



Servisno-orijentisane arhitekture – Projekti

Tea Mitić 17274

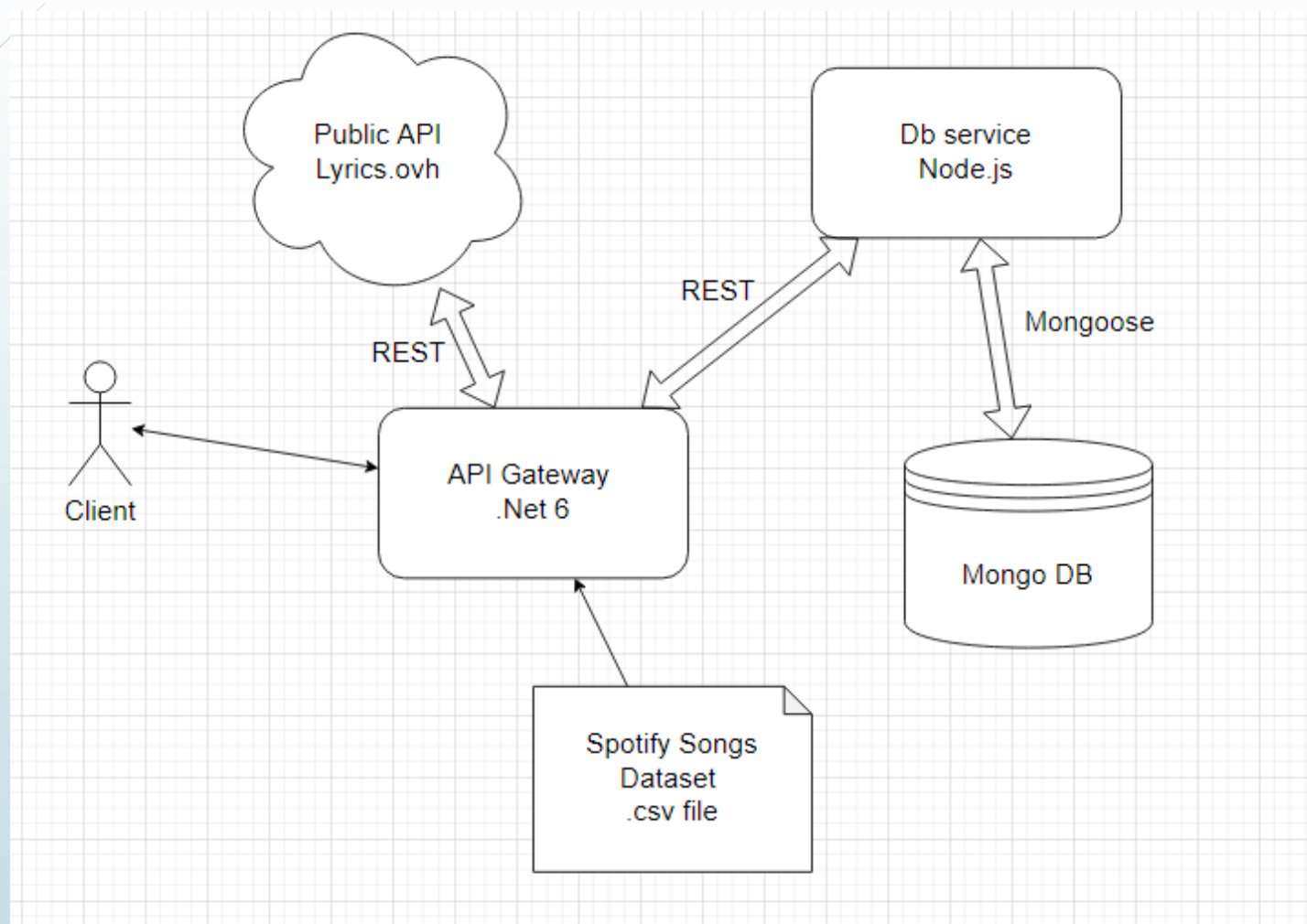
Dimitrije Mitić 17269



Projekat 1 – Ideja

- Ideja prvog projekta je aplikacija koja pribavlja podatke o pesmama zajedno sa njihovim tekstovima.
- Tekst (lyrics) pesme se pribavlja korišćenjem javnog API-ja – Lyrics.ovh
- Ostali podaci su pozajmljeni iz .csv dataset-a

Projekat 1 – Arhitektura





Projekat 1 – Arhitektura

- Klijent komunicira sa sistemom preko API Gateway-a pisanog u .Net framework-u za C#.
- API Gateway prosledjuje zahteve pomocu REST principa do DB servisa koji komunicira sa MongoDB NoSql bazom podataka.
- Mapiranje i komunikacija DB servisa i Mongo baze odradjena je koriscenjem npm paketa Mongoose.
- API Gateway pribavlja tekst pesme od javnog API-ja takodje pomocu REST-a.

Projekat 1 – Swagger UI

Song

POST

`/api/songs/LoadDBfromCSV/{chunkSize}` Loads songs in database from csv file.

GET

`/api/songs/GetSongs/{limit}` Gets songs from database lyrics.

GET

`/api/songs/GetOne/{artist}/{track}` Gets one song.

DELETE

`/api/songs/DeleteOne/{artist}/{track}` Deletes a song.

POST

`/api/songs/AddOne` Adds one song in db.

PUT

`/api/songs/EditOne` Edits one song in db.

Projekat 1 – Populacija baze

Song

POST

`/api/songs/LoadDBfromCSV/{chunkSize}` Loads songs in database from csv file.

Parameters

Name

Description

chunkSize * required

integer(\$int32)
(path)

Chunk size for songs (How much songs to read from csv at once).

Execute

Responses

Code

Description

200

Informs that songs are correctly loaded in db.

Projekat 1 – Primer API poziva

Request URL

`http://localhost:5170/api/songs/GetOne/Billie%20Eilish/bad%20guy`

Server response

Code

Details

200

Response body

```
{
  "song": {
    "trackName": "bad guy",
    "artistName": "Billie Eilish",
    "genre": "electropop",
    "beatsPerMinute": 135,
    "energy": 43,
    "danceability": 70,
    "loudnessIndB": -11,
    "liveness": 10,
    "valence": 56,
    "length": 194,
    "acousticness": 33,
    "speechiness": 38,
    "popularity": 95
  },
  "lyrics": "Paroles de la chanson Bad guy par Billie Eilish\r\nWhite shirt, now red my bloody nose\r\nSleeping, you're on your tippy toes\r\nCreeping around like nobody knows\r\nThink you're so criminal\r\nBruises, on both my knees for you\r\nDon't say thank you or please \"\r\nI do what I want when I'm wanting to\r\nMy soul? So cynical\r\n\r\nSo you're a tough guy\r\nLike it really rough guy\r\nJust can't get enough guy\r\nChest always so puffed guy\r\nI'm that bad type\r\nMake your mama sad type\r\nMake your girlfriend mad tight\r\n\r\nMight seduce your dad type\r\nI'm the bad guy, duh\r\n\r\nI like it when you take control\r\nEven if you know that you don't\r\nOwn me, I'll let you play the role\r\nI'll be your animal\r\nMy mommy likes to sing along with me\r\nBut she won't sing this song\r\nIf she reads all the lyrics\r\nShe'll pity the men I know\r\n\r\nSo you're a tough guy\r\nLike it really rough guy\r\nJust can't get enough guy\r\nChest always so puffed guy\r\nI'm that bad type\r\nMake your mama sad type\r\n\r\nMake your girlfriend mad tight\r\nMight seduce your dad type\r\nI'm the bad guy, duh\r\nI'm only good at being bad\r\n\r\nI like it when you get mad\r\nI guess I'm pretty glad\r\nThat you're alone\r\nYou say she's scared of me? I mean\r\nI don't see what she sees\r\nBut maybe it's 'cause I'm wearing your cologne\r\n\r\nI'm a bad guy\r\nI'm a bad guy\r\nBad guy, bad guy\r\nI'm a bad"
}
```



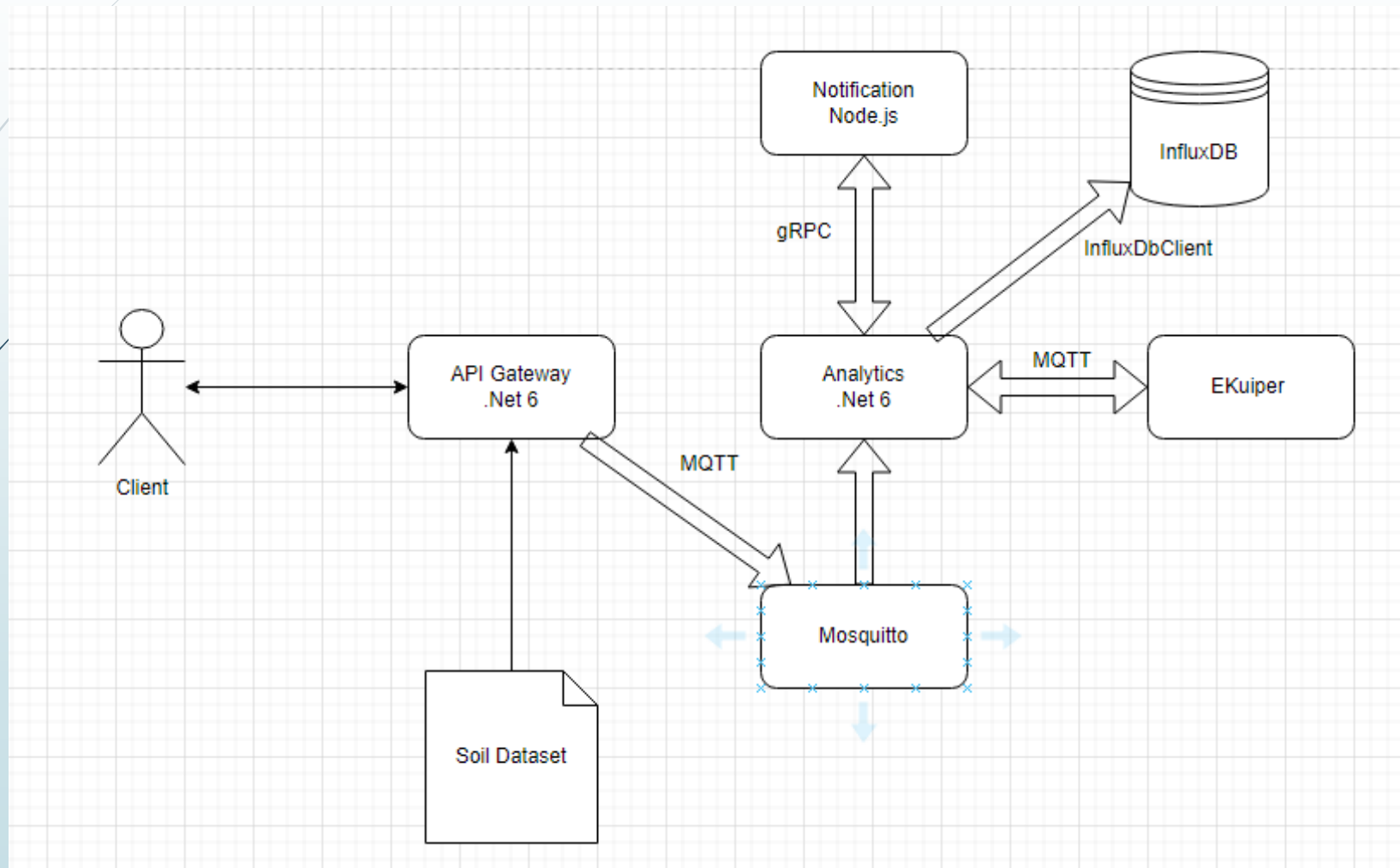
Download



Projekat 2 – Ideja

- Ideja drugog projekta je aplikacija koja pribavlja podatke sa senzora o kvalitetu zemljišta i vrši analizu prikupljenih podataka. U zavisnosti od prikupljenih podataka zemljište može biti kvalitetno i nekvalitetno. U slučaju da kvalitet zemljišta nije dobar, beleži se takav podatak i obavestava klijent.
- Simulacija senzora se može pokrenuti API pozivom funkcije.

Projekat 2 – Arhitektura





Projekat 2 – Arhitektura

- Klijent komunicira sa postojećim Gateway servisom iz prvog projekta
- Simuliranje senzora se može odraditi pozivom API funkcije
- Očitane podatke Gateway šalje Analytics servisu preko MQTT protokola koriscenjem Mosquitto implementaciju
- Analytics servis je pisan je takodje pisan u .Net framework
- On prosledjuje podatke eKuiperu putem MQTT protokla na analizu
- Za podatke koji predstavljaju los kvalitet zemljista eKuiper preko MQTT vraca odgovor Analytics servisu.
- Analytics perzistira primljene podatke u InfluxDb bazi. I salje preko gRPC-a obavestenje Notification servisu o kvalitetu zemljista.
- Notification servis je pisan u Javascript-u koriscenjem Node.js framework-a.

Projekat 2 – eKuiper

Stream Name: agricultureStream

Stream Fields:

Name	Type	Operations
Nitrogen	bigint	
Phosphorus	bigint	
Potassium	bigint	
temperature	float	
humidity	float	
ph	float	
rainfall	float	
cropType	string	

DATASOURCE: analytics/agriculture

KEY:

FORMAT: json

CONF_KEY: mosquitto

TYPE: mqtt

Rule ID

badSoilHealth

```
1 SELECT * FROM agricultureStream WHERE humidity < 40 AND temperature > 32 OR ph < 4
```

View action

* Sink

[Documentation](#)

mqtt

Connection selector ?

MQTT broker address ?

tcp://mqtt:1883

MQTT topic ?

MQTT ClientID ?

analytics/alerts

```
1 SELECT * FROM agricultureStream WHERE humidity < 40 AND temperature > 32 OR ph < 4
```

Projekat 2 – Simulacija senzora

Agriculture

POST /api/agriculture/GenerateData/{sleepSeconds} Generate data from csv file to mock iot sensor for agriculture data

Parameters

Name	Description
sleepSeconds <small>* required</small> integer(\$int32) (path)	Time gap between two sensor readings

Execute

Responses

Curl

```
curl -X 'POST' \
  'http://localhost:5170/api/agriculture/GenerateData/0' \
  -H 'accept: */*' \
  -d ''
```

Request URL

```
http://localhost:5170/api/agriculture/GenerateData/0
```

Server response

Code	Details
200	<div>Response body<pre>Generating data finished.</pre></div>

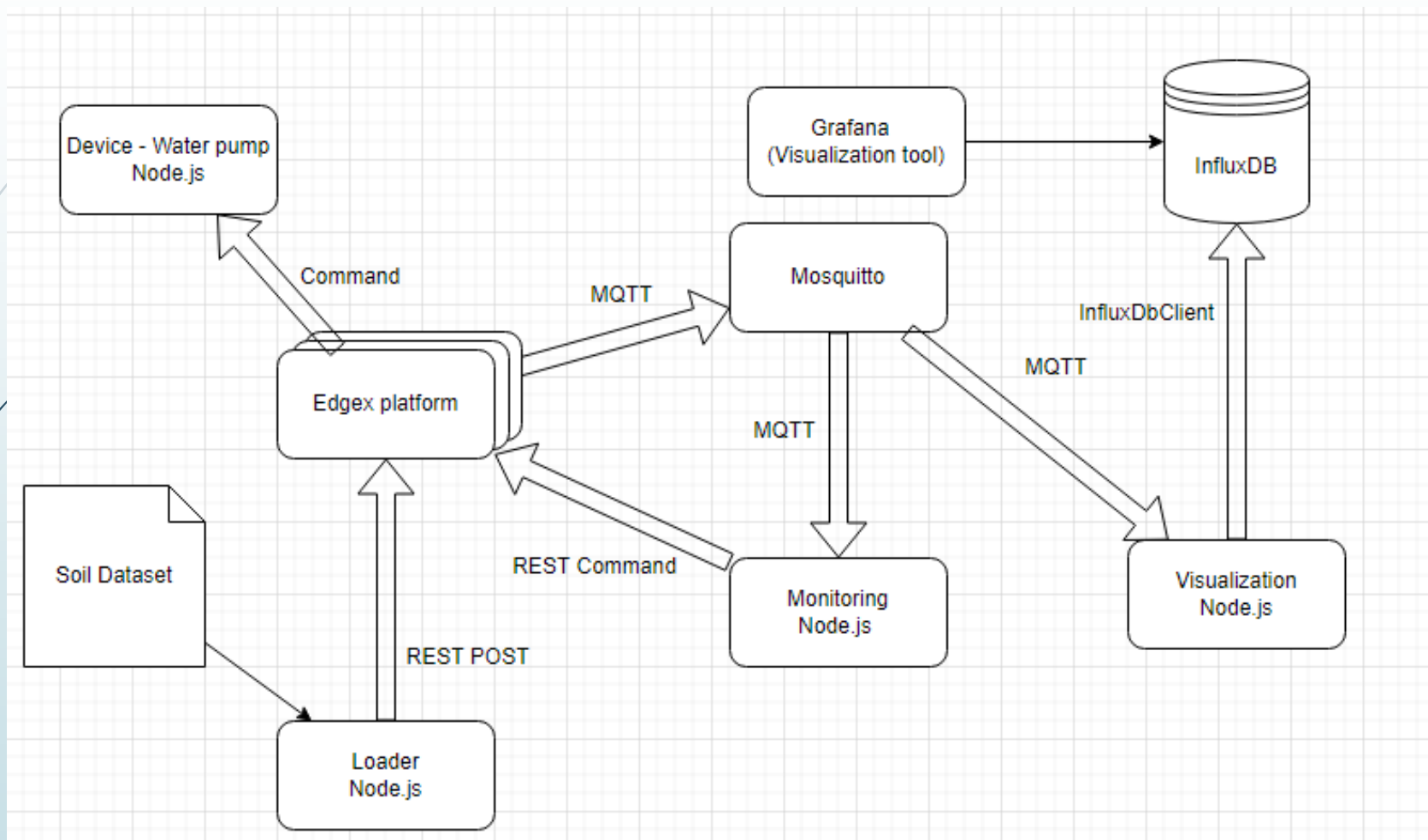
Projekat 2 – gRPC proto

```
1  syntax = "proto3";
2
3  option csharp_namespace = "GrpcClient";
4
5  package notif;
6
7
8  service Notification{
9      rpc sendNotif(Notif) returns(Response);
10 }
11
12 message Notif {
13     int32 Nitrogen = 1;
14     int32 Phosphorus = 2;
15     int32 Potassium = 3;
16     float Temperature = 4;
17     float Humidity = 5;
18     float Ph = 6;
19     float Rainfall = 7;
20     string CropType = 8;
21 }
22
23 message Response {
24     string res = 1;
25 }
```

Projekat 3 – Ideja

- Ideja treceg projekta je slicna ideji drugog projekta pri cemu se radi sa drugim datasetom takodje sa podacima o kvalitetu zemljista. Razlika postoji u tome da kada se detektuje odredjeni nivo vlaznosti zemljista se ne obavestava klijent vec se pali i gasi pumpa za vodu koja regulise vlaznost zemljista.
- Svi podaci koje generise sensor se pamte u Time Series bazu podataka i moguc je graficki prikaz tih podatka.
- Simulaciju rada senzora zamenjuje konzolna aplikacija koja ucitava podatke iz .csv dataset-a.

Projekat 3 – Arhitektura



Projekt 3 – Sensor & Aktuator

```
▼ "labels": [
  "waterPump",
  "testapp"
],
"location": "Nis",
▼ "commands": [
  ▼ {
    "created": 1659897236677,
    "modified": 1659897236677,
    "id": "82393c25-24e2-41d4-8733-c1cca5862717",
    "name": "waterPump",
    ▼ "get": {
      "path": "/api/waterPump",
      ▼ "responses": [
        ▼ {
          "code": "200",
          "description": "get current water pump state",
          ▼ "expectedValues": [
            "true",
            "false"
          ]
        },
        ▼ {
          "code": "503",
          "description": "service unavailable"
        }
      ],
      "url": "http://edgex-core-command:48082/api/v1/device/868a4373-bee9-4e16-9d78-c717cd28edc8/command/82393c25-24e2-41d4-8733-c1cca5862717"
    },
    ▼ "put": {
      "path": "/api/waterPump",
      ▼ "responses": [
        ▼ {
          "code": "201",
          "description": "set water pump state"
        },
        { ... } // 2 items
      ],
      "url": "http://edgex-core-command:48082/api/v1/device/868a4373-bee9-4e16-9d78-c717cd28edc8/command/82393c25-24e2-41d4-8733-c1cca5862717"
    }
  },
  {
    "id": "625ff260-0f5d-4a95-a891-0725590c0f03",
    "name": "Temp_and_Humidity_sensor_cluster_01",
    "adminState": "UNLOCKED",
    "operatingState": "ENABLED",
    ▼ "labels": [
      "Humidity sensor",
      "Temperature sensor",
      "DHT11"
    ],
    "location": "Nis"
  }
],
```


Resursi

- Lyrics text – public API - <https://lyricsovh.docs.apiary.io/#>
- Spotify Songs Dataset – Projeakt 1 - <https://www.kaggle.com/datasets/leonardopena/top50spotify2019>
- Agriculture Soil Dataset – Projekat 2 - <https://www.kaggle.com/datasets/siddharthss/crop-recommendation-dataset?resource=download>
- Kuiper setup tutorial – Projekat 2 - <https://github.com/sssteefaaan/SOA-Projekat/tree/main/Projekat%20II>
- Irrigation Dataset – Projekat 3 - <https://www.kaggle.com/datasets/nelakurthisudheer/dataset-for-predicting-watering-the-plants>
- Edgex setup tutorial – Projekat 3 - <https://jonamiki.com/2020/08/26/edgex-foundry-hands-on-tutorial/>