

Project 4 Task 2 - LyricsFinder

Team Members:

Member 1:

Name: Shivam Patel

AndrewID: shpatel

Email: shpatel@cmu.edu

Member 2:

Name: Gautam Naik

AndrewID: gnaik

Email: gnaik@andrew.cmu.edu

API Name: Vagalume

API Documentation URL: <https://api.vagalume.com.br/docs/letras/>

Link To Project Dashboard (Logs and Analytics): <https://still-reaches-60603.herokuapp.com/>

Description: Our mobile app will prompt the user for the song artist name and song name. Then, it will search Vagalume using its API and display the song lyrics associated with the particular artist and song name to the user on the mobile app.

Here is how our application meets the task requirements:

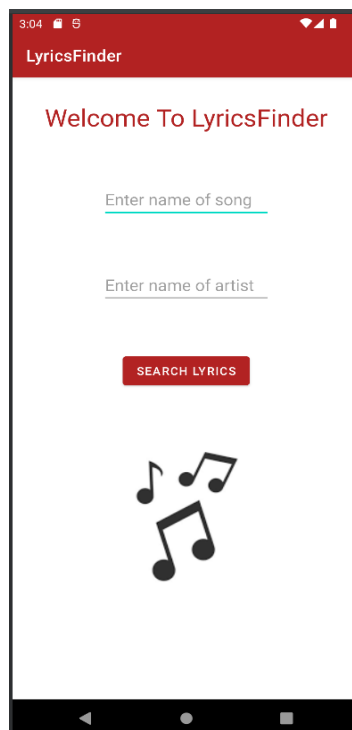
1. Implement a native Android application

The name of our native Android application project in Android Studio is:
Project4Android

a. Has at least three different kinds of views in your Layout (TextView, EditText, ImageView, etc.)

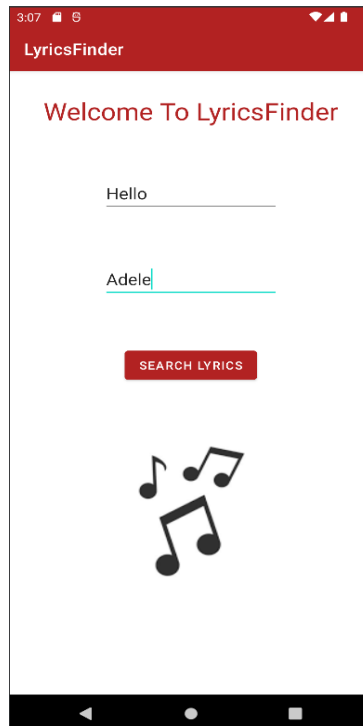
Our application uses TextView, EditText, Button, ImageView, ScrollView and HorizontalScrollView. See activity_main.xml and activity_search.xml for details of how they are incorporated into the LinearLayout.

Here is a screenshot of the layout before the song lyrics have been fetched.



b. Requires input from the user

Here is a screenshot of the user searching for the lyrics of the song “Hello” by Adele.



c. Makes an HTTP request (using an appropriate HTTP method) to your web service

Our application does an HTTP GET request in SearchActivity.java (in the searchLyrics function). The application uses **the Volley library** to make the HTTP request. The Volley library internally provides multithreading. It has a main thread, a cache thread, and a network thread (one that makes a HTTP GET request to the web service).

Note: We had asked whether we can use this library in a Piazza post. Professor Joe Mertz had said that we can use it, but we need to provide the reference link which we have done in the code. Hence, we have not created a separate Java file to create a background thread (as shown in the Android Lab).

The HTTP request is:

"https://still-reaches-60603.herokuapp.com/getLyrics?apiKey="+apiKey+

"&artistName="+artistName+"&songName="+songName+

"&phoneBrand="+brand+"&phoneDevice="+device

In the request:

- apiKey: API Key of the user
- artistName: Name of artist associated with the song.
- songName: Name of the song.
- brand: Brand that the Android phone belongs to (E.g.: Samsung).
- device: The model name of the phone (E.g.: Galaxy S22).

The brand and device names are computed by the app itself.

The user can apply for a API key for free by following these steps:

1. Create an account on Vagalume at <https://www.vagalume.com.br/>
2. Login and then click on your profile icon.
3. A dropdown will appear. Click on "My data".
4. Select "API" section from the left
5. Click on the "Add Credential" button.
6. Mention the app name and description.
7. Press "register"
8. The API key will get generated and can be used in the API call.

The searchLyrics method makes a request to our web application, parses the returned JSON to get the response data or error message, stores the lyrics, song name and artist name and then makes the app navigate to the next screen where the app displays the lyrics.

We store the song name and artist name sent by the API response and show it on the display screen. We do this because the user might enter a slightly wrong song name E.g.: User enters "Hell" instead of "Hello" as the song name and "Adelle" as the artist's name.

In such a case, the API still returns the lyrics for the song "Hello" by Adele instead of throwing an error. We want to display the right names of the song and artist. **Hence, we return the song and artist names from the API, store it in the Android and then finally display it on the next page instead of reusing the names provided by the user.**

d. Receives and parses an XML or JSON formatted reply from the web service

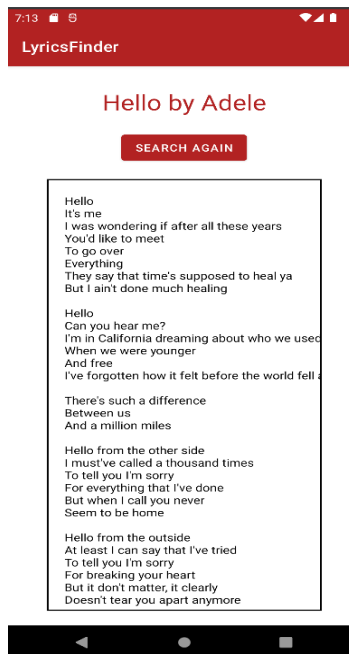
An example of the JSON reply is:

```
{ "artistName": Adele, "songName": Hello,
```

```
  "lyrics": "Hello\nIt's me\nI was wondering if after all these years\nYou'd like to meet\nTo go over\nEverything\nThey say that time's supposed to heal ya\nBut I ain't done much healing\n\nHello\nCan you hear me?\nI'm in California dreaming about who we used to be\nWhen we were younger\nAnd free\nI've forgotten how it felt before the world fell at our feet\n\nThere's such a difference\nBetween us\nAnd a million miles\n\nHello from the other side\nI must've called a thousand times\nTo tell you I'm sorry\nFor everything that I've done\nBut when I call you never\nSeem to be home\n\nHello from the outside\nAt least I can say that I've tried\nTo tell you I'm sorry\nFor breaking your heart\nBut it don't matter, it clearly\nDoesn't tear you apart anymore\n\nHello\nHow are you?\nIt's so typical of me to talk about myself\nI'm sorry, I hope\nThat you're well\nDid you ever make it out of that town\nWhere nothing ever happened?\n\nIt's no secret\nThat the both of us\nAre running out of time\n\nSo hello from the other side\nI must've called a thousand times\nTo tell you I'm sorry\nFor everything that I've done\nBut when I call you never\nSeem to be home\n\nHello from the outside\nAt least I can say that I've tried\nTo tell you I'm sorry\nFor breaking your heart\nBut it don't matter, it clearly\nDoesn't tear you apart anymore\n\nOohh, anymore\nOohh, anymore\nOohh, anymore\nAnymore\n\nHello from the other side\nI must've called a thousand times\nTo tell you I'm sorry\nFor everything that I've done\nBut when I call you never\nSeem to be home\n\nHello from the outside\nAt least I can say that I've tried\nTo tell you I'm sorry\nFor breaking your heart\nBut it don't matter, it clearly\nDoesn't tear you apart anymore"
```

```
}
```

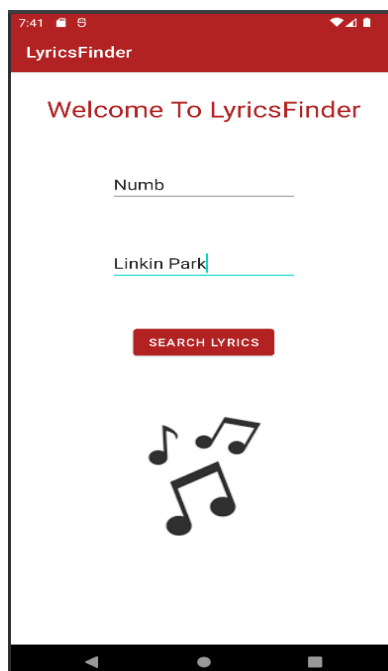
e. Displays new information to the user



Note: The screen is scrollable horizontally and vertically. It shows each song line on a separate line. The user can scroll horizontally and vertically to view all the lines properly.

f. Is repeatable (i.e., the user can repeatedly reuse the application without restarting it.)

The user can click on Search Again to get back to the previous screen. After he gets back, he can search for another song (Eg: Numb by Linkin Park)



7:43

LyricsFinder

Numb by Linkin Park

SEARCH AGAIN

I'm tired of being what you want me to be
Feeling so faithless, lost under the surface
I don't know what you're expecting of me
Put under the pressure
Of walking in your shoes
(Caught in the undertow, just caught in the un
Every step that I take is another mistake to yo
(Caught in the undertow, just caught in the un

I've become so numb
I can't feel you there
Become so tired
So much more aware
I'm becoming this
All I want to do
Is be more like me
And be less like you

Can't you see that you're smothering me
Holding too tightly
Afraid to lose control
'Cause everything that you thought I would be
Has fallen apart right in front of you
(Caught in the undertow, just caught in the un
Every step that I take is another mistake to yo
(Caught in the undertow, just caught in the un
And every second I waste is more than I can t

I've become so numb
I can't feel you there
Become so tired
So much more aware
I'm becoming this

2. Implement a web application, deployed to Heroku

The URL of our web service deployed to Heroku is:

still-reaches-60603

Link To Dashboard: <https://still-reaches-60603.herokuapp.com/>

The project directory name is Project4WebService.

a. Using an HttpServlet to implement a simple (can be a single path) API

In our web app project:

Model 1: LyricsFinderAPIModel.java

Model 2: LyricsFinderAndroidModel.java

Model 3: LyricsFinderDashboardModel.java

Model 4: LyricsFinderMongoDBModel.java

View: dashboard.jsp

Controller: LyricsFinderServlet.java

b. Receives an HTTP request from the native Android application

LyricsFinderServlet.java receives the HTTP GET request with the arguments: apiKey, artistName, songName, phoneBrand and phoneDevice. The Servlet creates the URL String for making an API call to the third-party API. The Servlet then sends the URL String to the model (LyricsFinderAPIModel.java).

c. Executes business logic appropriate to your application

LyricsFinderAPIModel.java makes an HTTP request (using Volley) to:

`https://api.vagalume.com.br/search.php?art=Adele&mus=Hello&apikey=4794d71e3256361ba03a768912556bc9`

It then parses the JSON response and extracts the parts it needs to respond to the Android application.

Along with this, the **LyricsFinderDashboardModel.java** is used to build the final dashboard for shows the logs stored in the MongoDB database and to display the operation analytics. **LyricsFinderMongoDBModel.java** does the reads and writes to the MongoDB database. And the **LyricsFinderAndroidModel.java** is used to perform

server-side validation to verify song name and artist name entered by the user of the Android app.

d. Replies to the Android application with an XML or JSON formatted response.

LyricsFinderServlet.java formats the response to the mobile application in a simple JSON format of our own design:

```
{
  "artistName":<artist-name>,
  "songName":<song-name>,
  "lyrics": <lyrics>
}
```

In the case of an error (during server-side validation, invalid input, 3rd party API data not found cases, etc.) the Servlet would send an error message to the mobile application in a simple JSON format as follows. Along with the error message, we also set the response code for the response that is being sent to the application.

```
{
  "errorMessage":< errorMessage>
}
```

3. Handle error conditions

The errors that we handle are as follows:

a. Invalid Mobile App Input

The song name must be non-empty and alphanumeric. Besides alphanumeric, the name can contain these characters: single quote, double quotes, exclamation mark, space, ampersand, opening and closing round braces. Any other inputs are considered invalid and are handled accordingly in the mobile app (by showing error).

The artist's name must be non-empty and alphanumeric. Besides alphanumeric, the name can contain space and single quotes. Any other inputs are considered invalid and are handled accordingly in the mobile app (by showing error).

b. Invalid Server-Side Input

On the Server-Side, the same checks are performed as the Android app.

c. Mobile App Network Failure/Unable To Reach Server

If the mobile app loses connection to the internet or if our web service is down, the app handles it by showing the appropriate message to the user.

d. Third Party API Unavailable

If the API is unavailable for some reason, the web service sends the appropriate error message to the app which then shows it to the user.

e. Third Party API Invalid Data

If the user provides incorrect artist and/or song names or if the user provides a song whose lyrics are not present in the 3rd party API's database, then the web service would send the appropriate error message to the app which would then show it to the user.

f. Unauthorized Access

If a user tries to fetch the lyrics by making an HTTP GET request from outside the app but does not provide a valid apiKey in the query string parameters, then the web service would not send back the lyrics to the Android app. Instead, it would send an error response to the user.

4. Log Useful Information

a. API Logs

We log the following pieces of information for interactions between the web service and the 3rd party API:

1. request_artist_name
2. request_song_name
3. response_artist_name
4. response_song_name
5. request_timestamp
6. response_timestamp
7. lyrics
8. status_code
9. latency

Reason for logging the above data: The main reason to store the above logs is to let us (as developers of the application) know (or peek into!) what is happening when requests are made to the third party API and responses are collected from the third party API. Majorly we store what is sent to the API (request_artist_name, request_song_name), what is received from the API (response_song_name, response_artist_name, lyrics). The time stamps of requests and responses are stored to find the average latency and display it in the operation analytics. Moreover, these would also help us know as to when our users are using our application the most. The status code is stored to know the performance of the API (over a long period of time) on the requests sent by the mobile application.

b. Android App Logs:

We log the following pieces of information for interactions between the Android app and the web service:

1. request_artist_name
2. request_song_name
3. response_artist_name
4. response_song_name
5. request_timestamp
6. response_timestamp
7. lyrics
8. status_code
9. latency
10. mobile_brand
11. mobile_model

Reason for logging the above data: The main reason to store the above logs is to let us (as developers of the application) know (or peek into!) what is happening when the Android mobile application makes requests to the server and when the server sends responses back to the mobile application. Majorly we store what is sent by the mobile application to the server (request_artist_name, request_song_name, mobile_brand, mobile_model), what is sent by the server to the mobile application (response_song_name, response_artist_name, lyrics). The time stamps of requests and responses are stored to find the average latency and display it in the operation analytics. Moreover, these would also help us know as to when our users are using our application the most. The status code is stored to know the performance of the API (over a long period of time) on the requests sent by the mobile application. Finally, the mobile brands and mobile models details are stored to help us know as to what type of mobile phones are making the most request and understand the trend better for the future development of our application.

5. Store the log information in a database

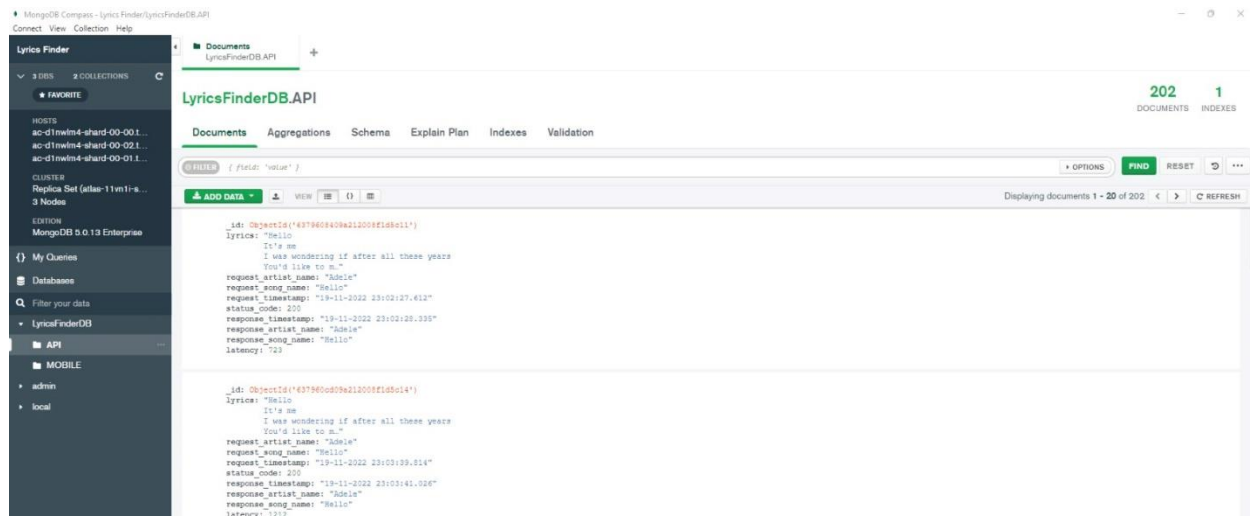
Connection String:

"mongodb://ShivamGautamDSProject4:ShivamGautamDSProject4@ac-d1nwl4-shard-00-00.tsumdav.mongodb.net:27017, ac-d1nwl4-shard-00-01.tsumdav.mongodb.net:27017,ac-d1nwl4-shard-00-02.tsumdav.mongodb.net:27017/?w=majority&retryWrites=true&tls=true&authMechanism=SCRAM-SHA-1"

Note: To perform operations analytics, we needed a lot of meaningful data. The emulator provided the same brand and model name for every request. Moreover, the emulator provides an incorrect model name. Hence, we have used hardcoded brand and model values to make requests to populate the database. However, the final submission code has dynamic values of brand and model in each request made from the Android application.

Screenshots of the stored logs on MongoDB Database

Screenshot of the API collection in MongoDB Database



Screenshot of the MOBILE collection in MongoDB Database

The screenshot displays the MongoDB Compass interface for the **LyricsFinderDB** database. The left sidebar shows the database structure, including the **MOBILE** collection. The main panel shows the **Documents** tab for the **LyricsFinderDB.MOBI** collection, displaying 202 documents and 1 index. The search bar is set to `{ field: "value" }`. The first document is displayed in JSON format:

```
{
  "_id": ObjectId("637960d09a212009f1d5012"),
  "lyrics": "Hello\nIt's me\nI was wondering if after all these years\nYou'd like to H-",
  "mobile_brand": "Samsung",
  "mobile_model": "Galaxy A23 5G",
  "latency": 1250,
  "status_code": 200,
  "request_artist_name": "Adele",
  "request_song_name": "Hello",
  "request_timestamp": "19-11-2022 23:02:27.611",
  "response_timestamp": "19-11-2022 23:02:28.841",
  "response_artist_name": "Adele",
  "response_song_name": "Hello"
}
```

The second document is also displayed in JSON format:

```
{
  "_id": ObjectId("637960d09a212009f1d5013"),
  "lyrics": "Hello\nIt's me\nI was wondering if after all these years\nYou'd like to H-",
  "mobile_brand": "Samsung",
  "mobile_model": "Galaxy A23 5G",
  "latency": 1389,
  "status_code": 200,
  "request_artist_name": "Adele",
  "request_song_name": "Hello",
  "request_timestamp": "19-11-2022 23:03:39.814",
  "response_timestamp": "19-11-2022 23:03:41.203",
  "response_artist_name": "Adele",
  "response_song_name": "Hello"
}
```

6. Display Operations Analytics And Full Logs On A Web-Based Dashboard

a. Android App Logs

These logs represent interactions between the Android app and the web service.

Android App Logs

API Logs

Operation Analytics

Android App Logs

Sr. No.	Mobile Brand	Mobile Model	Request Artist Name	Request Song Name	Request Timestamp	Response Artist Name	Response Song Name	Response Timestamp	Status Code	Latency (ms)	Lyrics
1	Samsung	Galaxy A23 5G	Adelle	Hello	19-11-2022 23:02:27.611	Adelle	Hello	19-11-2022 23:02:28.841	200	1230.0	Hello It's me I was wondering if after all these years You'd like to meet To go over Everything They say that time's supposed to heal ya But I ain't done much healing Hello Can you hear me? I'm in California dreaming about who we used to be When we were younger And free I've forgotten how it felt before the world fell at our feet There's such a difference Between us And a million miles Hello from the other side I must've called a thousand times To tell you I'm sorry For everything that I've done But when I call you never Seem to be home Hello from the outside At least I can say that I've tried To tell you I'm sorry For breaking your heart But it don't matter, it clearly Doesn't tear you apart anymore Hello How are you? It's so typical of me to talk about myself I'm sorry, I hope That you're well Did you ever make it out of that town Where nothing ever happened? It's no secret That the both of us Are running out of time So hello from the other side I must've called a thousand times To tell you I'm sorry For everything that I've done But when I call you never Seem to be home
27	Samsung	Galaxy S22 Ultra	Adelle	Easy On Me	19-11-2022 23:12:36.002	Adelle	Easy On Me	19-11-2022 23:12:36.224	200	222.0	- There ain't no gold in this river That I've been washing my hands in forever I know there is hope in these waters But I can't bring myself to swim When I am drowning in the silence Baby, let me in Go easy on me, baby I was still a child Didn't get the chance to Feel the world around me I had no time to choose what I chose to do So go easy on me There ain't no room for a thing to change When we are both so deeply stuck in our ways You can't deny how hard I've tried I've changed who I was to put you both first But now, I give up Go easy on me, baby I was still a child Didn't get the chance to Feel the world around me Had no time to choose what I chose to do So go easy on me I had good intentions And the highest hopes But I know it now It probably hasn't even shown Go easy on me, baby I was still a child Didn't get the chance to Feel the world around me Had no time to choose what I chose to do So go easy on me

184	google	emulator64_x86_64_arm64	hcjhd*chd	tdjen	20-11-2022 22:53:05.182	Invalid input	Invalid input	20-11-2022 22:53:05.580	422	398.0	Invalid input
185	google	emulator64_x86_64_arm64	hcjhd*chd	tdjen	20-11-2022 22:56:25.907	Invalid input	Invalid input	20-11-2022 22:56:26.677	422	770.0	Invalid input
186	google	emulator64_x86_64_arm64	hcjhd*chd	qjduams	20-11-2022 23:39:11.643	Invalid input	Invalid input	20-11-2022 23:39:12.140	422	497.0	Invalid input
187	google	emulator64_x86_64_arm64	hcjhd*chd	qjduams	20-11-2022 23:39:14.169	Invalid input	Invalid input	20-11-2022 23:39:14.201	422	32.0	Invalid input
188	google	emulator64_x86_64_arm64	Eminem	Rap God	20-11-2022 23:42:00.884	Eminem	Rap God	20-11-2022 23:42:01.418	200	534.0	<p>Look, I was gonna go easy on you And not to hurt your feelings But I'm only going to get this one chance Something's wrong, I can feel it Just a feeling I've got Like something's about to happen But I don't know what If that means, what I think it means We're in trouble, big trouble And if he is as bananas as you say I'm not taking any chances You were just what the doctor ordered</p> <p>I'm beginning to feel like a Rap God, Rap God All my people from the front to the back not, back not Now who thinks their arms Are long enough to slapbox, slapbox? They said I rap like a robot So call me Rapbot</p> <p>But for me to rap like a computer Must be in my genes I got a laptop in my back pocket My pen'll go off when I half-cock it Got a fat knot from that rap profit Made a living and a killing off it Ever since Bill Clinton was still in office With Monica Lewinsky feeling on his nut-sack I'm an MC still as honest But as rude and as indecent as all hell Syllables, kilaholic (kill 'em all with) This sickety, gibbedy, hibbedy hip hop You don't really wanna get into a peeing match With this rapbot's rap Packing a Mac in the back of the Ac Pack backpack rap, yep, yinkidy-eyes And at the exact same time I attempt these lyrical acrobat stunts While I'm practicing that I'll still be able to break a motherfucker's table Over the back of a couple of haggie and crack it in half Only realized it was ironic I was under Aftermath after the fact How could I not blow? All I do is drop F-bombs Feed my wrath of attack Rappers are having a rough time period Here's a misspud It's actually disastrously bad for the wack While I'm masterfully constructing this masterpiece as</p> <p>I'm beginning to feel like a Rap God, Rap God All my people from the front to the back not, back not Now who thinks their arms </p>

189	google	emulator64_x86_64_arm64	sdcojaea	unworo	20-11-2022 23:45:33.206	Data not found	Data not found	20-11-2022 23:45:33.764	422	558.0	<p>r or the day that they can say i ren on They'd be celebrating 'Cause I know the way to get 'em motivated I make elevating music, you make elevator music Oh, he's too mainstream Well, that's what they do When they get jealous, they confuse it It's not hip hop, it's pop, cause I found a hell'a way to fuse it With rock, shock rap with Doc Throw on Love Yourself and make 'em lose it I don't know how to make songs like that I don't know what words to use Let me know when it occurs to you While I'm ripping any one of these verses Oversee as you It's curtains, I'm inadvertently hurtin' you How many verses I gotta murder to prove That if you're half as nice at songs You can sacrifice virgins too School funkies, still junky But look at the accolades the skills bring me Full of myself, but still hungry I bully myself cause I make me do What I put my mind to And I'm a million leagues above you Ill when I speak in tongues But it's still tongue in cheek, fuck you I'm drunk so Satan take the fucking wheel I'm asleep in the front seat Bumping Heavy D and the Boys, still "Chunky, But Funky" But in my head there's something I can feel hugging and strugging Angels fight with devils Here's what they want from me They asking me to eliminate Some of the women hate But if you take into consideration The bitter hatred that I had Then you may be a little palpat And more sympathetic to the situation And understand the discrimination But fuck it, life's handing you lemons, make lemonade then But if I can't batter the women how the fuck Am I supposed to take them a cake then? Don't mistake it for Satan It's a fatal mistake if you think I need to be overseas And take a vacation to trip a broad And make her fall on her face and don't be a retard Be a king? Think not Why be a king when you can be a God?</p>
-----	--------	-------------------------	----------	--------	-------------------------	----------------	----------------	-------------------------	-----	-------	--

b. API Logs

These logs represent interactions between the web service and the 3rd party API.

Android App Logs

API Logs

Operation Analytics

API Logs

Sr. No.	Request Artist Name	Request Song Name	Request Timestamp	Response Artist Name	Response Song Name	Response Timestamp	Status Code	Latency (ms)	Lyrics
1	Adele	Hello	19-11-2022 23:02:27.612	Adele	Hello	19-11-2022 23:02:28.335	200	723.0	<p>Hello It's me I was wondering if after all these years You'd like to meet To go over Everything They say that time's supposed to heal ya But I ain't done much healing</p> <p>Hello Can you hear me? I'm in California dreaming about who we used to be When we were younger And free I've forgotten how it felt before the world fell at our feet</p> <p>There's such a difference Between us And a million miles</p> <p>Hello from the other side I must've called a thousand times To tell you I'm sorry For everything that I've done But when I call you never Seem to be home</p> <p>Hello from the outside At least I can say that I've tried To tell you I'm sorry For breaking your heart But it don't matter, it clearly Doesn't tear you apart anymore</p> <p>Hello How are you? It's so typical of me to talk about myself I'm sorry, I hope That you're well Did you ever make it out of that town Where nothing ever happened?</p> <p>It's no secret That the both of us Are running out of time</p> <p>So hello from the other side I must've called a thousand times To tell you I'm sorry For everything that I've done But when I call you never Seem to be home</p>
27	Adele	Easy On Me	19-11-2022 23:12:36.002	Adele	Easy On Me	19-11-2022 23:12:36.072	200	70.0	<p>There ain't no gold in this river That I've been washing my hands in forever I know there is hope in these waters But I can't bring myself to swim When I am drowning in the silence Baby, let me in</p> <p>Go easy on me, baby I was still a child Didn't get the chance to Feel the world around me I had no time to choose what I chose to do So go easy on me</p> <p>There ain't no room for a thing to change When we are both so deeply stuck in our ways You can't deny how hard I've tried I've changed who I was to put you both first But now, I give up</p> <p>Go easy on me, baby I was still a child Didn't get the chance to Feel the world around me Had no time to choose what I chose to do So go easy on me</p> <p>I had good intentions And the highest hopes But I know it now It probably hasn't even shown</p> <p>Go easy on me, baby I was still a child Didn't get the chance to Feel the world around me Had no time to choose what I chose to do So go easy on me</p>

184	houht"chd	fdjen	Invalid input	Invalid input	Invalid input	Invalid input	422	0.0	Invalid input
185	houht"chd	fdjen	Invalid input	Invalid input	Invalid input	Invalid input	422	0.0	Invalid input
186	houht"chd	sjduwns	Invalid input	Invalid input	Invalid input	Invalid input	422	0.0	Invalid input
187	houht"chd	sjduwns	Invalid input	Invalid input	Invalid input	Invalid input	422	0.0	Invalid input
188	Eminem	Rap God	20-11-2022 23:42:00.884	Eminem	Rap God	20-11-2022 23:42:01.283	200	399.0	<p>Look, I was gonna go easy on you And not to hurt your feelings But I'm only going to get this one chance Something's wrong, I can feel it Just a feeling I've got Like something's about to happen But I don't know what If that means, what I think it means We're in trouble, big trouble And if he is as bananas as you say I'm not taking any chances You were just what the doctor ordered</p> <p>I'm beginning to feel like a Rap God, Rap God All my people from the front to the back nod, back nod Now who thinks their arms Are long enough to slapbox, slapbox? They said I rap like a robot So call me Rapbot</p> <p>But for me to rap like a computer Must be in my genes I got a laptop in my back pocket My pen'll go off when I half-cook it Got a fat knot from that rap profit Made a living and a killing off it Ever since Bill Clinton was still in office With Monica Lewinsky feeling on his nut-sack I'm an Mc still as honest But as rude and as indecent as all hell Syllables, kilaholic (Kil 'em all with) This slickety, gibbedy, hibbudy hip hop You don't really wanna get into a passing match With this rapidy rap Packing a Mac in the back of the Ac Pack backpack rap, yep, yackidy-yac And at the exact same time I attempt these lyrical acrobat stunts While I'm practicing that I'll still be able to break a motherfuckin' table Over the back of a couple of faggots and crack it in half Only realized it was ironic I was under Aftermath after the fact How could I not blow? All I do is drop F-bombs Feel my wrath of attack Rappers are having a rough time period Here's a maxipad It's actually disastrously bad for the wack While I'm masterfully constructing this masterpiece as</p> <p>I'm beginning to feel like a Rap God, Rap God All my people from the front to the back nod, back nod</p>
189	sdojaaa	uwowoo	20-11-2022 23:45:33.207	Data not found	Data not found	20-11-2022 23:45:33.654	422	447.0	<p>More than never demonstrating How to give a motherfuckin' audience A feeling like it's levitating Never lading And I know that the haters are forever waiting For the day that they can say I fell off They'd be celebrating 'Cause I know the way to get 'em motivated I make elevating music, you make elevator music Oh, he's too mainstream Well, that's what they do When they get jealous, they confuse it It's not hip hop, it's pop, cause I found a hellia way to fuse it With rock, shock rap with Doc Throw on Lose Yourself and make 'em lose it I don't know how to make songs like that I don't know what words to use Let me know when it occurs to you While I'm ripping any one of these verses Diverse as you It's curtains, I'm inadvertently hurtin' you How many verses I gotta murder to prove That if you're half as nice at songs You can sacrifice virgins too School funkies, pill junky But look at the accolades the skills bring me Full of myself, but still hungry I bully myself cause I make me do What I put my mind to And I'm a million leagues above you Ill when I speak in tongues But it's still tongue in cheek, fuck you I'm drunk so Satan take the fucking wheel I'm asleep in the front seat Bumping Heavy D and the Boys, still "Chunky, But Funky" But in my head there's something I can feel tugging and struggling Angels fight with devils Here's what they want from me They asking me to eliminate Some of the women hate But if you take into consideration The bitter hatred that I had Then you may be a little patient And more sympathetic to the situation And understand the discrimination But fuck it, life's handing you lemons, make lemonade then But if I can't batter the women how the fuck Am I supposed to bake them a cake then? Don't mistake it for Satan It's a fatal mistake if you think I need to be overseas And take a vacation to trip a broad And make her fall on her face and don't be a retard Be a king? Think not Why be a king when you can be a God?</p>

c. Operations Analytics

We have performed the following 5 operations analytics for our project:

1. Top 10 songs searched in LyricsFinder

Android App Logs	API Logs	Operation Analytics																																	
<h2>Operation Analytics</h2> <h3>Operation Analytics 1: Top 10 songs searched in LyricsFinder</h3> <table><tr><th>Rank</th><th>Song Name</th><th>Number of Searches</th></tr><tr><td>1</td><td>Shivers</td><td>27</td></tr><tr><td>2</td><td>Believer</td><td>20</td></tr><tr><td>3</td><td>Hello</td><td>20</td></tr><tr><td>4</td><td>Levitating</td><td>17</td></tr><tr><td>5</td><td>Easy On Me</td><td>14</td></tr><tr><td>6</td><td>Mockingbird</td><td>12</td></tr><tr><td>7</td><td>Bones</td><td>12</td></tr><tr><td>8</td><td>Numb</td><td>11</td></tr><tr><td>9</td><td>Perfect</td><td>11</td></tr><tr><td>10</td><td>Rap God</td><td>10</td></tr></table>			Rank	Song Name	Number of Searches	1	Shivers	27	2	Believer	20	3	Hello	20	4	Levitating	17	5	Easy On Me	14	6	Mockingbird	12	7	Bones	12	8	Numb	11	9	Perfect	11	10	Rap God	10
Rank	Song Name	Number of Searches																																	
1	Shivers	27																																	
2	Believer	20																																	
3	Hello	20																																	
4	Levitating	17																																	
5	Easy On Me	14																																	
6	Mockingbird	12																																	
7	Bones	12																																	
8	Numb	11																																	
9	Perfect	11																																	
10	Rap God	10																																	

2. Top 10 artists searched in LyricsFinder

Operation Analytics 2: Top 10 artists searched in LyricsFinder

Rank	Artist Name	Number of Searches
1	Ed Sheeran	38
2	Imagine Dragons	36
3	Adele	34
4	Eminem	22
5	Dua Lipa	22
6	Linkin Park	11
7	Meg Myers	8
8	Pink	6
9	Invalid input	5
10	Elton John	4

3. Average Latency – Android App

Operation Analytics 3: Average Latency - Android App

Average search latency for Android App = **812.92 milliseconds**

4. Average Latency - API

Operation Analytics 4: Average Latency - API

Average search latency for Vagalume API (3rd Party API) = **478.34 milliseconds**

5. Top 5 Android phone models using LyricsFinder

Operation Analytics 5: Top 5 Android phone models using LyricsFinder

Rank	Mobile Brand	Mobile Model	Number of Requests
1	OnePlus	9 Pro 5G	38
2	Samsung	Galaxy A52 5G	30
3	ASUS	Zenfone 8	25
4	ASUS	Zenfone 9	20
5	google	emulator64_x86_64_arm64	20