95-702 Distributed Systems
Project 4 Task 2

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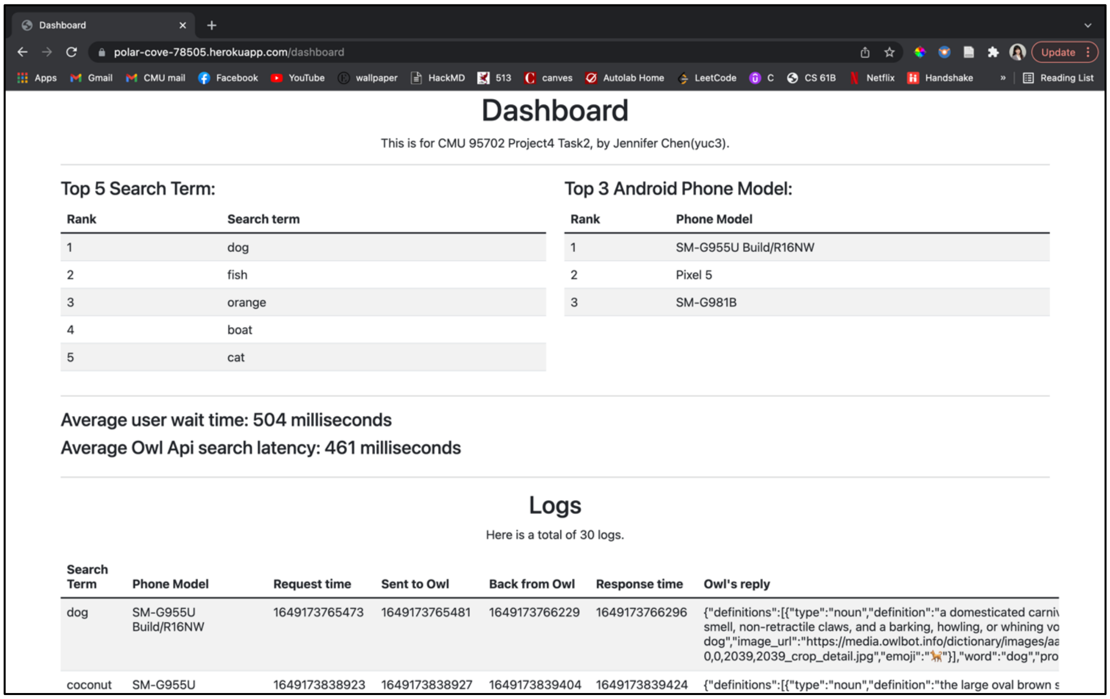
Web Service Logging and Analysis Dashboard

My Dashboard URL: https://polar-cove-78505.herokuapp.com/dashboard

Description:
This dashboard will display information about how my service is being used. Including showing logs and some interesting analytics. Below is the screenshot of my dashboard. I use Bootstrap to make it looks better.



Dashboard

This is for CMU 95702 Project4 Task2, by Jennifer Chen(yuc3).

Top 5 Search Term:

Rank	Search term
1	dog
2	fish
3	orange
4	boat
5	cat

Top 3 Android Phone Model:

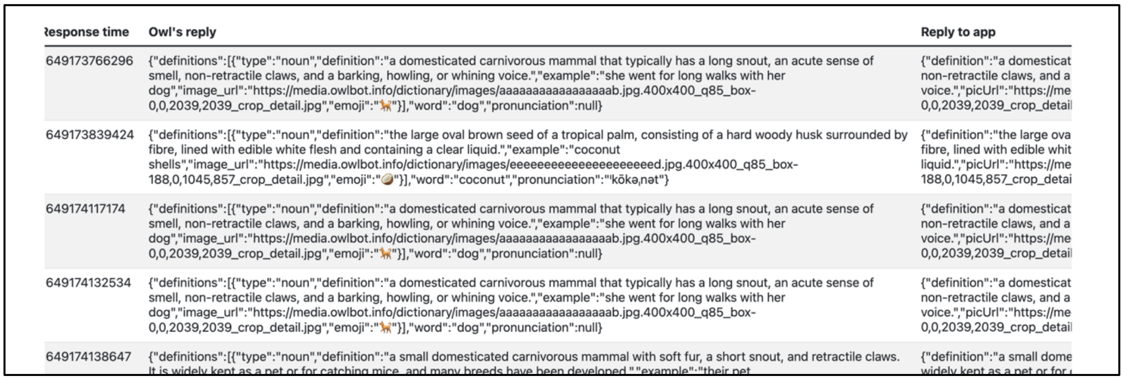
Rank	Phone Model
1	SM-G955U Build/R16NW
2	Pixel 5
3	SM-G981B

Average user wait time: 504 milliseconds
Average Owl Api search latency: 461 milliseconds

Logs

Here is a total of 30 logs.

Search Term	Phone Model	Request time	Sent to Owl	Back from Owl	Response time	Owl's reply
dog	SM-G955U Build/R16NW	1649173765473	1649173765481	1649173766229	1649173766296	{"definitions":[{"type":"noun","definition":"a domesticated carniv smell, non-retractile claws, and a barking, howling, or whining vo dog","image_url":"https://media.owlbot.info/dictionary/images/aa 0,0,2039,2039_crop_detail.jpg","emoji":"🐕"}],"word":"dog","pro
coconut	SM-G955U	1649173838923	1649173838927	1649173839404	1649173839424	{"definitions":[{"type":"noun","definition":"the large oval brown s



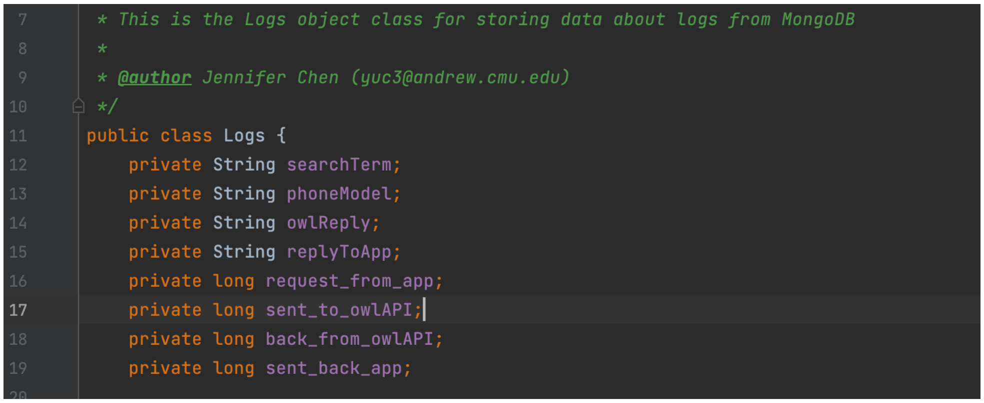
℞esponse time	Owl's reply	Reply to app
649173766296	{"definitions":[{"type":"noun","definition":"a domesticated carnivorous mammal that typically has a long snout, an acute sense of smell, non-retractile claws, and a barking, howling, or whining voice.","example":"she went for long walks with her dog","image_url":"https://media.owlbot.info/dictionary/images/aaaaaaaaaaaaaaaab.jpg.400x400_q85_box-0,0,2039,2039_crop_detail.jpg","emoji":"🐕"}],"word":"dog","pronunciation":null}	{"definition":"a domesticat non-retractile claws, and a voice.","picUrl":"https://me 0,0,2039,2039_crop_detail
649173839424	{"definitions":[{"type":"noun","definition":"the large oval brown seed of a tropical palm, consisting of a hard woody husk surrounded by fibre, lined with edible white flesh and containing a clear liquid.","example":"coconut shells","image_url":"https://media.owlbot.info/dictionary/images/eeeeeeeeeeeeeeeeeeeeed.jpg.400x400_q85_box-188,0,1045,857_crop_detail.jpg","emoji":"🥥"}],"word":"coconut","pronunciation":"ˈkōkəˌnət"}	{"definition":"the large ova fibre, lined with edible whit liquid.","picUrl":"https://me 188,0,1045,857_crop_detai
649174117174	{"definitions":[{"type":"noun","definition":"a domesticated carnivorous mammal that typically has a long snout, an acute sense of smell, non-retractile claws, and a barking, howling, or whining voice.","example":"she went for long walks with her dog","image_url":"https://media.owlbot.info/dictionary/images/aaaaaaaaaaaaaaaab.jpg.400x400_q85_box-0,0,2039,2039_crop_detail.jpg","emoji":"🐕"}],"word":"dog","pronunciation":null}	{"definition":"a domesticat non-retractile claws, and a voice.","picUrl":"https://me 0,0,2039,2039_crop_detail
649174132534	{"definitions":[{"type":"noun","definition":"a domesticated carnivorous mammal that typically has a long snout, an acute sense of smell, non-retractile claws, and a barking, howling, or whining voice.","example":"she went for long walks with her dog","image_url":"https://media.owlbot.info/dictionary/images/aaaaaaaaaaaaaaaab.jpg.400x400_q85_box-0,0,2039,2039_crop_detail.jpg","emoji":"🐕"}],"word":"dog","pronunciation":null}	{"definition":"a domesticat non-retractile claws, and a voice.","picUrl":"https://me 0,0,2039,2039_crop_detail
649174138647	{"definitions":[{"type":"noun","definition":"a small domesticated carnivorous mammal with soft fur, a short snout, and retractile claws. It is widely kept as a pet or for catching mice, and many breeds have been developed.","example":"their pet	{"definition":"a small dome widely kept as a pet or for

Below is how my application meets the task requirements:

1. Log useful information
(You should NOT log data from interactions from the operations dashboard)

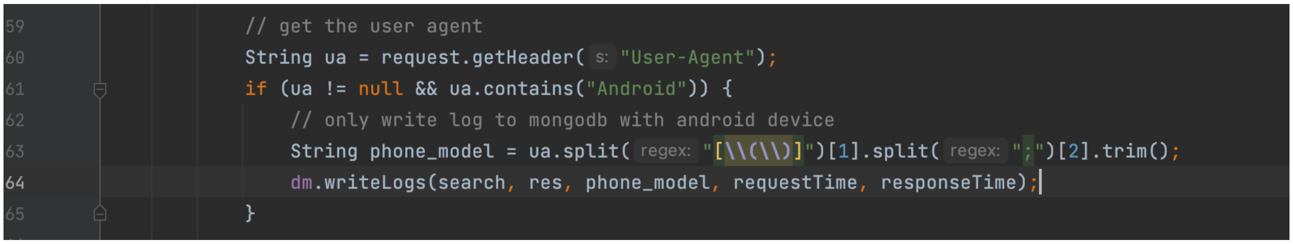
Below is the log information I stored, in a total of **8** catalogs:

1. Search Term
2. Phone Model
3. Owl API's return json
4. My web server's json reply to app
5. Timestamp: the time when user send request to my web service
6. Timestamp: the time when my web service send request to Owl Api
7. Timestamp: the time when my web service get response from Owl Api
8. Timestamp: the time when my web service send response to the user App



```java
 * This is the Logs object class for storing data about logs from MongoDB
 *
 * @author Jennifer Chen (yuc3@andrew.cmu.edu)
 */
public class Logs {
    private String searchTerm;
    private String phoneModel;
    private String owlReply;
    private String replyToApp;
    private long request_from_app;
    private long sent_to_owlAPI;
    private long back_from_owlAPI;
    private long sent_back_app;
```

Logs.java is an object class to have all the info about the log, can easily use this class to display in the view

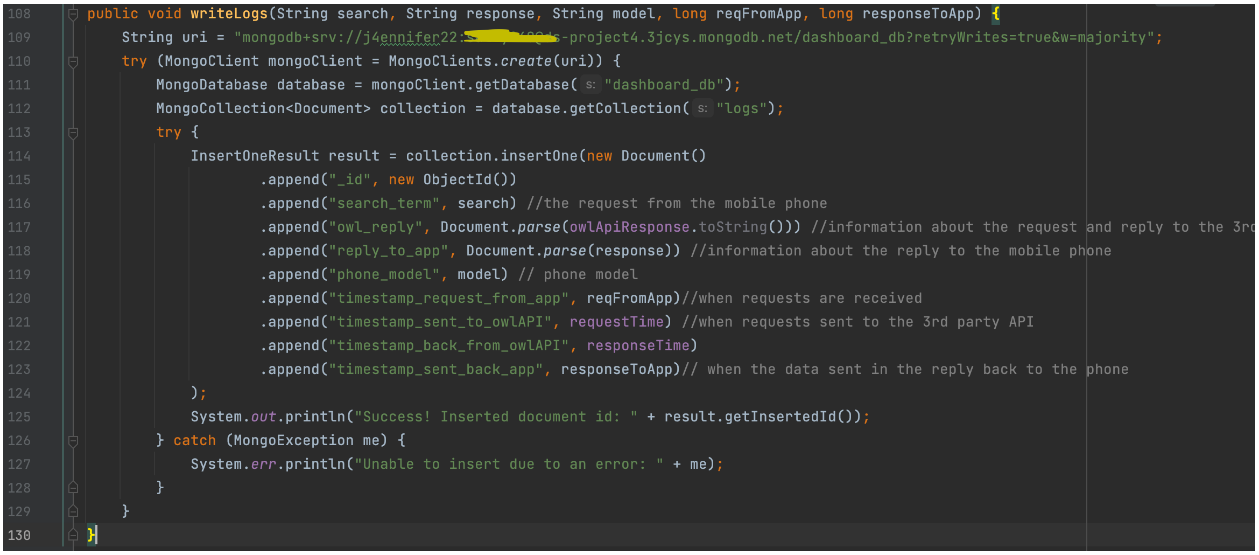


```java
        // get the user agent
        String ua = request.getHeader( s: "User-Agent");
        if (ua != null && ua.contains("Android")) {
            // only write log to mongodb with android device
            String phone_model = ua.split( regex: "[\\(\\)]")[1].split( regex: ";")[2].trim();
            dm.writeLogs(search, res, phone_model, requestTime, responseTime);
        }
```

Only write the log when the interaction is come from a m Android mobile device

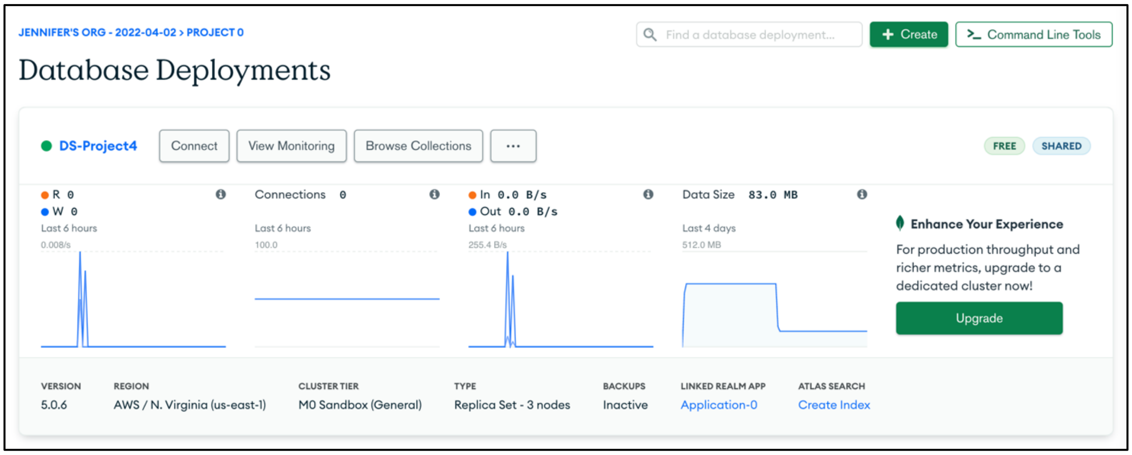
2. Store the log information in a database

Below is how I insert data into MongoDB:
Reference from: https://www.mongodb.com/docs/drivers/java/sync/v4.3/quick-start/

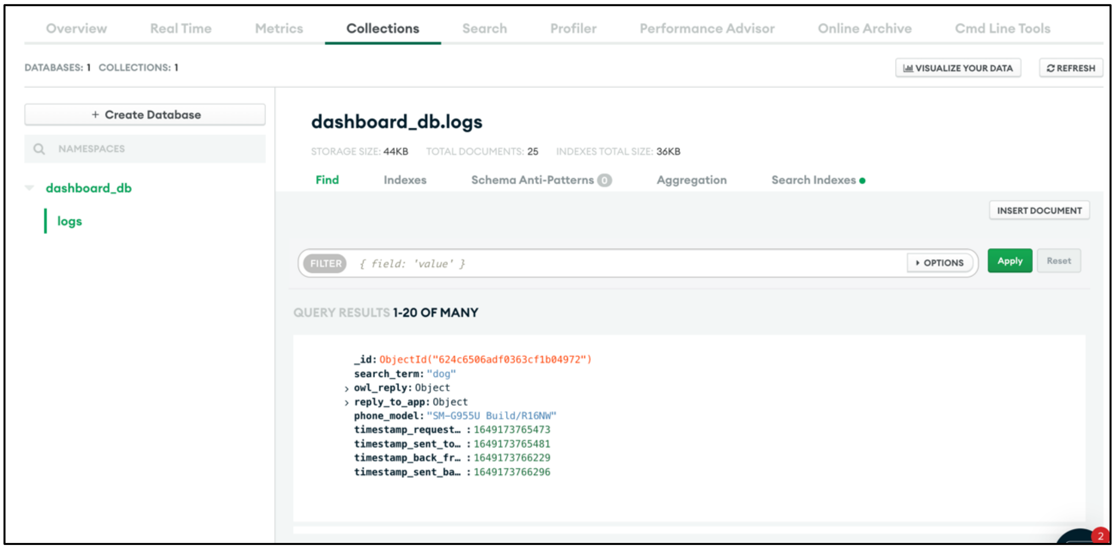


```java
public void writeLogs(String search, String response, String model, long reqFromApp, long responseToApp) {
    String uri = "mongodb+srv://j4ennifer22:[redacted]s-project4.3jcys.mongodb.net/dashboard_db?retryWrites=true&w=majority";
    try (MongoClient mongoClient = MongoClients.create(uri)) {
        MongoDatabase database = mongoClient.getDatabase( s: "dashboard_db");
        MongoCollection<Document> collection = database.getCollection( s: "logs");
        try {
            InsertOneResult result = collection.insertOne(new Document()
                    .append("_id", new ObjectId())
                    .append("search_term", search) //the request from the mobile phone
                    .append("owl_reply", Document.parse(owlApiResponse.toString())) //information about the request and reply to the 3r
                    .append("reply_to_app", Document.parse(response)) //information about the reply to the mobile phone
                    .append("phone_model", model) // phone model
                    .append("timestamp_request_from_app", reqFromApp)//when requests are received
                    .append("timestamp_sent_to_owlAPI", requestTime) //when requests sent to the 3rd party API
                    .append("timestamp_back_from_owlAPI", responseTime)
                    .append("timestamp_sent_back_app", responseToApp)// when the data sent in the reply back to the phone
            );
            System.out.println("Success! Inserted document id: " + result.getInsertedId());
        } catch (MongoException me) {
            System.err.println("Unable to insert due to an error: " + me);
        }
    }
}
```

Part of my *MyDictionaryModelUsingWS.java*



VERSION	REGION	CLUSTER TIER	TYPE	BACKUPS	LINKED REALM APP	ATLAS SEARCH
5.0.6	AWS / N. Virginia (us-east-1)	M0 Sandbox (General)	Replica Set - 3 nodes	Inactive	Application-0	Create Index



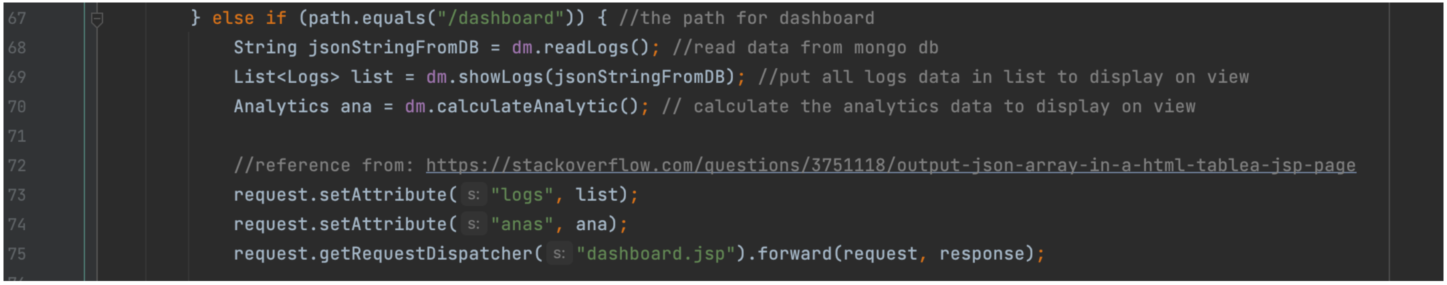
```
  _id: ObjectId("624c6506adf0363cf1b04972")
  search_term: "dog"
> owl_reply: Object
> reply_to_app: Object
  phone_model: "SM-G955U Build/R16NW"
  timestamp_request… : 1649173765473
  timestamp_sent_to… : 1649173765481
  timestamp_back_fr… : 1649173766229
  timestamp_sent_ba… : 1649173766296
```

Screenshots from my MongoDB dashboard

3. Display operations analytics and full logs on a web-based dashboard

3-a. A unique URL addresses a web interface dashboard for the web service.

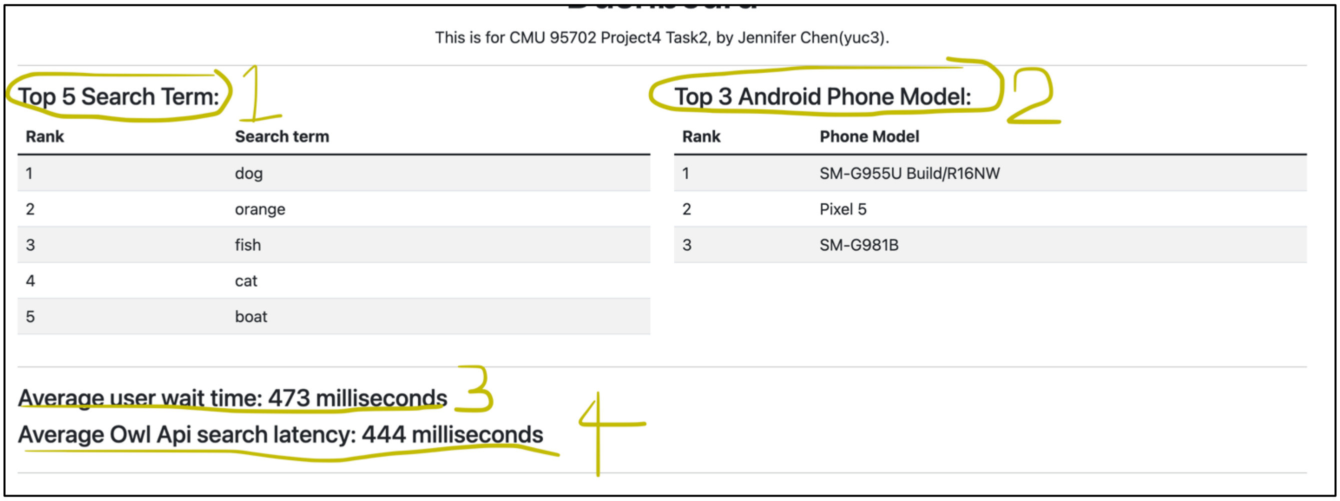
I set the url path to "/dashboard", so you could visit XXXXX to get the latest info about the logs and analytics.



```
        } else if (path.equals("/dashboard")) { //the path for dashboard
            String jsonStringFromDB = dm.readLogs(); //read data from mongo db
            List<Logs> list = dm.showLogs(jsonStringFromDB); //put all logs data in list to display on view
            Analytics ana = dm.calculateAnalytic(); // calculate the analytics data to display on view

            //reference from: https://stackoverflow.com/questions/3751118/output-json-array-in-a-html-tablea-jsp-page
            request.setAttribute( s: "logs", list);
            request.setAttribute( s: "anas", ana);
            request.getRequestDispatcher( s: "dashboard.jsp").forward(request, response);
```

Part of my *MyDictionaryServerServlet.java*

3-b. The dashboard displays at least 3 interesting operations analytics.



This is for CMU 95702 Project4 Task2, by Jennifer Chen(yuc3).

Top 5 Search Term:

Rank	Search term
1	dog
2	orange
3	fish
4	cat
5	boat

Top 3 Android Phone Model:

Rank	Phone Model
1	SM-G955U Build/R16NW
2	Pixel 5
3	SM-G981B

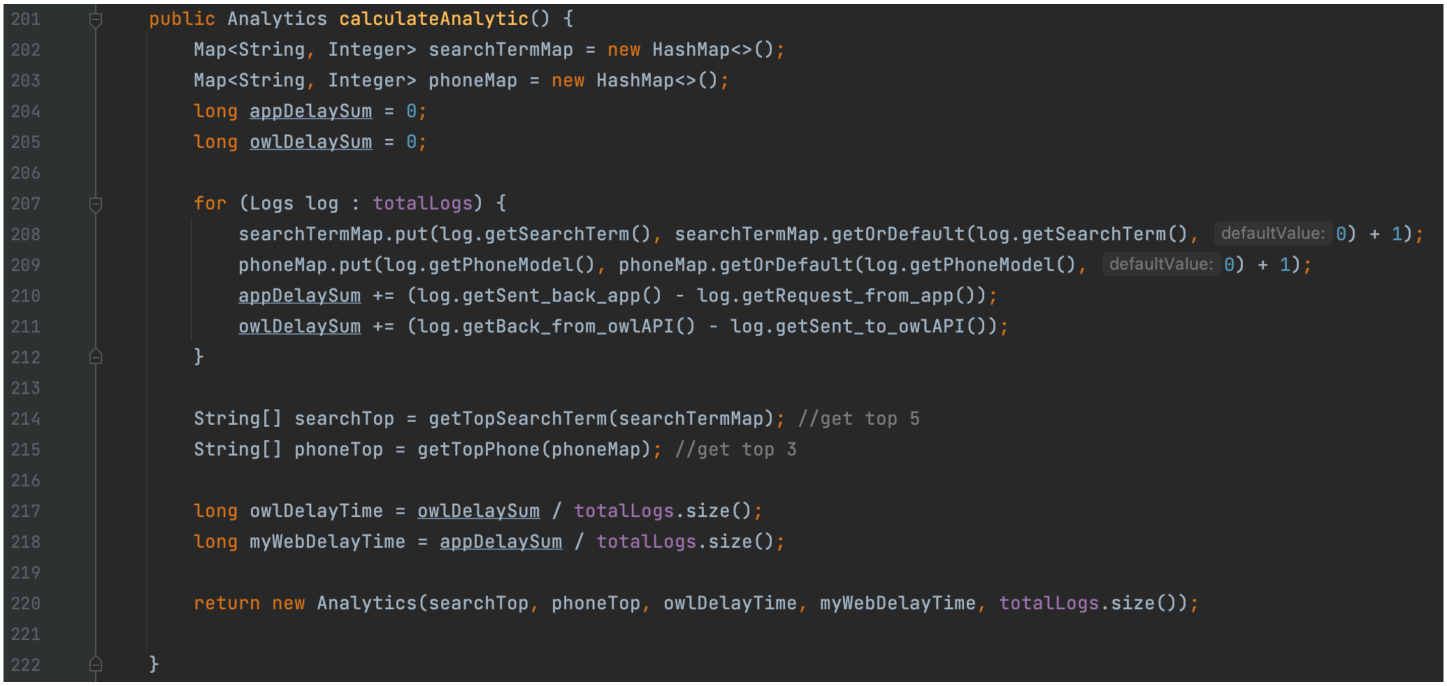
Average user wait time: 473 milliseconds

Average Owl Api search latency: 444 milliseconds

A total of 4 interesting operations analytics as above shows.

1. Top 5 search Term
2. Top 3 Android Phone Model
3. Average user wait time
4. Average Owl Api search latency do

Below is how I calculate the analytics. I also have an *Analytics.java* object class to store the result of the analytic for easily show on the view.

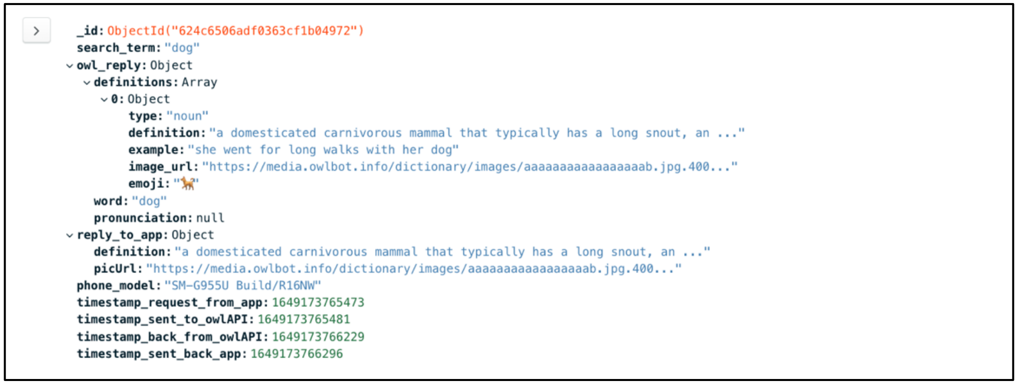


```java
public Analytics calculateAnalytic() {
    Map<String, Integer> searchTermMap = new HashMap<>();
    Map<String, Integer> phoneMap = new HashMap<>();
    long appDelaySum = 0;
    long owlDelaySum = 0;

    for (Logs log : totalLogs) {
        searchTermMap.put(log.getSearchTerm(), searchTermMap.getOrDefault(log.getSearchTerm(),  defaultValue: 0) + 1);
        phoneMap.put(log.getPhoneModel(), phoneMap.getOrDefault(log.getPhoneModel(),  defaultValue: 0) + 1);
        appDelaySum += (log.getSent_back_app() - log.getRequest_from_app());
        owlDelaySum += (log.getBack_from_owlAPI() - log.getSent_to_owlAPI());
    }

    String[] searchTop = getTopSearchTerm(searchTermMap); //get top 5
    String[] phoneTop = getTopPhone(phoneMap); //get top 3

    long owlDelayTime = owlDelaySum / totalLogs.size();
    long myWebDelayTime = appDelaySum / totalLogs.size();

    return new Analytics(searchTop, phoneTop, owlDelayTime, myWebDelayTime, totalLogs.size());

}
```

Part of my *MyDictionaryModelUsingWS.java*

3-c. The dashboard displays formatted full logs.

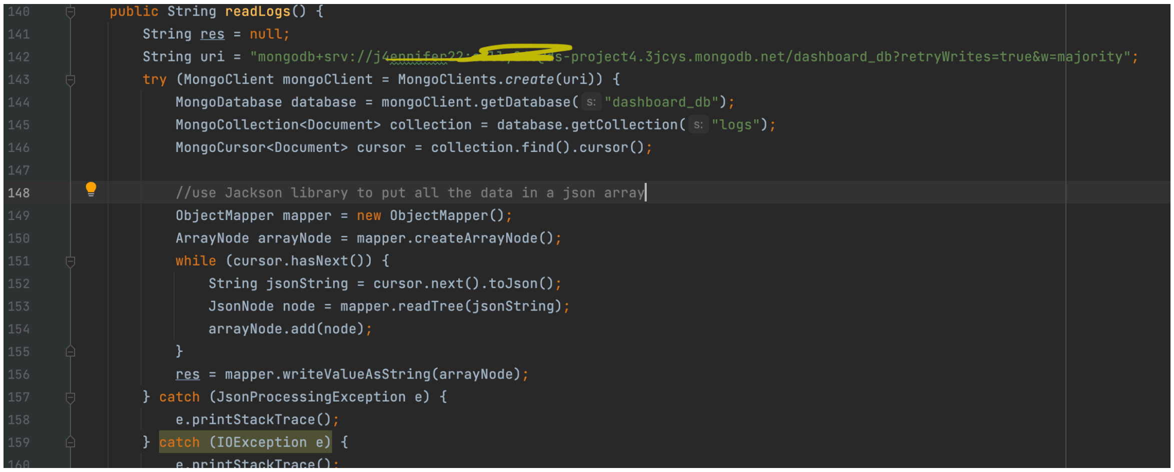
Below is how the data logs store on my mongodb. Compare with the screenshots of my dashboard, I show all the log information in my dashboard, same as all the log data on mongodb.



```
_id: ObjectId("624c6506adf0363cf1b04972")
search_term: "dog"
owl_reply: Object
  definitions: Array
    0: Object
      type: "noun"
      definition: "a domesticated carnivorous mammal that typically has a long snout, an ..."
      example: "she went for long walks with her dog"
      image_url: "https://media.owlbot.info/dictionary/images/aaaaaaaaaaaaaaaab.jpg.400..."
      emoji: "🐕"
  word: "dog"
  pronunciation: null
reply_to_app: Object
  definition: "a domesticated carnivorous mammal that typically has a long snout, an ..."
  picUrl: "https://media.owlbot.info/dictionary/images/aaaaaaaaaaaaaaaab.jpg.400..."
phone_model: "SM-G955U Build/R16NW"
timestamp_request_from_app: 1649173765473
timestamp_sent_to_owlAPI: 1649173765481
timestamp_back_from_owlAPI: 1649173766229
timestamp_sent_back_app: 1649173766296
```

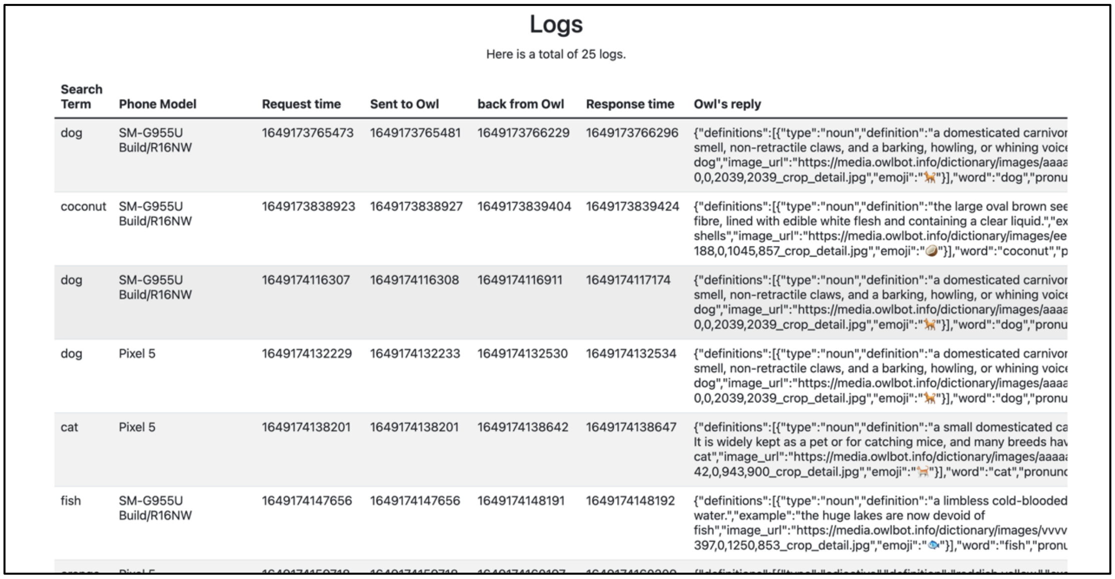
Screenshot of how the log data store on mongodb

And here is how I read data from the mongoDB.
Reference from: https://www.mongodb.com/docs/drivers/java/sync/v4.3/quick-start/



```java
    public String readLogs() {
        String res = null;
        String uri = "mongodb+srv://j4ennifer22:[redacted]s-project4.3jcys.mongodb.net/dashboard_db?retryWrites=true&w=majority";
        try (MongoClient mongoClient = MongoClients.create(uri)) {
            MongoDatabase database = mongoClient.getDatabase("dashboard_db");
            MongoCollection<Document> collection = database.getCollection("logs");
            MongoCursor<Document> cursor = collection.find().cursor();

            //use Jackson library to put all the data in a json array
            ObjectMapper mapper = new ObjectMapper();
            ArrayNode arrayNode = mapper.createArrayNode();
            while (cursor.hasNext()) {
                String jsonString = cursor.next().toJson();
                JsonNode node = mapper.readTree(jsonString);
                arrayNode.add(node);
            }
            res = mapper.writeValueAsString(arrayNode);
        } catch (JsonProcessingException e) {
            e.printStackTrace();
        } catch (IOException e) {
            e.printStackTrace();
```

Part of my *MyDictionaryModelUsingWS.java*

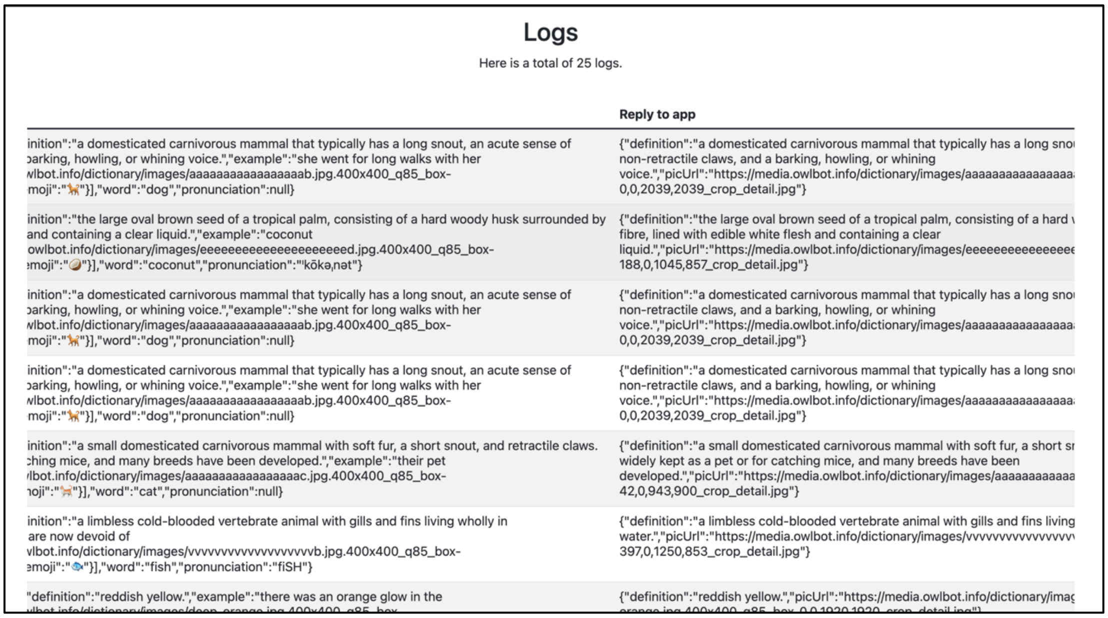


Logs

Here is a total of 25 logs.

Search Term	Phone Model	Request time	Sent to Owl	back from Owl	Response time	Owl's reply
dog	SM-G955U Build/R16NW	1649173765473	1649173765481	1649173766229	1649173766296	{"definitions":[{"type":"noun","definition":"a domesticated carnivor smell, non-retractile claws, and a barking, howling, or whining voice dog","image_url":"https://media.owlbot.info/dictionary/images/aaaa 0,0,2039,2039_crop_detail.jpg","emoji":"🐕"}],"word":"dog","pronu
coconut	SM-G955U Build/R16NW	1649173838923	1649173838927	1649173839404	1649173839424	{"definitions":[{"type":"noun","definition":"the large oval brown see fibre, lined with edible white flesh and containing a clear liquid.","ex shells","image_url":"https://media.owlbot.info/dictionary/images/ee 188,0,1045,857_crop_detail.jpg","emoji":"🥥"}],"word":"coconut","p
dog	SM-G955U Build/R16NW	1649174116307	1649174116308	1649174116911	1649174117174	{"definitions":[{"type":"noun","definition":"a domesticated carnivor smell, non-retractile claws, and a barking, howling, or whining voice dog","image_url":"https://media.owlbot.info/dictionary/images/aaaa 0,0,2039,2039_crop_detail.jpg","emoji":"🐕"}],"word":"dog","pronu
dog	Pixel 5	1649174132229	1649174132233	1649174132530	1649174132534	{"definitions":[{"type":"noun","definition":"a domesticated carnivor smell, non-retractile claws, and a barking, howling, or whining voice dog","image_url":"https://media.owlbot.info/dictionary/images/aaaa 0,0,2039,2039_crop_detail.jpg","emoji":"🐕"}],"word":"dog","pronu
cat	Pixel 5	1649174138201	1649174138201	1649174138642	1649174138647	{"definitions":[{"type":"noun","definition":"a small domesticated ca It is widely kept as a pet or for catching mice, and many breeds hav cat","image_url":"https://media.owlbot.info/dictionary/images/aaaa 42,0,943,900_crop_detail.jpg","emoji":"🐈"}],"word":"cat","pronunc
fish	SM-G955U Build/R16NW	1649174147656	1649174147656	1649174148191	1649174148192	{"definitions":[{"type":"noun","definition":"a limbless cold-blooded water.","example":"the huge lakes are now devoid of fish","image_url":"https://media.owlbot.info/dictionary/images/vvvv 397,0,1250,853_crop_detail.jpg","emoji":"🐟"}],"word":"fish","pronu

Screenshot of my dashboard's log part. It also shows the total number of the logs.



Logs

Here is a total of 25 logs.

	Reply to app
inition":"a domesticated carnivorous mammal that typically has a long snout, an acute sense of barking, howling, or whining voice.","example":"she went for long walks with her wlbot.info/dictionary/images/aaaaaaaaaaaaaaaab.jpg.400x400_q85_box- moji":"🐕"}],"word":"dog","pronunciation":null}	{"definition":"a domesticated carnivorous mammal that typically has a long sno non-retractile claws, and a barking, howling, or whining voice.","picUrl":"https://media.owlbot.info/dictionary/images/aaaaaaaaaaaaaaa 0,0,2039,2039_crop_detail.jpg"}
inition":"the large oval brown seed of a tropical palm, consisting of a hard woody husk surrounded by and containing a clear liquid.","example":"coconut owlbot.info/dictionary/images/eeeeeeeeeeeeeeeeeeeeed.jpg.400x400_q85_box- emoji":"🥥"}],"word":"coconut","pronunciation":"ˈkōkəˌnət"}	{"definition":"the large oval brown seed of a tropical palm, consisting of a hard fibre, lined with edible white flesh and containing a clear liquid.","picUrl":"https://media.owlbot.info/dictionary/images/eeeeeeeeeeeeeee 188,0,1045,857_crop_detail.jpg"}
inition":"a domesticated carnivorous mammal that typically has a long snout, an acute sense of barking, howling, or whining voice.","example":"she went for long walks with her wlbot.info/dictionary/images/aaaaaaaaaaaaaaaab.jpg.400x400_q85_box- moji":"🐕"}],"word":"dog","pronunciation":null}	{"definition":"a domesticated carnivorous mammal that typically has a long sno non-retractile claws, and a barking, howling, or whining voice.","picUrl":"https://media.owlbot.info/dictionary/images/aaaaaaaaaaaaaaa 0,0,2039,2039_crop_detail.jpg"}
inition":"a domesticated carnivorous mammal that typically has a long snout, an acute sense of barking, howling, or whining voice.","example":"she went for long walks with her wlbot.info/dictionary/images/aaaaaaaaaaaaaaaab.jpg.400x400_q85_box- moji":"🐕"}],"word":"dog","pronunciation":null}	{"definition":"a domesticated carnivorous mammal that typically has a long sno non-retractile claws, and a barking, howling, or whining voice.","picUrl":"https://media.owlbot.info/dictionary/images/aaaaaaaaaaaaaaa 0,0,2039,2039_crop_detail.jpg"}
inition":"a small domesticated carnivorous mammal with soft fur, a short snout, and retractile claws. ching mice, and many breeds have been developed.","example":"their pet lbot.info/dictionary/images/aaaaaaaaaaaaaaaac.jpg.400x400_q85_box- moji":"🐈"}],"word":"cat","pronunciation":null}	{"definition":"a small domesticated carnivorous mammal with soft fur, a short s widely kept as a pet or for catching mice, and many breeds have been developed.","picUrl":"https://media.owlbot.info/dictionary/images/aaaaaaaaaaa 42,0,943,900_crop_detail.jpg"}
inition":"a limbless cold-blooded vertebrate animal with gills and fins living wholly in are now devoid of wlbot.info/dictionary/images/vvvvvvvvvvvvvvvvvvb.jpg.400x400_q85_box- emoji":"🐟"}],"word":"fish","pronunciation":"fiSH"}	{"definition":"a limbless cold-blooded vertebrate animal with gills and fins living water.","picUrl":"https://media.owlbot.info/dictionary/images/vvvvvvvvvvvvvvvv 397,0,1250,853_crop_detail.jpg"}
"definition":"reddish yellow.","example":"there was an orange glow in the	{"definition":"reddish yellow.","picUrl":"https://media.owlbot.info/dictionary/imag

Since I have too much info to display in a table, the width is responsive, could simply scroll left and right to see all table info.

4. Deploy the web service to Heroku

This is my URL for Task 2 Dashboard:
https://polar-cove-78505.herokuapp.com/dashboard

The URL of my web service deployed to Heroku is: polar-cove-78505
This web service have all the functionality of Task 1 but with the additional logging, database, and dashboard analytics functions