cloudera packages using yum or your web browser.

- If you are installing Accumulo on a SLES system, you can download the Cloudera packages using zypper, YaST, or your web browser.
- If you are installing Accumulo on an Ubuntu or Debian system, you can download the Cloudera packages using apt or your web browser.

On Red Hat-compatible Systems

Use one of the following methods to add or build the Accumulo repository or download the packages on Red Hat-compatible systems:

- To add the Accumulo repository: *OR*
- *OR*: To build a Yum repository:

Do this on all systems in the cluster.

To add the Accumulo repository:

Click the entry in the table below that matches your Red Hat or CentOS system, navigate to the repo file for your system, and save it in the `/etc/yum.repos.d/` directory.

For OS Version	Click this Link
Red Hat/CentOS/Oracle 5	Red Hat/CentOS/Oracle 5 link
Red Hat/CentOS/Oracle 6	Red Hat/CentOS/Oracle 6 link

Now continue with Step 2: Install Accumulo.

OR: To build a Yum repository:

If you want to create your own yum repository, download the appropriate repo file, create the repo, distribute the repo file, and set up a web server, as described under Creating a Local Yum Repository.

On SLES Systems

Use one of the following methods to download the Accumulo repository or packages on SLES systems:

- To add the Accumulo repository: *OR*
- *OR*: To build a SLES repository:

To add the Accumulo repository:

1. Run the following command:

```
$ sudo zypper addrepo –f
http://archive.cloudera.com/accumulo/sles/11/x86_64/cdh/cloudera-
accumulo.repo
```

2. Update your system package index by running:

```
$ sudo zypper refresh
```

OR: To build a SLES repository:

If you want to create your own SLES repository, create a mirror of the Accumulo SLES directory by following these instructions that explain how to create a SLES repository from the mirror.

Now continue with Step 2: Install Accumulo.

On Ubuntu or Debian Systems

Use one of the following methods to add or build the Accumulo repository or download the packages on Ubuntu or Debian systems:

- To add the Accumulo repository: *OR*
- *OR*: To build a Debian repository:

Do this on all the systems in the cluster.

To add the Accumulo repository:

Create a new file `/etc/apt/sources.list.d/cloudera-accumulo.list` with the following contents:

- For Ubuntu systems:

```
deb [arch=amd64] http://archive.cloudera.com/accumulo/<OS-release-
arch> <RELEASE>-cdh4 contrib

deb-src http://archive.cloudera.com/accumulo/<OS-release-arch>
<RELEASE>-cdh4 contrib
```

- For Debian systems:

```
deb http://archive.cloudera.com/accumulo/<OS-release-arch> <RELEASE>-
cdh4 contrib

deb-src http://archive.cloudera.com/accumulo/<OS-release-arch>
<RELEASE>-cdh4 contrib
```

where: `<OS-release-arch>` is `debian/squeeze/amd64/cdh`, `ubuntu/lucid/amd64/cdh`, or `ubuntu/precise/amd64/cdh`, and `<RELEASE>` is the name of your distribution, which you can find by running `lsb_release -c`.

For example, to install Accumulo for 64-bit Ubuntu Lucid:

```
deb [arch=amd64]
```

```
http://archive.cloudera.com/accumulo/ubuntu/lucid/amd64/cdh lucid-
cdh4 contrib

deb-src http://archive.cloudera.com/accumulo/ ubuntu/lucid/amd64/cdh
lucid-cdh4 contrib
```

OR: To build a Debian repository:

If you want to create your own apt repository, create a mirror of the Accumulo Debian directory and then create an apt repository from the mirror.

Now continue with Step 2: Install Accumulo.

Step 2: Install Accumulo

Important:

Before proceeding, you need to decide where to deploy the Accumulo Master, Accumulo Monitor, Accumulo Garbage Collector, and Accumulo Tracer daemons. As a general rule:

- The Accumulo Master and Accumulo Monitor run on the same "master" host unless the cluster is large (more than a few tens of nodes), and the master host (or hosts) should not run the Accumulo TabletServer or Accumulo Logger services.
- In a large cluster, it is especially important that the Accumulo Garbage Collector and Accumulo Tracer run on separate machines from the Accumulo Master
- Each node in the cluster **except the master host(s)** should run the Accumulo TabletServer and Accumulo Logger services. In particular, these services should be run on every DataNode.

1. Install and deploy CDH4. Follow instructions under CDH4 Installation
2. Install and deploy ZooKeeper. Follow instruction under ZooKeeper Installation.
3. Install each type of daemon package on the appropriate systems(s), as follows:

Where to install	**Install commands**
Accumulo Master host running:	
Red Hat/CentOS compatible	sudo yum clean all; sudo yum install accumulo-master
SLES	sudo zypper clean –all; sudo zypper install accumulo-master
Ubuntu or Debian	sudo apt-get update; sudo apt-get install accumulo-master

Accumulo Monitor host running:	
Red Hat/CentOS compatible	sudo yum clean all; sudo yum install accumulo-monitor
SLES	sudo zypper clean –all; sudo zypper install accumulo-monitor
Ubuntu or Debian	sudo apt-get update; sudo apt-get install accumulo-monitor
Accumulo Garbage Collector host running:	
Red Hat/CentOS compatible	sudo yum clean all; sudo yum install accumulo-gc
SLES	sudo zypper clean –all; sudo zypper install accumulo-gc
Ubuntu or Debian	sudo apt-get update; sudo apt-get install accumulo-gc
Accumulo Tracer host running:	
Red Hat/CentOS compatible	sudo yum clean all; sudo yum install accumulo-tracer
SLES	sudo zypper clean –all; sudo zypper install accumulo-tracer
Ubuntu or Debian	sudo apt-get update; sudo apt-get install accumulo-tracer
All cluster hosts except Accumulo Master, Accumulo Monitor, Accumulo Garbage Collector, and Accumulo Tracer hosts running:	
Red Hat/CentOS compatible	sudo yum clean all; sudo yum install accumulo-tserver accumulo-logger
SLES	sudo zypper clean –all; sudo zypper install accumulo-tserver accumulo-logger

Ubuntu or Debian	sudo apt-get update; sudo apt-get install accumulo-tserver accumulo-logger
All client hosts running:	
Red Hat/CentOS compatible	sudo yum clean all; sudo yum install accumulo
SLES	sudo zypper clean –all; sudo zypper install accumulo
Ubuntu or Debian	sudo apt-get update; sudo apt-get install accumulo

Now continue with Step 3: Configure Accumulo for your Environment.

Step 3: Configure Accumulo for your Environment

After installation, follow the steps in this section to configure Accumulo for your environment.

1. On every host, configure the following properties in `/etc/accumulo/conf/accumulo-site.xml` with the proper values for your environment:

```
<property>
  <name>instance.zookeeper.host</name>
  <value>localhost:2181</value>
  <description>comma separated list of zookeeper
servers</description>
</property>

<property>
  <name>logger.dir.walog</name>
  <value>/data/1/walogs</value>
  <description>The directory used to store write-ahead logs on the
local filesystem. It is possible to specify a comma-separated list of
directories.</description>
</property>

<property>
  <name>instance.secret</name>
  <value>DEFAULT</value>
  <description>A secret unique to a given instance that all servers
must know in order to communicate with one another.
               Change it before initialization. To change it later
use ./bin/accumulo org.apache.accumulo.server.util.ChangeSecret
[oldpasswd] [newpasswd],
               and then update this file.
  </description>
```

```
</property>

<property>
  <name>tserver.memory.maps.max</name>
  <value>256M</value>
</property>

<property>
  <name>tserver.cache.data.size</name>
  <value>15M</value>
</property>

<property>
  <name>tserver.cache.index.size</name>
  <value>40M</value>
</property>

<property>
  <name>trace.password</name>
  <value>trace</value>
</property>

<property>
  <name>trace.user</name>
  <value>trace</value>
</property>
```

2. Review the configured values. For example, verify that you changed the value for `instance.secret` and make sure that the `logger.dir.walog` value points to where you will want your Accumulo write-ahead logs saved on the hosts running the Logger service.
3. Review the service specific options, such as Java heap size, in the `/etc/default/accumulo` file:

```
ACCUMULO_TSERVER_OPTS="-Xmx1g -Xms1g -XX:NewSize=500m -
XX:MaxNewSize=500m"
ACCUMULO_MASTER_OPTS="-Xmx2g -Xms1g"
ACCUMULO_MONITOR_OPTS="-Xmx2g -Xms256m"
ACCUMULO_GC_OPTS="-Xmx256m -Xms256m"
ACCUMULO_LOGGER_OPTS="-Xmx1g -Xms256m"
ACCUMULO_GENERAL_OPTS="-XX:+UseConcMarkSweepGC -
XX:CMSInitiatingOccupancyFraction=75"
ACCUMULO_OTHER_OPTS="-Xmx1g -Xms256m"
```

4. On each host running the Logger service, create the write-ahead log directory. For our example this would be `/data/1/walogs`:

```
$ sudo mkdir –p /data/1/accumulo/walogs
```

```
$ sudo chown -R accumulo:accumulo /data/1/accumulo
```

Now continue with Step 4: Initialize Accumulo.

Important:

On a **multi-host cluster** replace `localhost` with the fully qualified domain name (FQDN) or IP address of the Accumulo Master in the `masters`, `monitor`, gc and `tracers` files in `/etc/accumulo/conf`, and add the FQDN or IP address of the TabletServers (one per line) to the `/etc/accumulo/conf/slaves` file.

Important:

On a **multi-host cluster**, the contents of the `/etc/accumulo/conf` directory must always be synchronized across all Accumulo servers within a cluster. This may be done using configuration management, version control or via a utility such as `rsync`. Servers with out-of-sync configurations will not be allowed to join the cluster.

Step 4: Initialize Accumulo

To initialize Accumulo:

1. Create the `/accumulo` and `/user/accumulo directoris` in HDFS and change their ownership to the `accumulo` user:

```
$ sudo su - hdfs
$ hadoop fs -mkdir /accumulo /user/accumulo
$ hadoop fs -chown accumulo:supergroup /accumulo /user/accumulo
$ hadoop fs -chmod 751 /accumulo
$ hadoop fs -chmod 750 /user/accumulo
$ exit
```

2. On the Accumulo Master, enter the following commands to initialize Accumulo and follow the prompts to name your instance (for this example, `cloudera`) and set a root password:

```
$ sudo -i service accumulo-master init
[util.Initialize] INFO : Hadoop Filesystem is
hdfs://localhost.localdomain:8020
[util.Initialize] INFO : Accumulo data dir is /accumulo
[util.Initialize] INFO : Zookeeper server is localhost:2181
[util.Initialize] INFO : Checking if Zookeeper is available. If this
```

```
hangs, then you need to make sure zookeeper is running

Instance name : cloudera
Enter initial password for root: ****
Confirm initial password for root: ****

[conf.Configuration] WARN : dfs.replication.min is deprecated. Instead,
use dfs.namenode.replication.min
[conf.Configuration] WARN : dfs.block.size is deprecated. Instead, use
dfs.blocksize
[security.ZKAuthenticator] INFO : Initialized root user with username:
root at the request of user !SYSTEM
```

Warnings:

You will be warned here if you didn't change your instance secret in `/etc/accumulo/conf/accumulo-site.xml`.

If the "`Hadoop Filesystem is`" line contains "`fs://`" instead of "`hdfs://`", HDFS is not properly configured.

Step 5: Start Accumulo

To start Accumulo:

1. Run the following commands on the following hosts:

For the following service	Run this command
Accumulo Master	`sudo -i service accumulo-master start`
Accumulo Monitor	`sudo -i service accumulo-monitor start`
Accumulo Garbage Collector	`sudo -i service accumulo-gc start`
Accumulo Tracer	`sudo -i service accumulo-tracer start`
All cluster hosts except Accumulo Master, Accumulo Monitor, Accumulo Garbage Collector, and Accumulo Tracer hosts	`sudo -i service accumulo-tserver start` `sudo -i service accumulo-logger start`

2. You should now be able to connect to Accumulo on http://localhost:50095. You can check the status of each daemon with the following command:

```
$ sudo -i service accumulo-<service> status
```

where <service> is one of master, monitor, gc, tracer, tserver, or logger.

3. You can stop each daemon with the following command:

```
$ sudo -i service accumulo-<service> stop
```

where <service> is one of master, monitor, gc, tracer, tserver, or logger.

Verify your installation by proceeding to the Test the Accumulo Shell section.

Install Apache Accumulo from the Distribution Tarball

This section describes how to install Cloudera's packaging of Accumulo from a tarball instead of using Cloudera Manager or packages.

> **Warning:**
>
> These instructions are meant for advanced users. It is highly recommended that you install Accumulo using Cloudera Manager or packages.

Step 1: Create a Accumulo User Account

Before installing Accumulo, follow the instructions in this section to create a user accumulo and assign ownership of the new /var/lib/accumulo directory to it.

To create a Accumulo user account:

1. Run the following commands on every host in your Accumulo cluster.

```
$ sudo mkdir /var/lib/accumulo
$ sudo useradd -r -s /bin/bash -d /var/lib/accumulo accumulo
$ sudo cp /etc/skel/.bash* ~accumulo/
$ sudo chown -R accumulo:accumulo /var/lib/accumulo
```

2. Verify that the accumulo user on the Accumulo Master is configured for passwordless SSH to the accumulo account on itself as well as all other servers running Accumulo processes:

```
$ sudo su - accumulo
$ ssh-keygen -t rsa
Generating public/private rsa key pair.
```

```
Enter file in which to save the key (/var/lib/accumulo/.ssh/id_rsa):
Created directory '/var/lib/accumulo/.ssh'.
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /var/lib/accumulo/.ssh/id_rsa.
Your public key has been saved in /var/lib/accumulo/.ssh/id_rsa.pub.

$ cat ~/.ssh/id_rsa.pub > ~/.ssh/authorized_keys
$ chmod 600 ~/.ssh/authorized_keys
```

3. On every host, verify that the `/var/lib/accumulo/.ssh/authorized_keys` file contains the key from `/var/lib/accumulo/.ssh/id_rsa.pub` as well. You should then be able to SSH from the Master to other members of the Accumulo cluster without being prompted for a password.

Step 2: Install Accumulo

To install Accumulo:

1. On every host, extract the Accumulo tarball to `/usr/lib/accumulo`:

```
$ sudo mkdir /usr/lib/accumulo
$ sudo tar -xf accumulo-1.4.4-cdh4.5.0.tar.gz -C /usr/lib/accumulo --
strip=1
$ sudo chown -R root:root /usr/lib/accumulo/
```

2. Move the `/usr/lib/accumulo/conf` directory to `/etc/accumulo/cdh4_default` and copy the correct example configuration based on whether CDH was installed with parcels (`/etc/accumulo/cdh4_default/examples/CDH4_parcels`) or packages (RPM/DEB) (`/etc/accumulo/cdh4_default/examples/CDH4_packages`):

```
$ sudo mkdir /etc/accumulo
$ sudo mv /usr/lib/accumulo/conf /etc/accumulo/cdh4_default
$ sudo chown -R root:root /etc/accumulo/
$ sudo chmod -R og+rX /etc/accumulo/cdh4_default/examples
$ sudo alternatives --install /etc/accumulo/conf accumulo-conf \
    /etc/accumulo/cdh4_default 20

For a parcel-based CDH install:
$ sudo cp /etc/accumulo/cdh4_default/examples/CDH4_parcels/* \
    /etc/accumulo/cdh4_default/

For a packages-based CDH install:
$ sudo cp /etc/accumulo/cdh4_default/examples/CDH4_packages/* \
    /etc/accumulo/cdh4_default/
```

3. Set the `ACCUMULO_CONF_DIR`, `ACCUMULO_HOME` and `JAVA_HOME` variables in `/var/lib/accumulo/.bashrc` to make them persistent:

```
$ sudo su - accumulo
$ echo "export ACCUMULO_CONF_DIR=/etc/accumulo/conf" >> ~/.bashrc
$ echo "export ACCUMULO_HOME=/usr/lib/accumulo" >> ~/.bashrc
$ echo "export JAVA_HOME=/usr/java/jdk1.6.0_31" >> ~/.bashrc
$ exit
```

4. Repeat step 3 for any other users who will need to use the Accumulo shell.

Step 3: Configure Accumulo for your Environment

After installation, follow the steps in this section to configure Accumulo for your environment.

1. On every host, configure the following properties in `/etc/accumulo/conf/accumulo-site.xml` with the proper values for your environment:

```
<property>
  <name>instance.zookeeper.host</name>
  <value>localhost:2181</value>
  <description>comma separated list of zookeeper
servers</description>
</property>

<property>
  <name>logger.dir.walog</name>
  <value>/data/1/walogs</value>
  <description>The directory used to store write-ahead logs on the
local filesystem. It is possible to specify a comma-separated list of
directories.</description>
</property>

<property>
  <name>instance.secret</name>
  <value>DEFAULT</value>
  <description>A secret unique to a given instance that all servers
must know in order to communicate with one another.
               Change it before initialization. To change it later
use ./bin/accumulo org.apache.accumulo.server.util.ChangeSecret
[oldpasswd] [newpasswd],
               and then update this file.
  </description>
</property>

<property>
  <name>tserver.memory.maps.max</name>
```

```
  <value>256M</value>
</property>

<property>
  <name>tserver.cache.data.size</name>
  <value>15M</value>
</property>

<property>
  <name>tserver.cache.index.size</name>
  <value>40M</value>
</property>

<property>
  <name>trace.password</name>
  <!--
    change this to the root user's password, and/or change the user
below
    -->
  <value>secret</value>
</property>

<property>
  <name>trace.user</name>
  <value>root</value>
</property>
```

2. Review the configured values. For example, verify that you changed the value for `instance.secret` and make sure that the `logger.dir.walog` value points to where you will want your Accumulo write-ahead logs saved on the hosts running the Logger service.

Important:

If you're using the example configuration files, you can skip this notice as the right ports are already configured.

If running a **multi-host cluster managed by Cloudera Manager,** you will need to add the following lines to `accumulo-site.xml`:

```
<property>
  <name>tserver.port.client</name>
  <value>10011</value>
</property>
```

This is to avoid a port conflict with the Cloudera Manager Service Monitor which also uses port 9997. In addition, be sure to open up TCP port 10011 in the firewall on all hosts running Table Servers.

Similarly, if you are running **Hue** (which is included but not started by default on Cloudera's

QuickStart VM) on the same server or virtual machine as Accumulo, you will need to add the following property to `accumulo-site.xml`:

```
<property>
  <name>master.port.client</name>
  <value>10010</value>
</property>
```

You will also need to open up TCP port 10010 in your firewall if you are running Hue and the Accumulo Master on the same node in a multi-node setup (this, however, is not recommended).

3. Open `accumulo-env.sh` and edit the value of the `ACCUMULO_LOG_DIR` variable to be `/var/log/accumulo`. Make sure that this folder is created on every host of this cluster:

```
$ sudo mkdir /var/log/accumulo
$ sudo chown accumulo:accumulo /var/log/accumulo
$ sudo rm -rf /usr/lib/accumulo/logs
```

4. Review any other settings you may want to change in `accumulo-env.sh`.
5. On each host running the Logger service, create the write-ahead log directory. For our example this would be `/data/1/accumulo/walogs`.

```
$ sudo mkdir -p /data/1/accumulo/walogs
$ sudo chown -R accumulo:accumulo /data/1/accumulo
$ sudo rm -rf /usr/lib/accumulo/walogs
```

6. Build the native libraries:

```
$ sudo yum install gcc-c++ glibc-devel libstdc++-devel
$ sudo make -C /usr/lib/accumulo/src/server/src/main/c++
```

Apache Accumulo is now installed and configured. Continue to the next section to initialize Accumulo and start the Accumulo services.

Important:

On a **multi-host cluster** replace `localhost` with the fully qualified domain name (FQDN) or IP address of the Accumulo Master in the `masters`, `monitor`, gc and `tracers` files in `/etc/accumulo/conf`, and add the FQDN or IP address of the TabletServers (one per line) to the `/etc/accumulo/conf/slaves` file.

Important:

On a **multi-host cluster**, the contents of the `/etc/accumulo/conf` directory must always be synchronized across all Accumulo servers within a cluster. This may be done using configuration management, version control or via a utility such as `rsync`. Servers with out-of-sync configurations will not be allowed to join the cluster.

Step 4: Initialize Accumulo

To initialize Accumulo:

1. Since the `hdfs` user is not running Accumulo, create the `/accumulo` and `/user/accumulo` directories in `hdfs` and change their ownership to the `accumulo` user.

```
$ sudo su - hdfs
$ hadoop fs -mkdir /accumulo /user/accumulo
$ hadoop fs -chown accumulo:supergroup /accumulo /user/accumulo
$ hadoop fs -chmod 751 /accumulo
$ hadoop fs -chmod 750 /user/accumulo
$ exit
```

2. On the Accumulo Master, enter the following commands to initialize Accumulo and follow the prompts to name your instance (for this example, `cloudera`) and set a root password:

```
$ sudo su - accumulo
$ cd /usr/lib/accumulo/
$ bin/accumulo init
[util.Initialize] INFO : Hadoop Filesystem is
hdfs://localhost.localdomain:8020
[util.Initialize] INFO : Accumulo data dir is /accumulo
[util.Initialize] INFO : Zookeeper server is localhost:2181
[util.Initialize] INFO : Checking if Zookeeper is available. If this
hangs, then you need to make sure zookeeper is running

Instance name : cloudera
Enter initial password for root: ****
Confirm initial password for root: ****

[conf.Configuration] WARN : dfs.replication.min is deprecated. Instead,
use dfs.namenode.replication.min
[conf.Configuration] WARN : dfs.block.size is deprecated. Instead, use
dfs.blocksize
[security.ZKAuthenticator] INFO : Initialized root user with username:
root at the request of user !SYSTEM
$ exit
```

Warnings:

You will be warned here if you didn't change your instance secret in `conf/accumulo-site.xml`.

If the "`Hadoop Filesystem is`" line contains "`fs://`" instead of "`hdfs://`", your HDFS is not properly configured.

3. Make sure that users in the `accumulo` group can access Accumulo utilities, such as the shell, while leaving access to Accumulo internals restricted by altering the permissions on the Accumulo section of HDFS:

```
$ sudo su - accumulo
$ hadoop fs -chmod 751 /accumulo
$ hadoop fs -chmod 750 /accumulo/*
$ hadoop fs -chmod 755 /accumulo/instance_id
$ exit
```

Step 5: Start Accumulo

To start Accumulo:

1. Run the following commands:

```
$ sudo su - accumulo
$ cd /usr/lib/accumulo/
$ bin/start-all.sh

Starting tablet servers and loggers .... done
Starting tablet server on localhost
Starting logger on localhost
[server.Accumulo] INFO : Attempting to talk to zookeeper
[server.Accumulo] INFO : Zookeeper connected and initialized,
attemping to talk to HDFS
[server.Accumulo] INFO : Connected to HDFS
Starting master on localhost
Starting garbage collector on localhost
Starting monitor on localhost
Starting tracer on localhost
$ exit
```

2. You should now be able to connect to Accumulo on http://localhost:50095/. Check the number of processes via the following command:

```
$ sudo -u accumulo jps -ml | grep org.apache.accumulo.start.Main \
    | wc -l
```

3. If you need to stop your Accumulo cluster, run the following commands on the Accumulo Master:

```
$ sudo su - accumulo
$ cd /usr/lib/accumulo/
$ bin/stop-all.sh

Accumulo shut down cleanly
Utilities and unresponsive servers will be shut down in 5 seconds
stopping gc on localhost
stopping monitor on localhost
stopping tracer on localhost
stopping gc on localhost
stopping monitor on localhost
stopping tracer on localhost
stopping unresponsive tablet servers (if any) ...
stopping logger on localhost
stopping unresponsive tablet servers hard (if any) ...
Cleaning tablet server and logger entries from zookeeper
Cleaning all server entries in zookeeper
$ exit
```

Note:

If you are attempting to connect to the Accumulo Master from another host, make sure your firewall allows inbound access on TCP port 50095. Also, in a **multi-node cluster**, make sure every Accumulo node can access the following TCP ports on every other Accumulo node: 4560, 11224, 12234, 50091, and 50095.

Note:

If the `bin/stop-all.sh` command is unresponsive, you may need to send it an interrupt via CTRL-C one or more times. This will cause it to forcibly stop unresponsive services.

Test the Accumulo Shell

You are now able to run the Accumulo shell on any client hosts (for CM installs, these are hosts assigned the **Gateway** role) in your cluster. By default, the user **root** is created and given the password **secret** or the password you set during install if you installed with packages or the tarball. It is strongly recommended that you change this password if you installed with CM.

1. Launch the Accumulo shell for the default root user.

```
$ accumulo shell -u root
grep: /etc/accumulo/conf/masters: No such file or directory
Enter current password for 'root'@'accumulo': ******

Shell - Apache Accumulo Interactive Shell
-
- version: 1.4.4-cdh4.5.0
- instance name: accumulo
- instance id: 9863d1f1-c323-4671-9e1f-69857f0d635f
-
- type 'help' for a list of available commands
-
root@accumulo>
```

2. Use the passwd command to set a new password for the root user.

```
root@accumulo> passwd
Enter current password for 'root': ******
Enter new password for 'root': *********
Please confirm new password for 'root': *********
root@accumulo>
```

3. Relaunch the shell with this new password.

```
root@accumulo> exit
$ accumulo shell -u root
grep: /etc/accumulo/conf/masters: No such file or directory
Enter current password for 'root'@'accumulo': *********

Shell - Apache Accumulo Interactive Shell
-
- version: 1.4.4-cdh4.5.0
- instance name: accumulo
- instance id: 9863d1f1-c323-4671-9e1f-69857f0d635f
-
- type 'help' for a list of available commands
-
```

```
root@accumulo>
```

4. Verify that you can list tables.

```
root@accumulo> tables
!METADATA
trace
root@accumulo>
```

5. If the trace table doesn't exist, make sure that you've created the trace user. Use the same password you used for the `trace.password` setting in `/etc/accumulo/conf/accumulo-site.xml` for packages or tarball installations or the **Trace Password** setting in Cloudera Manager for parcel installations.

```
root@cloudera> createuser trace
Enter new password for 'trace': *****
Please confirm new password for 'trace': *****
root@cloudera> grant System.CREATE_TABLE -s -u trace
root@cloudera> tables
!METADATA
trace
root@cloudera> revoke System.CREATE_TABLE -s -u trace
```

For more information on using the Accumulo shell, see the Accumulo user manual.

Using Accumulo with Maven

If you want to build applications or tools with Cloudera's packaging of Accumulo and you are using Maven or Ivy for dependency management, you can pull the Accumulo artifacts from the Cloudera Maven repository. The repository is available at https://repository.cloudera.com/artifactory/cloudera-repos/. The following is a sample POM (pom.xml) file:

```
<project xmlns="http://maven.apache.org/POM/4.0.0"
  xmlns:xsi=http://www.w3.org/2001/XMLSchema-instance
  xsi:schemaLocation="http://maven.apache.org/POM/4.0.0
http://maven.apache.org/maven-v4_0_0.xsd">

  <repositories>
    <repository>
      <id>cloudera</id>
      <url>https://repository.cloudera.com/artifactory/cloudera-repos/</url>
    </repository>
  </repositories>
</project>
```

CDH4 Compatible Releases

CDH 4.5 Compatible Releases

The following table lists the project name, groupId, artifactId, and version required to access each CDH4-compatible artifact.

Project	groupId	artifactId	version
Accumulo	org.apache.accumulo	accumulo	1.4.4-cdh4.5.0
	org.apache.accumulo	accumulo-core	1.4.4-cdh4.5.0
	org.apache.accumulo	accumulo-examples	1.4.4-cdh4.5.0
	org.apache.accumulo	accumulo-minicluster	1.4.4-cdh4.5.0
	org.apache.accumulo	accumulo-proxy	1.4.4-cdh4.5.0
	org.apache.accumulo	accumulo-server	1.4.4-cdh4.5.0
	org.apache.accumulo	accumulo-start	1.4.4-cdh4.5.0
	org.apache.accumulo	cloudtrace	1.4.4-cdh4.5.0
	org.apache.accumulo	examples-simple	1.4.4-cdh4.5.0

Troubleshooting

Reviewing Accumulo Logs

When troubleshooting Accumulo, first review the logs located at `/var/log/accumulo`. There are separate logs for each server process within Accumulo. For example, on our single node configuration there are four log file extensions/types: ".log", "out" (stdout), "err" (stderr) and ".debug" for each of the Accumulo roles.

Service	Base Log Name
Garbage Collector	`gc.FQDN.*`
Logger	`logger.FQDN.*`

Service	Base Log Name
Master	`master.FQDN.*`
Monitor	`monitor.FQDN.*`
Tracer	`tracer.FQDN.*`
TabletServer	`tserver.FQDN.*`

Review the logs on the Master as well as the TabletServers if you encounter issues.

Example: Troubleshooting missing native libraries for tarball installations

If the native libraries Accumulo relies on aren't in `/usr/lib/accumulo/lib/native`, the TabletServers will throw an error (yet continue to run). You can see this by running the following command after starting a TabletServer where `/usr/lib/accumulo/lib/native` doesn't exist:

```
$ grep ERROR /var/log/accumulo/tserver_localhost.localdomain.log
2013-08-28 10:28:15,813 [tabletserver.NativeMap] ERROR: Failed to
load native map library
/usr/lib/accumulo/lib/native/map/libNativeMap-Linux-amd64-64.so
```

To fix this error, run the following commands to rebuild the native libraries Accumulo needs, and then restart your TabletServer:

```
$ sudo make -C /usr/lib/accumulo/src/server/src/main/c++
$ sudo -i -u accumulo /usr/lib/accumulo/bin/tdown.sh && \
    sudo -i -u accumulo /usr/lib/accumulo/bin/tup.sh
```

If you look at the `/var/log/accumulo/tserver_localhost.localdomain.log` file, you will see there are no additional entries related to the missing library.

Note:

If you haven't previously compiled native libraries, you may need to install additional packages via the `yum` command in order to build them:

```
sudo yum install gcc-c++ glibc-devel libstdc++-devel
```

Creating a Local Yum Repository

This section explains how to set up a local yum repository that you can then use to install Accumulo on the machines in your cluster. There are a number of reasons you might want to do this, for example:

- The computers in your cluster may not have Internet access. You can still use yum to do an installation on those machines by creating a local yum repository.
- You may want to keep a stable local repository to ensure that any new installations (or re-installations on existing cluster members) use exactly the same bits.
- Using a local repository may be the most efficient way to distribute the software to cluster members.

To set up your own internal mirror, do the following.

Note:
Before You Start

These instructions assume you already have the appropriate Cloudera repo file on the system on which you are going to download the local repository. If this is not the case, follow the instructions under To add the Accumulo repository:.

1. On a computer that *does* have Internet access, install the `yum-utils` and `createrepo` packages if they are not already installed (`yum-utils` includes the `reposync` command):

   ```
   $ sudo yum install yum-utils createrepo
   ```

2. On the same computer as the previous step, download the yum repository into a temporary location. On Red Hat/CentOS 6, you can use a command such as:

   ```
   $ reposync -r cloudera-accumulo
   ```

   Note:
   `cloudera-accumulo` is the name of the repository on your system; the name is in square brackets and usually is on the first line of the repo file, which in this example is `/etc/yum.repos.d/cloudera-accumulo.repo`.

3. Copy all of the RPMs to the machine that will serve the local repository and place them in a directory served by your web server. For this example, we'll call it `/var/www/html/accumulo/1.4.4/RPMS/x86_64` (or `i386` for 32-bit systems). Make sure you can remotely access the files in the directory you just created (the URL should look like `http://<yourwebserver>/accumulo/1.4.4/RPMS/`).

4. On the server from step three, go to `/var/www/html/accumulo/1.4.4/` and type the following command:

```
$ createrepo .
```

   This will create or update the necessary metadata so yum can understand this new repository (you will see a new directory named `repodata`).

   Important:

   Check the permissions of the subdirectories under `/var/www/html/accumulo/1.4.4/`. Make sure they are all readable by your web server user.

5. Edit the repo file you downloaded previously and replace the line starting with `baseurl=` or `mirrorlist=` with `baseurl=http://<yourwebserver>/accumulo/1.4.4/`
6. Save this modified repo file in `/etc/yum.repos.d/`, and check that you can install Accumulo through yum.

Example:

```
$ yum update && yum install accumulo
```

Once you have confirmed that your internal mirror works, you can distribute this modified repo file to all your machines, and they should all be able to install Accumulo without needing access to the Internet. Follow the instructions under Step 2: Install Accumulo.