

ISIT312 Big Data Management

HBase Operations

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HBase Operations

Outline

HBase shell

Data definition commands

Data manipulation commands

HBase Java API

HBase shell

HBase provides extensible JRuby-based (Java Interactive Ruby - JIRB) shell as a feature to execute some commands

The shell is a typical Read-Eval-Print-Loop (REPL) shell also known as a language shell

It is a simple, interactive computer programming environment that takes single user inputs evaluates them, and returns the result to the user; a program written in a REPL environment is executed piecewise

It means that **HBase shell** allows for computation of Ruby scripts and brings all features enabled in JIRB shell

It allows to process a script of **HBase** commands saved in a file **file-name.hb** in the following way:

```
source 'file-name.hb'
```

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Data definition commands

In **Hbase**, a set of **data definition** commands includes: **create**, **list**, **describe**, **disable**, **disable_all**, **enable**, **enable_all**, **drop**, **drop_all**, **show_filters**, **alter**, **alter_status**

Create a table 'student' with a column family 'personal'

```
create 'student','personal'
```

HBase shell

Show a structure of a table 'student'

```
describe 'student'
```

HBase shell

Implement a column family 'personal' in transient memory

```
alter 'student',{NAME=>'personal',IN_MEMORY=>true}
```

HBase shell

Add a column family 'uni' to a table 'student'

```
alter 'student',{NAME=>'uni',VERSIONS=>'4'}
```

HBase shell

Data definition commands

Delete a column family 'uni' from a table 'student'

```
alter 'student','delete'=>'uni'
```

HBase shell

Add a column family 'university' to a table student and allow for 5 versions in each cell in the column family

```
alter 'student',{NAME=>'university',VERSIONS=>5}
```

HBase shell

Increase a number of allowed versions in a column family 'personal' to 3

```
alter 'student',{NAME=>'personal',VERSIONS=>3}
```

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Data Manipulation commands

In **Hbase**, a set of **data manipulation** commands includes: **count**, **put**, **get**, **delete**, **delete_all**, **truncate**, **scan**

Put a value '**James**' into a cell in a column family '**personal**', qualification '**first-name**', row key '**007**',

```
put 'student','007','personal:first-name','James'
```

HBase shell

Put a value '**Bond**' into a cell in a column family '**personal**', qualification '**last-name**', row key '**007**'

```
put 'student','007','personal:last-name','Bond'
```

HBase shell

Put a value '**01-OCT-1960**' into a cell in a column family '**personal**', qualification **dob**', row key '**007**',

```
put 'student','007','personal:dob','01-OCT-1960'
```

HBase shell

Data Manipulation commands

List the contents of a table 'student'

```
scan 'student'
```

HBase shell

Put a value '02-OCT-1960' as the second version into a cell in a column family 'personal', qualification 'dob', row key '007',

```
put 'student','007','personal:dob','02-OCT-1960'
```

HBase shell

Get no more than 5 versions of a cell 'dob' in a column family 'personal' from a row '007' in a table 'student'

```
get 'student','007',{COLUMN=>'personal:dob',VERSIONS=>5}
```

HBase shell

Get no more than 5 versions of a cell 'dob' in a column family 'personal', from a table 'student'

```
scan 'student',{COLUMN=>'personal:dob',VERSIONS=>5}
```

HBase shell

Data Manipulation commands

Get all column families in a row '666' in a table 'student'

```
get 'student', '666'
```

HBase shell

Get no more than 5 versions of values from all cells in a column family 'grade' in a row '666' in a table 'student'

```
get 'student', '666', {COLUMN=>'grade', VERSIONS=>5}
```

HBase shell

Get no more than 5 versions of values from a cell 'CSCI235' in a column family 'grade' in a row '666' in a table 'student'

```
get 'student', '666', {COLUMN=>'grade:CSCI235', VERSIONS=>5}
```

HBase shell

Get no more than 5 versions of values from a cell 'dob' in a column family 'grade' in a row '666' in a table 'student'

```
get 'student', '007', {COLUMN=>'personal:dob', VERSIONS=>5}
```

HBase shell

Data Manipulation commands

Count total number of rows in a table 'student'

```
count 'student'
```

HBase shell

Get entire table 'student', one version per cell

```
scan 'student'
```

HBase shell

Get entire table 'student', at most 5 versions per cell

```
scan 'student',{VERSIONS=>5}
```

HBase shell

Get all cells 'dob' from in a column family 'personal' from entire table 'student', at most 5 versions per cell

```
scan 'student',{COLUMNS=>'personal:dob',VERSIONS=>5}
```

HBase shell

Data Manipulation commands

Get all cells from the column families '**personal**' and '**university**' from entire table '**student**'

```
scan 'student',{COLUMNS=>['personal','university']}
```

HBase shell

Get at most 5 versions of cells 'dob' with timestamps in a range **[1,1502609828830]**, from a column family '**personal**' from entire table '**student**'

```
scan 'student',{COLUMNS=>'personal:dob',TIMERANGE=>[1,1502609828830],  
VERSIONS=>5}
```

HBase shell

Get at most 5 versions of cells 'dob' with timestamps in a range **[1,1502609828830]**, from a column family '**personal**' from entire table '**student**'

```
scan 'student',{COLUMNS=>'personal:dob',  
FILTER=>"TimestampsFilter(1,1502609828830)",VERSIONS=>5}
```

HBase shell

Data Manipulation commands

Get all cells whose name is \geq than 'f' in a table 'student'

```
scan 'student',{FILTER=>"QualifierFilter(>=,'binary:f')"} }
```

HBase shell

Get all rows from a table 'student' that have value of a cell \geq than 'J'

```
scan 'student',{FILTER=>"ValueFilter(>=,'binary:J')"} }
```

HBase shell

Get all rows from a table 'student' that have value of a cell in a range ['J', 'K']

```
scan 'student',{FILTER=>"ValueFilter(>=,'binary:J') AND  
ValueFilter(<=,'binary:K')"} }
```

HBase shell

Get all values of cells 'dob' in a column family 'personal' from rows in a table 'student' where a cell 'dob' has a value '02-OCT-1960'

```
scan 'student',{COLUMNS=>'personal:dob',FILTER=>  
"QualifierFilter(=,'binary:dob') AND  
ValueFilter(=,'binary:02-OCT-1960')"} }
```

HBase shell

Data Manipulation commands

Delete a cell 'CSCI235' from a column family 'student' in a row '666' in a table 'student'

```
delete 'student','666','grade:CSCI235'
```

HBase shell

Delete entire row '007' from a table 'student'

```
deleteall 'student', '007'
```

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HBase Java API

HBase Java Application Program Interface allows to access HBase tables from programs written in Java

The client APIs provide both data definition and data manipulation features

Creating a table 'my-table' and column families 'Address' and 'Name'

```
import org.apache.hadoop.conf.Configuration;
import org.apache.hadoop.hbase.HBaseConfiguration;
import org.apache.hadoop.hbase.HColumnDescriptor;
import org.apache.hadoop.hbase.HTableDescriptor;
import org.apache.hadoop.hbase.TableName;
import org.apache.hadoop.hbase.client.HBaseAdmin;
```

Java

```
public class CreateTable {
    public static void main(String[] args) throws Exception {
        Configuration conf = HBaseConfiguration.create();
        HBaseAdmin admin = new HBaseAdmin(conf);
        HTableDescriptor tableDescriptor = new HTableDescriptor(TableName.valueOf("my-table"));
        tableDescriptor.addFamily(new HColumnDescriptor("Address"));
        tableDescriptor.addFamily(new HColumnDescriptor("Name"));
        admin.createTable(tableDescriptor);
        boolean tableAvailable = admin.isTableAvailable("my-table");
        System.out.println("tableAvailable = " + tableAvailable); } }
```

Java

HBase Java API

Inserting data into HBase table 'my-table'

```
public class PutRow {  
    public static void main(String[] args) throws Exception {  
        Configuration conf = HBaseConfiguration.create();  
        HTable table = new HTable(conf, "my-table");  
        Put put = new Put(Bytes.toBytes("007"));  
        put.add(Bytes.toBytes("Address"), Bytes.toBytes("City"), Bytes.toBytes("Dapto"));  
        put.add(Bytes.toBytes("Address"), Bytes.toBytes("Street"), Bytes.toBytes("Ellenborough"));  
        put.add(Bytes.toBytes("Name"), Bytes.toBytes("First"), Bytes.toBytes("James"));  
        put.add(Bytes.toBytes("Name"), Bytes.toBytes("Last"), Bytes.toBytes("Bond"));  
        table.put(put);  
        table.flushCommits();  
        table.close();  
    }  
}
```

Java

HBase Java API

Getting data from HBase table 'my-table'

```
import java.util.Map;  
import java.util.NavigableMap
```

Java

```
public class GetRow {  
    public static void main(String[] args) throws Exception {  
        Configuration conf = HBaseConfiguration.create();  
        HTable table = new HTable(conf, "my-table");  
        Get get = new Get(Bytes.toBytes("007"));  
        get.setMaxVersions(3);  
        get.addFamily(Bytes.toBytes("Address"));  
        get.addColumn(Bytes.toBytes("Name"), Bytes.toBytes("First"));  
        get.addColumn(Bytes.toBytes("Name"), Bytes.toBytes("Last"));  
    }  
}
```

Java

```
// Get a specific value  
Result result = table.get(get);  
String row = Bytes.toString(result.getRow());
```

Java

HBase Java API

Getting data from HBase table 'my-table'

Java

```
String specificValue = Bytes.toString(result.getValue(Bytes.toBytes("Address"),
                                                         Bytes.toBytes("City")));
System.out.println("Latest Address:City is: " + specificValue);
specificValue = Bytes.toString(result.getValue(Bytes.toBytes("Address"),
                                                         Bytes.toBytes("Street")));
System.out.println("Latest Address:Street is: " + specificValue);
specificValue = Bytes.toString(result.getValue(Bytes.toBytes("Name"),
                                                         Bytes.toBytes("First")));
System.out.println("Latest Name:First is: " + specificValue);
specificValue = Bytes.toString(result.getValue(Bytes.toBytes("Name"),
                                                         Bytes.toBytes("Last")));
System.out.println("Latest Name:Last is: " + specificValue)
```

HBase Java API

Java

```
// Traverse entire returned row
System.out.println("Row key: " + row);
NavigableMap>> map = result.getMap();
for (Map.Entry>> navigableMapEntry : map.entrySet()) {
    String family = Bytes.toString(navigableMapEntry.getKey());
    System.out.println("\t" + family);
    NavigableMap> familyContents = navigableMapEntry.getValue();
    for (Map.Entry> mapEntry : familyContents.entrySet()) {
        String qualifier = Bytes.toString(mapEntry.getKey());
        System.out.println("\t\t" + qualifier);
        NavigableMap qualifierContents = mapEntry.getValue();
        for (Map.Entry entry : qualifierContents.entrySet()) {
            Long timestamp = entry.getKey();
            String value = Bytes.toString(entry.getValue());
            System.out.printf("\t\t\t%s, %d\n", value, timestamp);
        }
    }
}
table.close();
}
```

References

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