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
   a. In a Terminal window (Crtl-Alt-T) type:
      service cassandra status
   b. You should see
      * Cassandra is running
   c. 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>
```

3. First, let's try some queries on the data.

4. use wind;

5. Try
   select * from winddata where time = '2015-01-01' and stationid = 'SF36';
   You should see:

```
 stationid | time                     | direction | temp  | velocity
-----------+--------------------------+-----------+-------+----------
      SF36 | 2015-01-01 00:00:00+0000 |     116.9 | 11.33 |    2.727
```

6.

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)
```

7. 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)
```

8. 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!

9. Try again, but this time explicitly enabling this query.
   ```
   select * from winddata where time <= '2015-01-01 01:00:00' allow filtering;
   ```

10. 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.

11. 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)
    ```

12.

    ```
    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)
    ```

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

13. 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;
```

14. 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;
```

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

16.

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?
```

17. That's all for now!