HELLENIC REPUBLIC
National and Kapodistrian University of Athens
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Programming Project II
NoSQL 311-Chicago-Incidents

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1 Introduction

In this project we have designed and implemented a NoSQL database solution to manage *"311 Incidents"* data openly published by the city of Chicago, IL. Along with it we have also implemented a rest API, providing access to the aforementioned database to the users, namely the residents of Chicago. The database termed $db_311 ciispopulatedbydataavailableat$:
$https://www.kaggle.com/chicago/chicago-311-service-requests$.

2 Project Structure

- ***ChicagoIncidents_311_NonRelational***
  - ***ci_311***
    - ***views.py****: containing all the methods implementing the queries according to the rest api rules.*
  - ***migration***
    - ***indexes.bson****: all the indexes we used over the collections*
    - ***queries.bson****: all the native queries*
    - ***userGeneration.py****: script for citizen generation and insertion in collection*
    - ***migrationPreprocess.py***
  - ***README***

3 Data Base Schema, Indices and Data Migration

3.1 Schema

The database solution we provide consists of 2 collections, incidents and citizens respectively. The incident collection holds all the documents about the recorded incidents in the city of Chicago, along with an embedded field (names) the citizen upvotes that each incident has received. The citizen collection contains the name, phone, address and an embedded field containing the id's of the incidents that the citizen might have upvoted.

3.2 Indices

We concluded using the following incidents over the aforementioned collection to otpimize the run time of the queries we implement. First in the incident collection we added 3 indexes; ***a)*** *in creationDate, optimizing the run time for all queries depending on the creationDate field.* ***b)*** *requestType, enhansing the queries depending on actions over this particular field. Furthermore, we have a query running when we are about to insert a new incident in order to secure check that the new incident about to be inserted belongs to one of the existing request types. Without the index this query takes a respective amount of time, while now it is instant.* ***c)****requestServiceNumber this index is not actually used in any of the queries, but it is useful if we are going to search a particular incident. We consider this number as the id of the incident to the outside world, whereas the _id field is just for the programmer and the system.*

3.3 Data Migration

For the data migration we have use the official mongo GUI available. Before that, we run a mild preprocess (migrationPreprocess.py) to rename the CSVs' columns we use for input data so that they are uniform between the shared fields. n order to insert the citizens in a collection and add the embedded field voters in the incident collection, we created the script userGeneration.py using the database client from the libary pymongo to interact with the database and. To generate the users we use the open source library faker.

4 Rest API

For the Rest API we used the Django+Rest framework along with djongo, which integrates the django ORM when mongoDB is used as back-end. However, we ended up with the pymongo library since we saw it better fitting for this particular project, since one of the main subjects of this project is writing mongo native queries for the mongoDB we use as a back-end.

5 Sample snapshots of the query results - Metrics

1. *Find the total requests per type that were created within a specified time range and sort them in a descending order.*
2. *Find the number of total requests per day for a specific request type and time range.*
3. *Find the three most common service requests per zipcode for a specific day.*
4. *Find the three least common wards with regards to a given service request type.*
5. *Find the average completion time per service request for a specific date range.*
6. *Find the most common service request in a specified bounding box for a specific day. You are encouraged to use GeoJSON objects and Geospatial Query Operators*
7. *Find the fifty most upvoted service requests for a specific day.*
8. *Find the fifty most active citizens, with regard to the total number of upvotes.*
9. *Find the top fifty citizens, with regard to the total number of wards for which they have upvoted an incidents.*
10. *Find all incident ids for which the same telephone number has been used for more than one names.*

11. *Find all the wards in which a given name has casted a vote for an incident taking place in it.*

6 Query Metrics