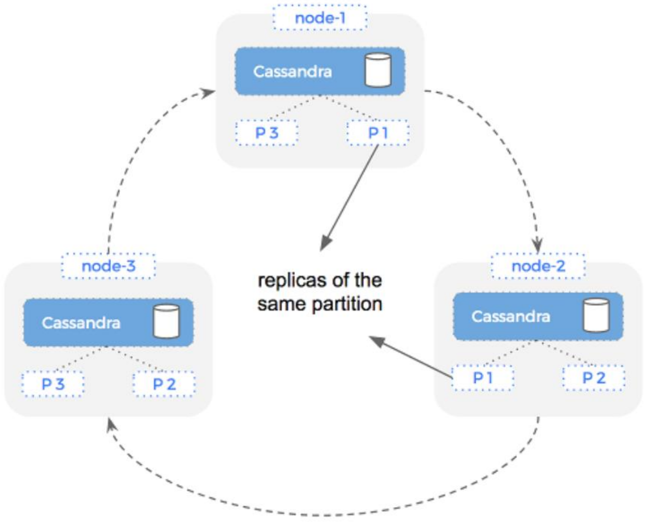
CSE 512- Distributed Database Systems

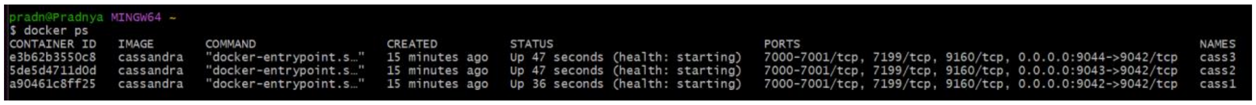
Group Project: Cassandrian

Part 5: Distributed NoSQL Database Systems Implementation

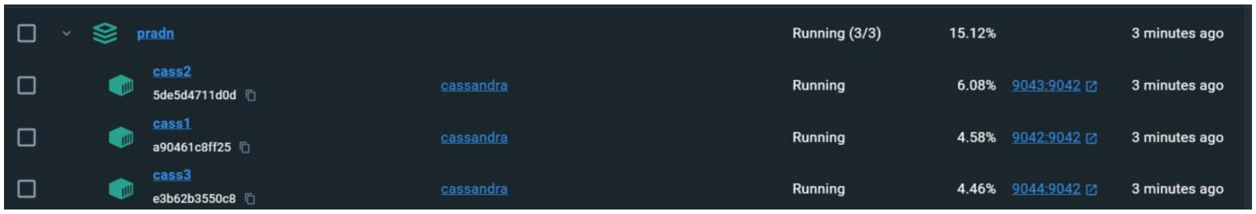
Based on the sample database found on Kaggle, the most suitable NoSQL database to cater to the requirements was **Cassandra**, because of its column-based database.

We created a Cassandra cluster of three nodes using docker, namely cass1, cass2, cass3. Cass1 & cass2 are seed nodes, i.e., cass1 & cass2 will the point of contact for the cluster and also contain all the information about the cluster. The distributed nature of Cassandra cluster ensures high availability.





```
pradn@Pradnya MINGW64 ~
$ docker ps
CONTAINER ID   IMAGE       COMMAND                  CREATED          STATUS                            PORTS                                                       NAMES
e3b62b3550c8   cassandra   "docker-entrypoint.s…"   15 minutes ago   Up 47 seconds (health: starting)   7000-7001/tcp, 7199/tcp, 9160/tcp, 0.0.0.0:9044->9042/tcp   cass3
5de5d4711d0d   cassandra   "docker-entrypoint.s…"   15 minutes ago   Up 47 seconds (health: starting)   7000-7001/tcp, 7199/tcp, 9160/tcp, 0.0.0.0:9043->9042/tcp   cass2
a90461c8ff25   cassandra   "docker-entrypoint.s…"   15 minutes ago   Up 36 seconds (health: starting)   7000-7001/tcp, 7199/tcp, 9160/tcp, 0.0.0.0:9042->9042/tcp   cass1
```



pradn		Running (3/3)	15.12%		3 minutes ago
cass2 5de5d4711d0d	cassandra	Running	6.08%	9043:9042	3 minutes ago
cass1 a90461c8ff25	cassandra	Running	4.58%	9042:9042	3 minutes ago
cass3 e3b62b3550c8	cassandra	Running	4.46%	9044:9042	3 minutes ago

The replication factor for the “commentary_keyspace” is set to 2, which would create 2 replicas of each partition of the keyspace across the cluster.

Data Schema & Data Model –

Table – commentary

Commentary table stores commentary information for each ball in a match.

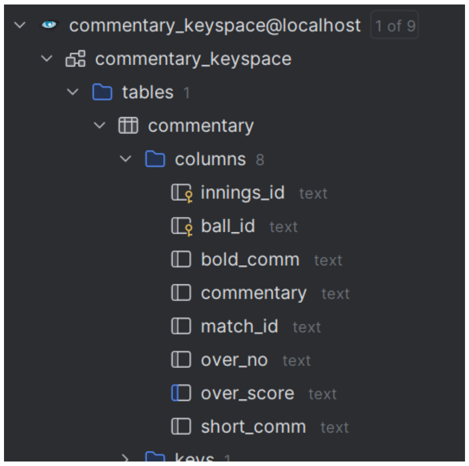
```
CREATE TABLE IF NOT EXISTS commentary (
                   Over_No TEXT,
                   Over_Score TEXT,
                   Short_comm TEXT,
                   Commentary TEXT,
                   Bold_Comm TEXT,
                   Innings_ID TEXT,
                   Ball_ID TEXT,
                   Match_ID TEXT,
                   PRIMARY KEY (Innings_ID, Ball_ID)
                   );
```

- Over_No: Over number (1.1, 3.5, etc)
- Over_score: Number of runs scored for that ball along with indication of wicket, byes, etc
- Short_comm: Short Commentary
- Commentary: Long version of commentary with all details
- Bold_comm: Comments made for entertainment
- Innings_ID: Identifies the innings of the match. It is a combination of match_ID & inning number eg. 1181768-1, 1181768-2
- Ball_ID: Identifies each ball within an innings
- Match_ID: References the match in which the commentary occurs

Innings_ID & Ball_ID together make the composite primary key.

CRUD operations –

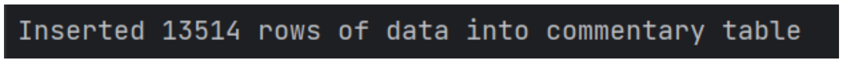
1. Create Commentary table:
   Create_table() method creates commentary table using the "create table" query



```
commentary_keyspace@localhost  1 of 9
  commentary_keyspace
    tables 1
      commentary
        columns 8
          innings_id  text
          ball_id  text
          bold_comm  text
          commentary  text
          match_id  text
          over_no  text
          over_score  text
          short_comm  text
        keys 1
```

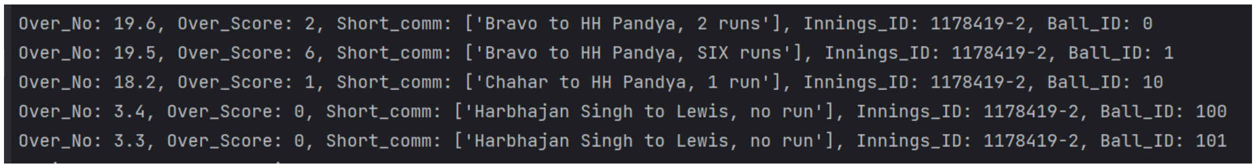
2. Insert the sample data:

Insert_csv_file_data() method inserts the data from sample csv file – ipl2019_final.csv into commentary table.



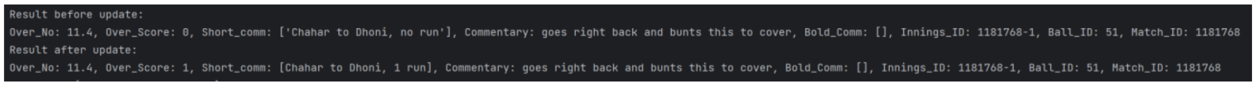
```
Inserted 13514 rows of data into commentary table
```

3. Sample read query:
   Read_query() method selects over_no, over_score, short_comm, innings_ID, ball_ID of 5 entries.



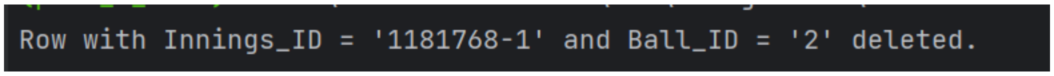
```
Over_No: 19.6, Over_Score: 2, Short_comm: ['Bravo to HH Pandya, 2 runs'], Innings_ID: 1178419-2, Ball_ID: 0
Over_No: 19.5, Over_Score: 6, Short_comm: ['Bravo to HH Pandya, SIX runs'], Innings_ID: 1178419-2, Ball_ID: 1
Over_No: 18.2, Over_Score: 1, Short_comm: ['Chahar to HH Pandya, 1 run'], Innings_ID: 1178419-2, Ball_ID: 10
Over_No: 3.4, Over_Score: 0, Short_comm: ['Harbhajan Singh to Lewis, no run'], Innings_ID: 1178419-2, Ball_ID: 100
Over_No: 3.3, Over_Score: 0, Short_comm: ['Harbhajan Singh to Lewis, no run'], Innings_ID: 1178419-2, Ball_ID: 101
```

4. Update query:
   Update_query() updates over_score & short_comm value of the entry with innings_ID '1181768-1' and ball_ID '51'



```
Result before update:
Over_No: 11.4, Over_Score: 0, Short_comm: ['Chahar to Dhoni, no run'], Commentary: goes right back and bunts this to cover, Bold_Comm: [], Innings_ID: 1181768-1, Ball_ID: 51, Match_ID: 1181768
Result after update:
Over_No: 11.4, Over_Score: 1, Short_comm: [Chahar to Dhoni, 1 run], Commentary: goes right back and bunts this to cover, Bold_Comm: [], Innings_ID: 1181768-1, Ball_ID: 51, Match_ID: 1181768
```

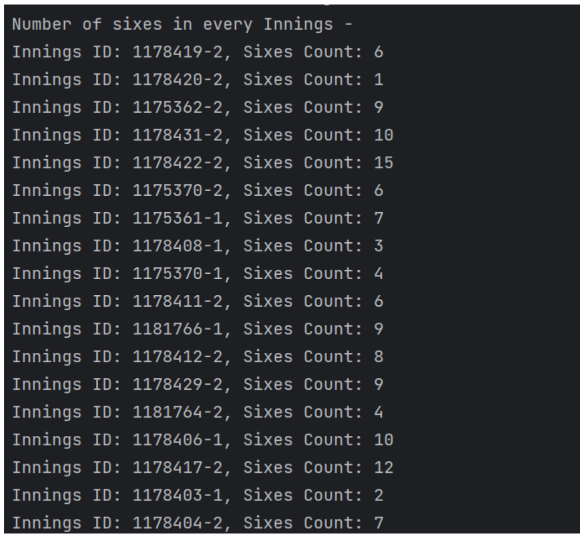
5. Delete query:
   Delete_query() method deletes entry with innings_ID '1181768-1' and ball_ID '2'



```
Row with Innings_ID = '1181768-1' and Ball_ID = '2' deleted.
```

Sample Queries to show data retrieval operations:

1. Get sixes by innings:
   Get_sixes_by_innings() method get the total number of sixes in every inning. As the where clause of this query contains a non-primary column over_score, a index needs to be created on that column, so as to not affect the computation capability of Cassandra. Create_index() is the method that creates index on over_score column.



```
Number of sixes in every Innings -
Innings ID: 1178419-2, Sixes Count: 6
Innings ID: 1178420-2, Sixes Count: 1
Innings ID: 1175362-2, Sixes Count: 9
Innings ID: 1178431-2, Sixes Count: 10
Innings ID: 1178422-2, Sixes Count: 15
Innings ID: 1175370-2, Sixes Count: 6
Innings ID: 1175361-1, Sixes Count: 7
Innings ID: 1178408-1, Sixes Count: 3
Innings ID: 1175370-1, Sixes Count: 4
Innings ID: 1178411-2, Sixes Count: 6
Innings ID: 1181766-1, Sixes Count: 9
Innings ID: 1178412-2, Sixes Count: 8
Innings ID: 1178429-2, Sixes Count: 9
Innings ID: 1181764-2, Sixes Count: 4
Innings ID: 1178406-1, Sixes Count: 10
Innings ID: 1178417-2, Sixes Count: 12
Innings ID: 1178403-1, Sixes Count: 2
Innings ID: 1178404-2, Sixes Count: 7
```