

Cloudera Runtime 7.0.1

## Accessing Apache HBase

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# CLOUDERA

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## HBase Shell overview

You can use the HBase Shell from the command line interface to communicate with HBase.

In CDP, you need to SSH into an HBase node before you can use the HBase Shell. For example, to SSH into an HBase node with the IP address 10.10.10.10, you must use the command:

```
ssh <username>@10.10.10.10
```



**Note:** You must use your IPA password for authentication.

After you have started HBase, you can access the database in an interactive way by using the HBase Shell, which is a command interpreter for HBase which is written in Ruby. Always run HBase administrative commands such as the HBase Shell, hbck, or bulk-load commands as the HBase user (typically hbase).

```
hbase shell
```

You can use the following commands to get started with the HBase shell:

- To get help and to see all available commands, use the help command.
- To get help on a specific command, use help "command". For example:

```
hbase> help "create"
```

- To remove an attribute from a table or column family or reset it to its default value, set its value to nil. For example, use the following command to remove the KEEP\_DELETED\_CELLS attribute from the f1 column of the users table:

```
hbase> alter 'users', { NAME => 'f1', KEEP_DELETED_CELLS => nil }
```

- To exit the HBase Shell, type quit.

## Virtual machine options for HBase Shell

You can set variables for the virtual machine running HBase Shell, by using the HBASE\_SHELL\_OPTS environment variable. This example sets several options in the virtual machine.

This example sets several options in the virtual machine.

```
$ HBASE_SHELL_OPTS="-verbose:gc -XX:+PrintGCApplicationStoppedTime -XX:+PrintGCDateStamps  
-XX:+PrintGCDetails -Xloggc:$HBASE_HOME/logs/gc-hbase.log" ./bin/hbase  
shell
```

## Script with HBase Shell

You can use HBase shell in your scripts. You can also write Ruby scripts for use with HBase Shell. Example Ruby scripts are included in the hbase-examples/src/main/ruby/ directory.

The non-interactive mode allows you to use HBase Shell in scripts, and allow the script to access the exit status of the HBase Shell commands. To invoke non-interactive mode, use the `-n` or `--non-interactive` switch. This small example script shows how to use HBase Shell in a Bash script.

```
#!/bin/bash
echo 'list' | hbase shell -n
status=$?
if [ $status -ne 0 ]; then
    echo "The command may have failed."
fi
```

Successful HBase Shell commands return an exit status of 0. However, an exit status other than 0 does not necessarily indicate a failure, but should be interpreted as unknown. For example, a command may succeed, but while waiting for the response, the client may lose connectivity. In that case, the client has no way to know the outcome of the command. In the case of a non-zero exit status, your script should check to be sure the command actually failed before taking further action.

You can use the `get_splits` command, which returns the split points for a given table:

```
hbase> get_splits 't2'
Total number of splits = 5

=> [ "", "10", "20", "30", "40" ]
```

## Use HBase command-line utilities

Besides the HBase Shell, HBase includes several other command-line utilities, which are available in the `hbase/bin/` directory of each HBase host. This topic provides basic usage instructions for the most commonly used utilities.

### PerformanceEvaluation

The PerformanceEvaluation utility allows you to run several preconfigured tests on your cluster and reports its performance. To run the PerformanceEvaluation tool, use the `bin/hbase pecommand`.

```
$ hbase pe

Usage: java org.apache.hadoop.hbase.PerformanceEvaluation \
  <OPTIONS> [-D<property=value>]* <command> <nclients>

Options:
  nomapred           Run multiple clients using threads (rather than use mapred
  use)
  rows              Rows each client runs. Default: One million
  size              Total size in GiB. Mutually exclusive with --rows. Default:
  1.0.
  sampleRate        Execute test on a sample of total rows. Only supported by r
  andomRead.
                   Default: 1.0
  traceRate         Enable HTrace spans. Initiate tracing every N rows. Defaul
  t: 0
  table             Alternate table name. Default: 'TestTable'
  multiGet          If >0, when doing RandomRead, perform multiple gets instea
  d of single
                   gets.
                   Default: 0
  compress          Compression type to use (GZ, LZO, ...). Default: 'NONE'
  flushCommits      Used to determine if the test should flush the table. Defau
  lt: false
  writeToWAL        Set writeToWAL on puts. Default: True
```

```

autoFlush          Set autoFlush on htable. Default: False
oneCon            all the threads share the same connection. Default: False
presplit          Create presplit table. Recommended for accurate perf analy
sis (see         guide). Default: disabled
inmemory         Tries to keep the HFiles of the CF inmemory as far as possi
ble. Not        guaranteed that reads are always served from memory. Defa
ult: false
usetags          Writes tags along with KVs. Use with HFile V3. Default:
false
numoftags        Specify the no of tags that would be needed. This works o
nly if usetags  is true.
filterAll        Helps to filter out all the rows on the server side there
by not returnin anything back to the client. Helps to check the server si
de performance. Uses FilterAllFilter internally.
latency          Set to report operation latencies. Default: False
bloomFilter      Bloom filter type, one of [NONE, ROW, ROWCOL]
valueSize        Pass value size to use: Default: 1024
valueRandom      Set if we should vary value size between 0 and 'valueSiz
e'; set on read  for stats on size: Default: Not set.
valueZipf        Set if we should vary value size between 0 and 'valueSize'
in zipf form:    Default: Not set.
period           Report every 'period' rows: Default: opts.perClientRunRo
ws / 10
multiGet        Batch gets together into groups of N. Only supported by ran
domRead.        Default: disabled
addColumnns      Adds columns to scans/gets explicitly. Default: true
replicas        Enable region replica testing. Defaults: 1.
splitPolicy      Specify a custom RegionSplitPolicy for the table.
randomSleep      Do a random sleep before each get between 0 and entered v
alue. Defaults: 0
columns         Columns to write per row. Default: 1
caching         Scan caching to use. Default: 30

Note: -D properties will be applied to the conf used.
For example:
-Dmapreduce.output.fileoutputformat.compress=true
-Dmapreduce.task.timeout=60000
Command:
append          Append on each row; clients overlap on keypace so some c
oncurrent      operations
checkAndDelete  CheckAndDelete on each row; clients overlap on keypace so
some concurrent operations
checkAndMutate  CheckAndMutate on each row; clients overlap on keypace so
some concurrent operations
checkAndPut     CheckAndPut on each row; clients overlap on keypace so s
ome concurrent operations
filterScan     Run scan test using a filter to find a specific row based
on it's value  (make sure to use --rows=20)
increment       Increment on each row; clients overlap on keypace so some
concurrent      operations

```

```

randomRead      Run random read test
randomSeekScan  Run random seek and scan 100 test
randomWrite     Run random write test
scan            Run scan test (read every row)
scanRange10    Run random seek scan with both start and stop row (max 10
rows)
scanRange100   Run random seek scan with both start and stop row (max 100
rows)
scanRange1000  Run random seek scan with both start and stop row (max 1000
rows)
scanRange10000 Run random seek scan with both start and stop row (max 1
0000 rows)
sequentialRead  Run sequential read test
sequentialWrite Run sequential write test
Args:
nclients       Integer. Required. Total number of clients (and HRegionS
ervers)
               running: 1 <= value <= 500
Examples:
To run a single client doing the default 1M sequentialWrites:
$ bin/hbase org.apache.hadoop.hbase.PerformanceEvaluation sequentialWrite 1
To run 10 clients doing increments over ten rows:
$ bin/hbase org.apache.hadoop.hbase.PerformanceEvaluation --rows=10 --noma
pred increment 10

```

## LoadTestTool

The LoadTestTool utility load-tests your cluster by performing writes, updates, or reads on it. To run the LoadTest Tool, use the `bin/hbase ltt` command. To print general usage information, use the `-h` option.

```

$ bin/hbase ltt -h

Options:
-batchupdate      Whether to use batch as opposed to separate
updates for every column in a row
-bloom <arg>     Bloom filter type, one of [NONE, ROW, ROWC
OL]
-compression <arg> Compression type, one of [LZO, GZ, NONE, SN
APPY, LZ4]
-data_block_encoding <arg> Encoding algorithm (e.g. prefix compress
ion) to use for data blocks in the test column family, one of
[NONE, PREFIX, DIFF, FAST_DIFF, PREFIX_T
REE].
-deferredlogflush Enable deferred log flush.
-encryption <arg> Enables transparent encryption on the test
table, one of [AES]
-families <arg>   The name of the column families to use se
parated by comma
-generator <arg>  The class which generates load for the too
l. Any args for this class can be passed as colon separated after c
lass name
-h,--help        Show usage
-in_memory       Tries to keep the HFiles of the CF inmemory
as far as possible. Not guaranteed that reads are always served fro
m inmemory
-init_only       Initialize the test table only, don't do
any loading

```

```

-key_window <arg>           The 'key window' to maintain between reads
and writes for concurrent  write/read workload. The default is 0.
                             The maximum number of read errors to tol
                             reader threads. The default is 10.
                             Desired cell size to exceed in bytes that
-max_read_errors <arg>     Whether to use multi-gets as opposed to sep
erate before terminating all arate gets for every
                             column in a row
-mob_threshold <arg>       Whether to use multi-puts as opposed to s
will use the MOB write path eparate puts for every
                             column in a row
-multiget_batchsize <arg>  The number of keys to read/write
                             Desired number of regions per region serv
                             er. Defaults to 5.
-multiput                   A positive integer number. When a number n
                             will load n table parallely. -tn parameter
                             value becomes table name prefix.
                             Each table name is in format <tn>_1...<tn>
_n
-read <arg>                 <verify_percent>[:<#threads=20>]
-reader <arg>               The class for executing the read requests
-region_replica_id <arg>    Region replica id to do the reads from
-region_replication <arg>  Desired number of replicas per region
-regions_per_server <arg>  A positive integer number. When a number n
                             is specified, load test tool
                             will create the test table with n regions p
er server
-skip_init                  Skip the initialization; assume test table
                             already exists
-start_key <arg>           The first key to read/write (a 0-based ind
ex). The default value is 0.
-tn <arg>                  The name of the table to read or write
-update <arg>              <update_percent>[:<#threads=20>][:<#whether
                             to ignore nonce collisions=0>]
-updater <arg>             The class for executing the update requests
-write <arg>               <avg_cols_per_key>:<avg_data_size>[:<#thr
eads=20>]
-writer <arg>              The class for executing the write requests
-zk <arg>                  ZK quorum as comma-separated host names w
ithout port numbers
-zk_root <arg>             name of parent znode in zookeeper

```

## wal

The wal utility prints information about the contents of a specified WAL file. To get a list of all WAL files, use the HDFS command `hadoop fs -ls -R /hbase/WALs`. To run the wal utility, use the `bin/hbase wal` command. Run it without options to get usage information.

```

hbase wal
usage: WAL <filename...> [-h] [-j] [-p] [-r <arg>] [-s <arg>] [-w <arg>]
-h,--help                 Output help message
-j,--json                  Output JSON
-p,--printvals             Print values
-r,--region <arg>         Region to filter by. Pass encoded region name; e.g.
                             '9192caead6a5a20acb4454ffbc79fa14'
-s,--sequence <arg>       Sequence to filter by. Pass sequence number.
-w,--row <arg>            Row to filter by. Pass row name.

```

## hfile

The hfile utility prints diagnostic information about a specified hfile, such as block headers or statistics. To get a list of all hfiles, use the HDFS command `hadoop fs -ls -R /hbase/data`. To run the hfile utility, use the `bin/hbase hfilecommand`. Run it without options to get usage information.

```
$ hbase hfile

usage: HFile [-a] [-b] [-e] [-f <arg> | -r <arg>] [-h] [-i] [-k] [-m] [-p]
           [-s] [-v] [-w <arg>]
-a,--checkfamily      Enable family check
-b,--printblocks      Print block index meta data
-e,--printkey         Print keys
-f,--file <arg>      File to scan. Pass full-path; e.g.
                    hdfs://a:9000/hbase/hbase:meta/12/34
-h,--printblockheaders Print block headers for each block.
-i,--checkMobIntegrity Print all cells whose mob files are missing
-k,--checkrow         Enable row order check; looks for out-of-order
                    keys
-m,--printmeta        Print meta data of file
-p,--printkv          Print key/value pairs
-r,--region <arg>    Region to scan. Pass region name; e.g.
                    'hbase:meta,,1'
-s,--stats            Print statistics
-v,--verbose          Verbose output; emits file and meta data
                    delimiters
-w,--seekToRow <arg> Seek to this row and print all the kvs for this
                    row only
```

## hbck

The hbck utility checks and optionally repairs errors in HFiles.



**Warning:** Running hbck with any of the `-fix` or `-repair` commands is dangerous and can lead to data loss. Contact Cloudera support before running it.

To run hbck, use the `bin/hbase hbck` command. Run it with the `-h` option to get more usage information.

```
-----
NOTE: As of HBase version 2.0, the hbck tool is significantly changed.
In general, all Read-Only options are supported and can be used
safely. Most -fix/ -repair options are NOT supported. Please see usage
below for details on which options are not supported.
-----
```

```
Usage: fsck [opts] {only tables}
where [opts] are:
  -help Display help options (this)
  -details Display full report of all regions.
  -timelag <timeInSeconds> Process only regions that have not experienced
any metadata updates in the last <timeInSeconds> seconds.
  -sleepBeforeRerun <timeInSeconds> Sleep this many seconds before checking
if the fix worked if run with -fix
  -summary Print only summary of the tables and status.
  -metaonly Only check the state of the hbase:meta table.
  -sidelineDir <hdfs://> HDFS path to backup existing meta.
  -boundaries Verify that regions boundaries are the same between META and
store files.
  -exclusive Abort if another hbck is exclusive or fixing.
```

```
Datafile Repair options: (expert features, use with caution!)
```

```

-checkCorruptHFiles      Check all Hfiles by opening them to make sure the
y are valid
-sidelineCorruptHFiles  Quarantine corrupted HFiles.  implies -checkCorru
ptHFiles

Replication options
-fixReplication         Deletes replication queues for removed peers

Metadata Repair options supported as of version 2.0: (expert features, use
with caution!)
-fixVersionFile        Try to fix missing hbase.version file in hdfs.
-fixReferenceFiles     Try to offline lingering reference store files
-fixHFileLinks         Try to offline lingering HFileLinks
-noHdfsChecking        Don't load/check region info from HDFS. Assumes hbas
e:meta region info is good. Won't check/fix any HDFS issue, e.g. hole, orpha
n, or overlap
-ignorePreCheckPermission ignore filesystem permission pre-check

NOTE: Following options are NOT supported as of HBase version 2.0+.
UNSUPPORTED Metadata Repair options: (expert features, use with caution!)
-fix                    Try to fix region assignments. This is for backwards
compatibility
-fixAssignments        Try to fix region assignments. Replaces the old -fix
-fixMeta               Try to fix meta problems. This assumes HDFS region inf
o is good.
-fixHdfsHoles          Try to fix region holes in hdfs.
-fixHdfsOrphans        Try to fix region dirs with no .regioninfo file in hdfs
-fixTableOrphans       Try to fix table dirs with no .tableinfo file in hdfs
(online mode only)
-fixHdfsOverlaps       Try to fix region overlaps in hdfs.
-maxMerge <n>          When fixing region overlaps, allow at most <n> regions
to merge. (n=5 by default)
-sidelineBigOverlaps   When fixing region overlaps, allow to sideline big
overlaps
-maxOverlapsToSideline <n> When fixing region overlaps, allow at most <
n> regions to sideline per group. (n=2 by default)
-fixSplitParents       Try to force offline split parents to be online.
-removeParents         Try to offline and sideline lingering parents and keep
daughter regions.
-fixEmptyMetaCells     Try to fix hbase:meta entries not referencing any
region (empty REGIONINFO_QUALIFIER rows)

UNSUPPORTED Metadata Repair shortcuts
-repair                Shortcut for -fixAssignments -fixMeta -fixHdfsHoles -
fixHdfsOrphans -fixHdfsOverlaps -fixVersionFile -sidelineBigOverlaps -fixRef
erenceFiles -fixHFileLinks
-repairHoles           Shortcut for -fixAssignments -fixMeta -fixHdfsHoles

```

## clean

After you have finished using a test or proof-of-concept cluster, the `hbase clean` utility can remove all HBase-related data from ZooKeeper and HDFS.



**Warning:** The `hbase clean` command destroys data. Do not run it on production clusters, or unless you are absolutely sure you want to destroy the data.

To run the `hbase clean` utility, use the `bin/hbase clean` command. Run it with no options for usage information.

```

$ bin/hbase clean

Usage: hbase clean (--cleanZk|--cleanHdfs|--cleanAll)
Options:

```

```
--cleanZk    cleans hbase related data from zookeeper.
--cleanHdfs  cleans hbase related data from hdfs.
--cleanAll   cleans hbase related data from both zookeeper and hdfs.
```

## Use the Java API

The Java API is the most common mechanism for getting data into HBase, through Put operations. The Thrift and REST APIs, as well as the HBase Shell, use the Java API.

The following simple example uses the Java API to put data into an HBase table. The Java API traverses the entire write path and can cause compactions and region splits, which can adversely affect performance.

```
...
HTable table = null;
try {
    table = myCode.createTable(tableName, fam);
    int i = 1;
    List<Put> puts = new ArrayList<Put>();
    for (String labelExp : labelExps) {
        Put put = new Put(Bytes.toBytes("row" + i));
        put.add(fam, qual, HConstants.LATEST_TIMESTAMP, value);
        puts.add(put);
        i++;
    }
    table.put(puts);
} finally {
    if (table != null) {
        table.flushCommits();
    }
}
...
```

## Use the Apache Thrift Proxy API

The Apache Thrift library provides cross-language client-server remote procedure calls (RPCs), using Thrift bindings.

A Thrift binding is client code generated by the Apache Thrift Compiler for a target language (such as Python) that allows communication between the Thrift server and clients using that client code. HBase includes an Apache Thrift Proxy API, which allows you to write HBase applications in Python, C, C++, or another language that Thrift supports. The Thrift Proxy API is slower than the Java API and may have fewer features. To use the Thrift Proxy API, you need to configure and run the HBase Thrift server on your cluster. You also need to install the [Apache Thrift compiler](#) on your development system.

After the Thrift server is configured and running, generate Thrift bindings for the language of your choice, using an IDL file. A HBase IDL file named HBase.thrift is included as part of HBase. After generating the bindings, copy the Thrift libraries for your language into the same directory as the generated bindings. In the following Python example, these libraries provide the thrift.transport and thrift.protocol libraries. These commands show how you might generate the Thrift bindings for Python and copy the libraries on a Linux system.

```
mkdir HBaseThrift
cd HBaseThrift/
thrift -gen py /path/to/Hbase.thrift
mv gen-py/* .
rm -rf gen-py/
mkdir thrift
cp -rp ~/Downloads/thrift-0.9.0/lib/py/src/* ./thrift/
```

The following example shows a simple Python application using the Thrift Proxy API.

```
from thrift.transport import TSocket
from thrift.protocol import TBinaryProtocol
from thrift.transport import TTransport
from hbase import Hbase

# Connect to HBase Thrift server
transport = TTransport.TBufferedTransport(TSocket.TSocket(host, port))
protocol = TBinaryProtocol.TBinaryProtocolAccelerated(transport)

# Create and open the client connection
client = Hbase.Client(protocol)
transport.open()

# Modify a single row
mutations = [Hbase.Mutation(
    column='columnfamily:columndescriptor', value='columnvalue')]
client.mutateRow('tablename', 'rowkey', mutations)
# Modify a batch of rows
# Create a list of mutations per work of Shakespeare
mutationsbatch = []

for line in myDataFile:
    rowkey = username + "-" + filename + "-" + str(linenum).zfill(6)
    mutations = [
        Hbase.Mutation(column=messagecolumncf, value=line.strip()),
        Hbase.Mutation(column=linenumcolumncf, value=encode(linenum)),
        Hbase.Mutation(column=usernamecolumncf, value=username)
    ]
    mutationsbatch.append(Hbase.BatchMutation(row=rowkey, mutations=mutations))

# Run the mutations for all the lines in myDataFile
client.mutateRows(tablename, mutationsbatch)

transport.close()
```

The Thrift Proxy API does not support writing to HBase clusters that are secured using Kerberos.

### Related Information

[Using the HBase Thrift Interface, Part 1](#)

[Using the HBase Thrift Interface, Part 2](#)

## Use the Hue HBase app

Hue includes an HBase App that allows you to interact with HBase through a Thrift proxy server.

Because Hue sits between the Thrift server and the client, the Thrift server assumes that all HBase operations come from the hue user and not the client. To ensure that users in Hue are only allowed to perform HBase operations assigned to their own credentials, and not those of the hue user, you must enable HBase impersonation. For more information about the how to enable doAs Impersonation for the HBase Browser Application, see [Enabling the HBase Browser Application with doAs Impersonation](#).