Agenda:

- HW6 overview
- HBase setup EC2 AMI instance
- Hbase (and Spark) on EMR
- HBase Shell (CLI)
- Code examples

HBase Basics

Apache HBase Reference Guide:
https://hbase.apache.org/book.html#getting_started

HBase setup on EC2 AMI instance:

Highly recommended to avoid local Windows setup – use EC2 AMI from class

Match the EMR versions of spark (3.1.2) and HBase (2.4.4)

https://dlcdn.apache.org/spark/spark-3.2.1/spark-3.2.1-bin-hadoop3.2.tgz

tar xzvf spark-3.1.2-bin-hadoop3.2.tgz

export SPARK_HOME=/home/centos/software/spark-3.1.2-bin-hadoop3.2
export PATH=$SPARK_HOME/bin:$PATH
export PYTHONPATH=$SPARK_HOME/python:$SPARK_HOME/python/lib/py4j-0.10.9-src.zip
export PYSPARK_PYTHON=python3

Download Hbase 2.4.4

https://archive.apache.org/dist/hbase/2.4.4/hbase-2.4.4-bin.tar.gz

tar xzvf hbase-2.4.4-bin.tar.gz

edit hbase-2.4.4/conf/hbase-env.sh
and add the following line (note, the location is based on the class AMI on AWS)

export JAVA_HOME=/usr/java/jdk1.8.0_161

Next start up HBase:

/home/centos/hbase-2.4.4/bin/start-hbase.sh

Note: to stop HBase, use this:

<hbase_home>/bin/stop-hbase.sh

You can now start the shell (CLI):

/home/centos/hbase-2.4.4/bin/hbase shell

HBase Shell
Use "help" to get list of supported commands.

Use "exit" to quit this interactive shell.

For Reference, please visit: http://hbase.apache.org/2.0/book.html#shell

Version 2.4.4, rc49f7f63fca144765bf7c2da41791769286dfccc, Wed Nov 10 09:50:56 UTC 2021

Took 0.0016 seconds

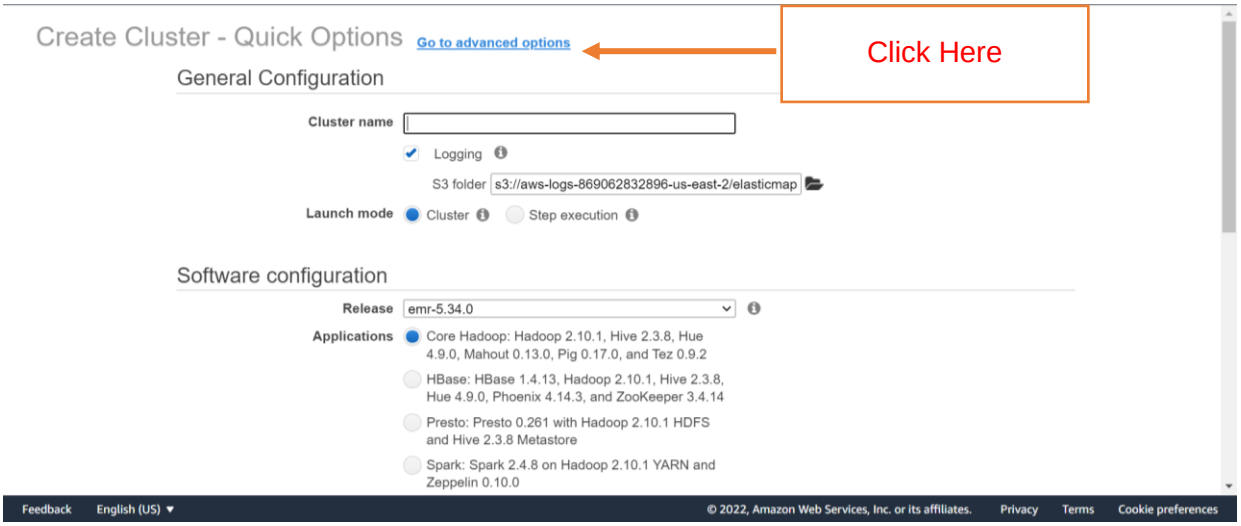
hbase:001:0> version

2.4.4, rc49f7f63fca144765bf7c2da41791769286dfccc, Wed Nov 10 09:50:56 UTC 2021

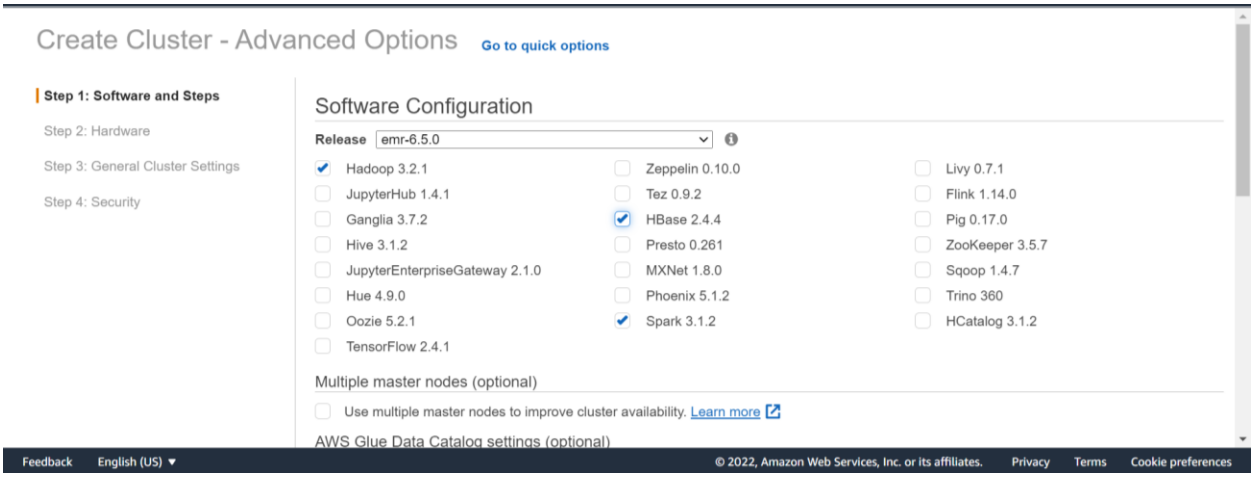
Took 0.0003 seconds

Hbase (and Spark) on EMR

This will be slightly different than previous setups. Instead of using the basic setup screen, go into Advanced Options.

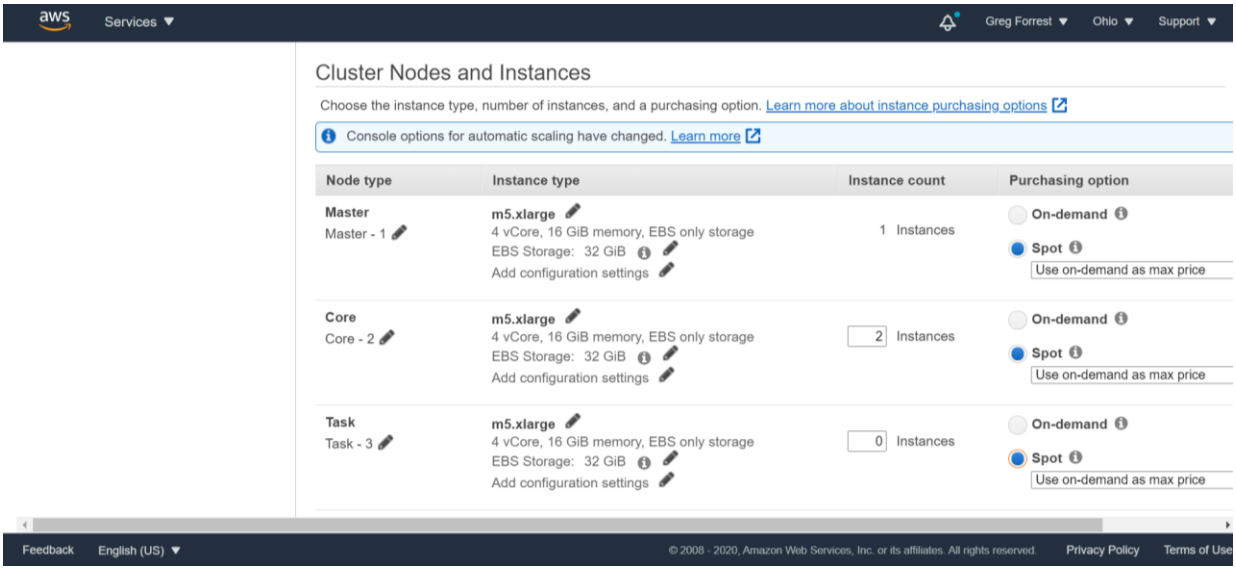


Select Hadoop, Spark, and HBase



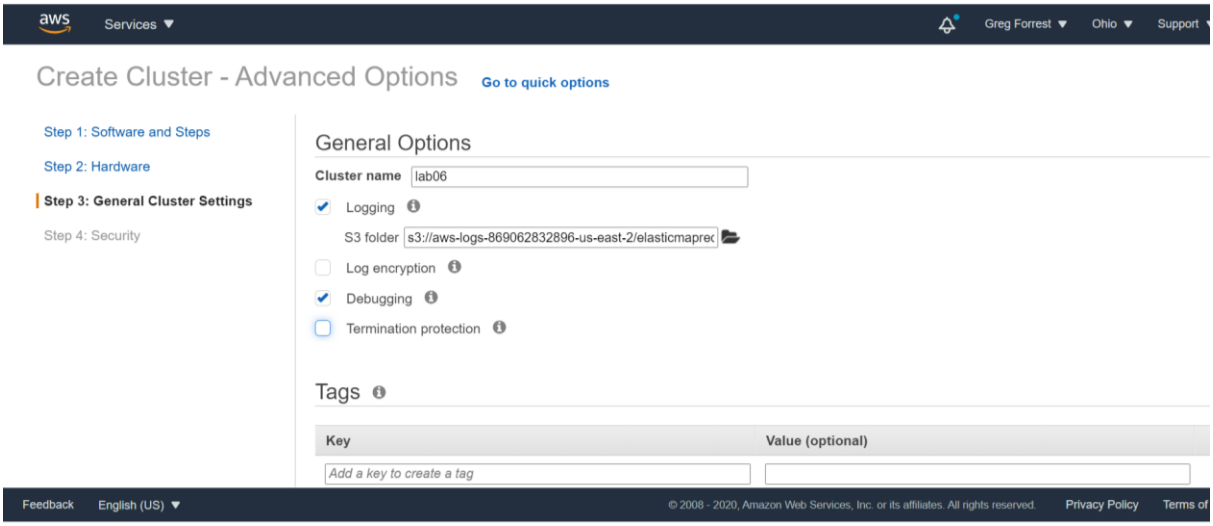
Click **Next**

On the next screen, you can adjust the Cluster Nodes to Spot instances instead of On-demand to help save some charges.



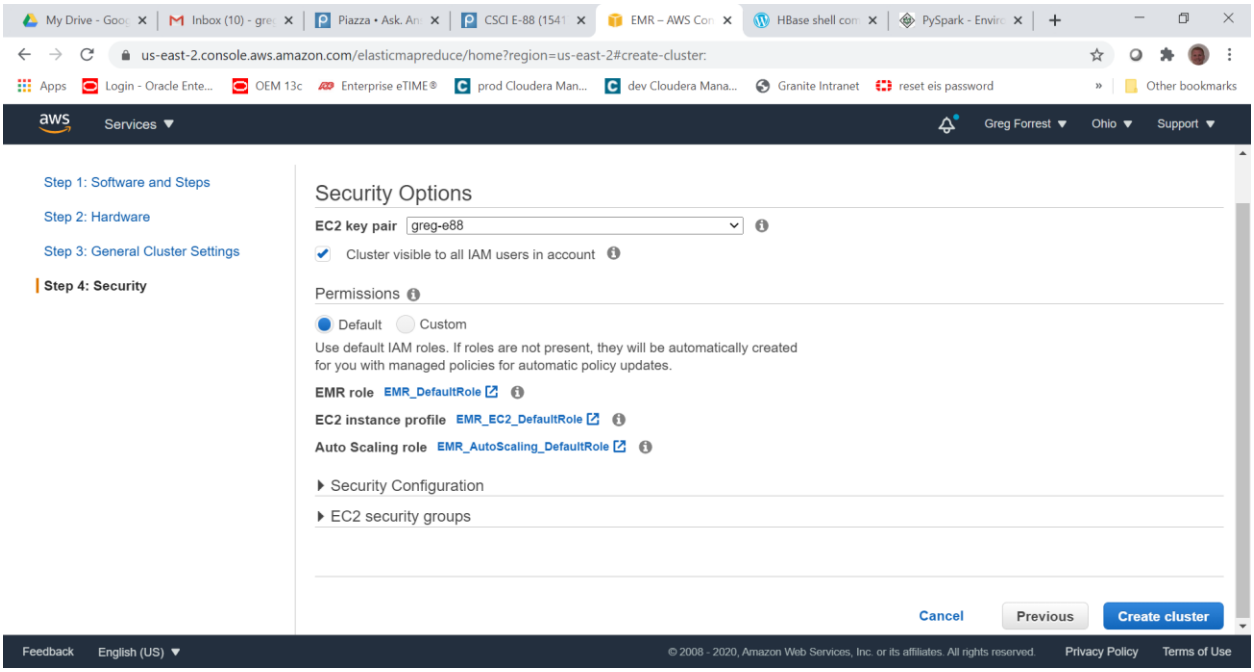
Click **Next**

Give your cluster a name and **deselect Termination protection**



Click **Next**

Select your EC2 key pair and click **Create cluster**



Basic CLI Commands

Here is a nice summary:

https://learnhbase.net/2013/03/02/hbase-shell-commands/

Create and review table

create '<table_name>', {NAME => '<column_family1>'}, {Name => '<column_family2>'}
or simply:
create '<table_name>', '<column_family1>' [,'<column_family2>',…'<column_familyN>']

Example:

hbase(main):002:0> **create 'CallLog', 'callDetails', 'callMetrics'**
0 row(s) in 1.5540 seconds

=> Hbase::Table - CallLog

describe '<table_name>'

hbase(main):004:0> describe 'CallLog'
Table CallLog is ENABLED
CallLog
COLUMN FAMILIES DESCRIPTION
{NAME => 'callDetails', BLOOMFILTER => 'ROW', VERSIONS => '1', IN_MEMORY => 'fal
se', KEEP_DELETED_CELLS => 'FALSE', DATA_BLOCK_ENCODING => 'NONE', TTL =>
'FOREV
ER', COMPRESSION => 'NONE', MIN_VERSIONS => '0', BLOCKCACHE => 'true',
BLOCKSIZE
=> '65536', REPLICATION_SCOPE => '0'}
{NAME => 'callMetrics', BLOOMFILTER => 'ROW', VERSIONS => '1', IN_MEMORY => 'fal
se', KEEP_DELETED_CELLS => 'FALSE', DATA_BLOCK_ENCODING => 'NONE', TTL =>
'FOREV
ER', COMPRESSION => 'NONE', MIN_VERSIONS => '0', BLOCKCACHE => 'true',
BLOCKSIZE
=> '65536', REPLICATION_SCOPE => '0'}
2 row(s) in 0.0480 seconds

Note the 2 rows – one for each column family in the table.

list

hbase(main):005:0> list
TABLE
CallLog
1 row(s) in 0.0190 seconds

=> ["CallLog"]

exists '<table_name>'
hbase(main):006:0> exists 'CallLog'
Table CallLog does exist
0 row(s) in 0.0160 seconds

Put and get data

put '<table_name>', '<row_key>', '<column_family>:<column>', '<value>'

hbase(main):008:0> put 'CallLog','20220303080000','callDetails:from','6171234567'
Took 0.1645 seconds

get '<table_name>', '<row_key>'

hbase:006:0> get 'CallLog', '20220303080000'
COLUMN CELL
callDetails:from timestamp=2022-03-02T20:58:55.549, value=6171234567
1 row(s)
Took 0.0713 seconds

scan '<table_name>'

hbase:007:0> scan 'CallLog'
ROW COLUMN+CELL
20220303080000 column=callDetails:from, timestamp=2022-03-02T20:58:55.549
, value=6171234567
1 row(s)
Took 0.0528 seconds

Versions:

alter '<table_name>', {NAME => '<column_family>', VERSIONS => <N> }

alter 'CallLog', { NAME => 'callDetails', VERSIONS => 3 }

Demo:

put 'CallLog', '20220303080000', 'callDetails:StillThere','Yes1'
put 'CallLog', '20220303080000', 'callDetails:StillThere','Yes2'
put 'CallLog', '20220303080000', 'callDetails:StillThere','Yes3'
put 'CallLog', '20220303080000', 'callDetails:StillThere','Yes4'
put 'CallLog', '20220303080000', 'callDetails:StillThere','No'

get 'CallLog', '20220303080000', {COLUMN => 'callDetails:StillThere', VERSIONS => 2}
COLUMN CELL
callDetails:StillThe timestamp=2022-03-02T21:04:39.118, value=No
re

callDetails:StillThe timestamp=2022-03-02T21:04:39.072, value=Yes4
re
1 row(s)
Took 0.0237 seconds

Dropping Tables

1st disable, then drop

disable '<table_name>'
drop '<table_name>'

create namespace '<name_space>'

Create a namespace

```
create_namespace 'lab'
create_namespace, alter_namespace, describe_namespace, drop_namespace,
list_namespace, list_namespace_tables
```

Scripting HBase CLI Commands

You can also package commands into a file and run them as a script:

./bin/hbase shell <file_containing_commands>

lab_setup.txt:

create_namespace 'lab'

create 'lab:date_hour', 'url'

describe 'lab:date_hour'

exit

```
CMD> ./bin/hbase shell ./lab_setup.txt
0 row(s) in 1.2090 seconds

0 row(s) in 1.3890 seconds

Table lab:date_hour is ENABLED
lab:date_hour
COLUMN FAMILIES DESCRIPTION
```

{NAME => 'url', BLOOMFILTER => 'ROW', VERSIONS => '1', IN_MEMORY => 'false', KEEP_DELETED_CELLS => 'FALSE', DATA_BLOCK_ENCODING => 'NONE', TTL => 'FOREVER', COMPRESSION => 'NONE', MIN_VERSIONS => '0', BLOCKCACHE => 'true', BLOCKSIZE => '65536', REPLICATION_SCOPE => '0'}
1 row(s) in 0.0410 seconds

Code Options

Python

Happybase

Happybase python library to connect to HBase via the Thrift API

https://happybase.readthedocs.io/en/latest/

To install, ensure python3-devel is installed and then use pip3 install:

sudo yum install python3-devel
sudo pip3 install happybase

For local testing, you need to start the thrift service:

<HBASE_HOME>/bin/hbase-daemon.sh start thrift

The thrift service should already be running on the EMR cluster.

spark-submit --packages org.apache.spark:spark-avro_2.12:3.1.2 --master yarn HoursCounterSparkHbaseHappy.py file-input-avro

Hortonworks Spark-Hbase Connector (SHC)

https://github.com/hortonworks-spark/shc

Supports Spark accessing HBase using Spark SQL dataframes

spark-submit --packages org.apache.spark:spark-avro_2.12:3.1.2,com.hortonworks:shc-core:1.1.1-2.1-s_2.11 --repositories http://repo.hortonworks.com/content/groups/public/ --files /etc/hbase/conf/hbase-site.xml HoursCounterSparkHbaseSHC.py

Java

```
// https://mvnrepository.com/artifact/org.apache.spark/spark-sql
compile group: 'org.apache.hbase', name: 'hbase', version: '2.4.4'

// https://mvnrepository.com/artifact/org.apache.spark/spark-sql
compile group: 'org.apache.hbase', name: 'hbase-client', version: '2.4.4'
```

To add hbase libraries into the spark classpath - update spark.driver.extraClassPath and spark.executor.extraClassPath in spark-defaults.conf

sudo vim /etc/spark/conf/spark-defaults.conf

:/usr/lib/hbase/*:/usr/lib/hadoop/hadoop-aws.jar:/usr/lib/hbase/lib/htrace-core-3.1.0-incubating.jar :/usr/lib/hbase/lib/metrics-core-2.2.0.jar

```
spark-submit --class package cscie88.spring2022.week6.HoursCounterSparkJobAvroHBase lab6-0.0.1-SNAPSHOT.jar input
```