**Exercise 12**

*Further Cassandra*

**Prior Knowledge**

Unix Command Line Shell

Cassandra exercise

**Learning Objectives**

Better understand Cassandra’s CQL shell and CQL  
Understand limitations of Cassandra compared with SQL

Understand JSON support and non-traditional data-types

**Software Requirements**

(see separate document for installation of these)

* Apache Cassandra 3.0.8

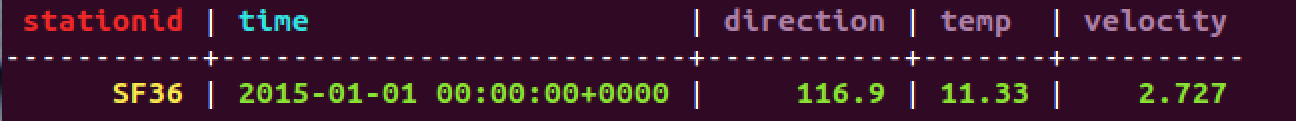
1. Make sure Cassandra is running
   1. In a Terminal window (Crtl-Alt-T) type:  
      service cassandra status
   2. You should see  
      \* Cassandra is running
   3. If not, try   
        
      sudo service cassandra start  
        
      and then check the status again.
2. Now you can start the Cassandra Shell:  
   Type:

cqlsh  
  
You should see:  
Connected to Test Cluster at 127.0.0.1:9042.

[cqlsh 5.0.1 | Cassandra 2.2.3 | CQL spec 3.3.1 | Native protocol v4]

Use HELP for help.

cqlsh>

1. First, let’s try some queries on the data.
2. use wind;
3. Try  
   select \* from winddata where time = '2015-01-01' and stationid = 'SF36';  
   You should see:  
   
4. Now try  
   select \* from winddata where time <= '2015-01-02' and stationid = 'SF36' limit 20;  
     
   All normal:

stationid | time | direction | temp | velocity

-----------+--------------------------+-----------+-------+----------

SF36 | 2015-01-01 00:00:00+0000 | 116.9 | 11.33 | 2.727

SF36 | 2015-01-01 00:05:00+0000 | 108.5 | 11.25 | 1.814

SF36 | 2015-01-01 00:10:00+0000 | 113.7 | 11.2 | 2.621

SF36 | 2015-01-01 00:15:00+0000 | 117.8 | 11.11 | 3.678

SF36 | 2015-01-01 00:20:00+0000 | 117.3 | 11.07 | 2.842

SF36 | 2015-01-01 00:25:00+0000 | 117.3 | 11.07 | 2.629

SF36 | 2015-01-01 00:30:00+0000 | 117.3 | 11.09 | 2.235

SF36 | 2015-01-01 00:35:00+0000 | 117.2 | 11.09 | 2.043

SF36 | 2015-01-01 00:40:00+0000 | 117.2 | 11.05 | 1.635

SF36 | 2015-01-01 00:45:00+0000 | 117.3 | 10.93 | 2.224

SF36 | 2015-01-01 00:50:00+0000 | 112.5 | 10.86 | 1.822

SF36 | 2015-01-01 00:55:00+0000 | 108.7 | 10.8 | 0.866

SF36 | 2015-01-01 01:00:00+0000 | 108.7 | 10.67 | 1.068

SF36 | 2015-01-01 01:05:00+0000 | 108.6 | 10.54 | 1.393

SF36 | 2015-01-01 01:10:00+0000 | 108.7 | 10.44 | 1.468

SF36 | 2015-01-01 01:15:00+0000 | 108.9 | 10.37 | 1.859

SF36 | 2015-01-01 01:20:00+0000 | 108.6 | 10.29 | 1.67

SF36 | 2015-01-01 01:25:00+0000 | 108.6 | 10.25 | 1.241

SF36 | 2015-01-01 01:30:00+0000 | 108.5 | 10.21 | 0.675

SF36 | 2015-01-01 01:35:00+0000 | 108.4 | 10.26 | 0.623

(20 rows)

1. Now another:   
   select \* from winddata where time <= '2015-01-01 01:00:00' and stationid in ('SF37', 'SF36');

stationid | time | direction | temp | velocity

-----------+--------------------------+-----------+-------+----------

SF36 | 2015-01-01 00:00:00+0000 | 116.9 | 11.33 | 2.727

SF36 | 2015-01-01 00:05:00+0000 | 108.5 | 11.25 | 1.814

SF36 | 2015-01-01 00:10:00+0000 | 113.7 | 11.2 | 2.621

SF36 | 2015-01-01 00:15:00+0000 | 117.8 | 11.11 | 3.678

SF36 | 2015-01-01 00:20:00+0000 | 117.3 | 11.07 | 2.842

SF36 | 2015-01-01 00:25:00+0000 | 117.3 | 11.07 | 2.629

SF36 | 2015-01-01 00:30:00+0000 | 117.3 | 11.09 | 2.235

SF36 | 2015-01-01 00:35:00+0000 | 117.2 | 11.09 | 2.043

SF36 | 2015-01-01 00:40:00+0000 | 117.2 | 11.05 | 1.635

SF36 | 2015-01-01 00:45:00+0000 | 117.3 | 10.93 | 2.224

SF36 | 2015-01-01 00:50:00+0000 | 112.5 | 10.86 | 1.822

SF36 | 2015-01-01 00:55:00+0000 | 108.7 | 10.8 | 0.866

SF36 | 2015-01-01 01:00:00+0000 | 108.7 | 10.67 | 1.068

SF37 | 2015-01-01 00:00:00+0000 | 252.3 | 11.11 | 3.774

SF37 | 2015-01-01 00:05:00+0000 | 273.89999 | 10.75 | 2.69

SF37 | 2015-01-01 00:10:00+0000 | 299.79999 | 11.1 | 1.747

SF37 | 2015-01-01 00:15:00+0000 | 303.5 | 11.65 | 1.534

SF37 | 2015-01-01 00:20:00+0000 | 282.79999 | 10.27 | 2.269

SF37 | 2015-01-01 00:25:00+0000 | 281.70001 | 9.72 | 2.141

SF37 | 2015-01-01 00:30:00+0000 | 292.70001 | 9.78 | 1.054

SF37 | 2015-01-01 00:35:00+0000 | 280.39999 | 9.53 | 2.36

SF37 | 2015-01-01 00:40:00+0000 | 280.29999 | 9.3 | 2.155

SF37 | 2015-01-01 00:45:00+0000 | 266.10001 | 9.37 | 3.1

SF37 | 2015-01-01 00:50:00+0000 | 272 | 9.46 | 2.703

SF37 | 2015-01-01 00:55:00+0000 | 265.39999 | 9.54 | 3.026

SF37 | 2015-01-01 01:00:00+0000 | 291.60001 | 9.7 | 1.508

(26 rows)

1. So we can query normally can we? Let’s try something else:

select \* from winddata where time <= '2015-01-01 01:00:00';  
  
Uh oh!  
  
InvalidRequest: code=2200 [Invalid query] message="Cannot execute this query as it might involve data filtering and thus may have unpredictable performance. If you want to execute this query despite the performance unpredictability, use ALLOW FILTERING"  
  
Basically, Cassandra will not do unbounded time queries, unless you force it to!

1. Try again, but this time explicitly enabling this query.   
   select \* from winddata where time <= '2015-01-01 01:00:00' allow filtering;
2. Now let’s try another query:  
     
   select \* from winddata where time <= '2015-01-01 01:00:00' and temp < 10 ;  
     
   Again this fails. Unlike a normal SQL database, you cannot do arbitrary queries on Cassandra. You must limit your queries to those that can be done based on the primary key. There are ways of creating secondary indices, but these basically create a whole new table under the covers to allow efficient searching.
3. We have now come across some limitations of Cassandra. Let’s look at the extra stuff you can do.  
     
   First let’s try some JSON support. Try the following:

CREATE KEYSPACE jsontest WITH REPLICATION = { 'class' : 'SimpleStrategy', 'replication\_factor' : 1 };

Use jsontest;  
create table users (id text primary key, name text, age int , job text);  
insert into users (id, name, age, job) values ('1', 'Paul', 46, 'Student') ;

select json \* from users;

You should see:

[json]

----------------------------------------------------------

{"id": "1", "age": 46, "job": "Student", "name": "Paul"}

(1 rows)

1. Now let’s insert data using JSON.  
   Notice how we can use either JSON or not.

insert into users json ' {"id": "2", "age": 43, "job": "Teacher", "name": "Henry"} ';

select \* from users;

id | age | job | name

----+-----+---------+-------

2 | 43 | Teacher | Henry

1 | 46 | Student | Paul

(2 rows)

1. Of course JSON supports complex types including lists, maps, sets and other data. Luckily Cassandra does too. Try out the map type with the following commands:

create table demomap ( id int primary key, mapdata map<text,text>);

insert into demomap json   
'{"id":1, "mapdata":{ "key1": "value1","key2":"value2"}}';

select \* from demomap;

select json \* from demomap;

1. Now let’s try out the **set** type.

create table demoset (id int primary key, myset set<text>);

-- insert as json

insert into demoset json ' { "id":1, "myset":["a","b","c"]}';

-- insert in traditional sql style   
insert into demoset (id, myset) values (2, {'hello','paul'});

select \* from demoset;  
select json \* from demoset;

1. CQL also supports a list type. See if you can figure it out. If not, there is an example over the page.
2. List example:

create table demolist (id int primary key, list list<text>);

insert into demolist (id, list) values (1,['a1','b2','c3']);

select \* from demolist;

id | list

----+--------------------

1 | ['a1', 'b2', 'c3']

(1 rows)

update demolist set list = ['z1'] + list where id = 1;  
select \* from demolist;

-- what do you expect here?

1. **That’s all for now!**