Design Document – URL Shortener

High-Level Design

We create a mapping of a long URL to a short URL consisting of 5 characters. Each character lies from [a-z][A-Z][0-9] giving us 62 possibilities. Thus, we can store up to 62^5 which is about 916 M possibilities of URLs in our database. The md5 hash of the Base62 encoding of the user's URL input is taken.

All the functionality is present on the Web GUI application We have added a CURL API call service as well to generate a short URL via the terminal/command line if necessary. This functionality is limited to only creating new short URLs and not for checking user history.

Four 4 major aspects were covered:

Freemium model implemented

Free-Tier

- Just gives a mapping between the long and short URL of length 5

Premium Customer

- The user submits his email which is followed by OTP verification which will come into the client's mailbox (Do check spam/promotions etc) after which he is directed to a new page.
- The user is given the option to enter his long URL followed by a custom string that gives the short URL as the same as his custom string (Let us say he wants to keep it IITBhilai, so we give him IITBhilai) which allows him to use it.
- The user can specify a time for which the short URL will work as well. If the custom string is given a dialog says that the user needs to give another custom string.

Website Analytics (Front-Page)

Website usage is stored to give an idea of popularity to its old and new users. Website analytics is displayed on the front page which gives a history of the count of reads and count of writes count over the past 2 weeks to see the increase and decrease in the usage of service.

User Analytics (Premium Users)

Custom data associated with the custom string and database entry of a particular premium user is provided. Once the authentication is completed, we provide the user with a history of the service he has used. A table is given that gives him statistics of the number of redirections when each URL was created and each long URL that was inserted.

Tech Stack

Backend - Node.js, EJS

Integrates the database queries and information from the front end. API Keys for curl requests are covered using this. It also schedules the running of python scripts for daily database update to render on the webpage effectively.

EJS – Generated JavaScript templates to render the real-time user data for better UX.

Frontend – HTML/CSS

To display the graph on the home page and user history tables for premium users. Adding color features to the pages as well as making the page interactive graphically is performed here.

Analytics – Python

Written scripts to effectively trigger SQL queries on user email authentication to display history in a tabular format and auto-update the appropriate database tables daily (runs at 12:05 AM every day), values of redirection count, etc. It was also used to generate a curl script to check the application performance to the scaling specifications.

Database Schema

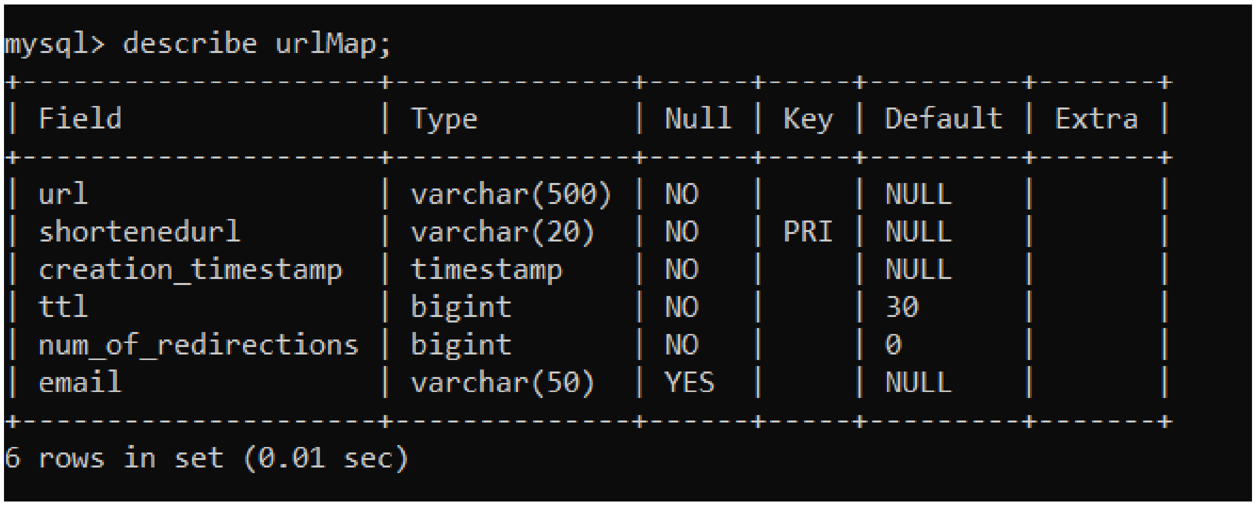
We use a relational database (MySQL server) as a large hash table, mapping the generated URL to a file server and path containing the paste file. It stores extra things such as redirection count, creation time, email ID for premium users.

As we have built an OTP authentications system, we even store the OTPs for a particular email for the first 5 minutes as we need to deal with multiple users dealing with the authentication process at the same time.

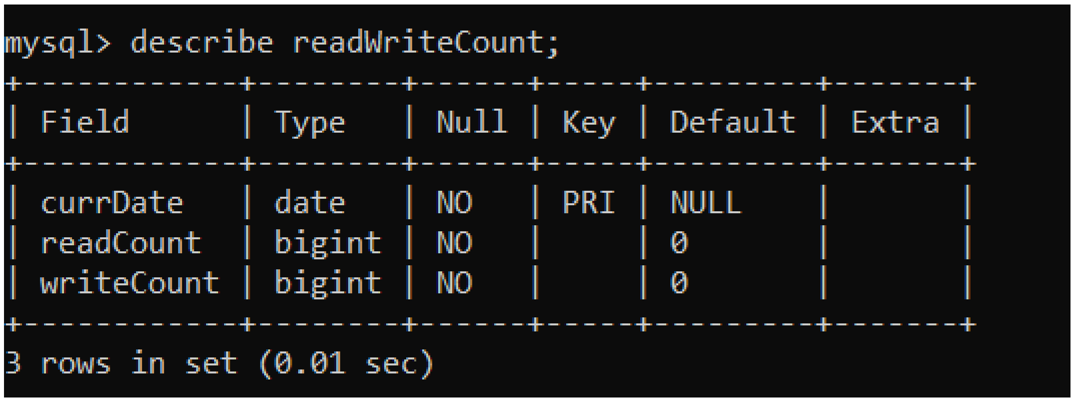
We store a table for the website usage to render it on the home page as well.

The reason for a SQL database is the vertical scaling as the numbers will grow bigger by the number of entries. We will rarely need to add a new row (such as a situation where we require new analytics on the system) but for the functional requirements, it won’t be necessary.

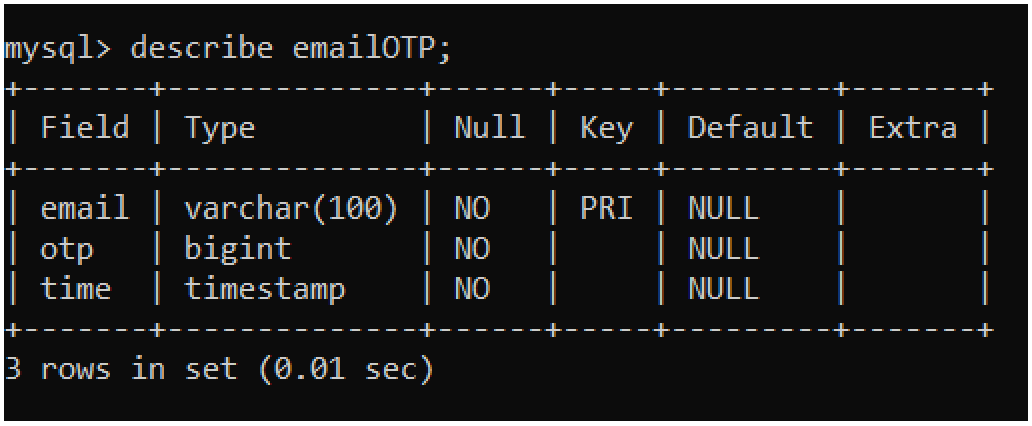
The MySQL schemas are as follows:



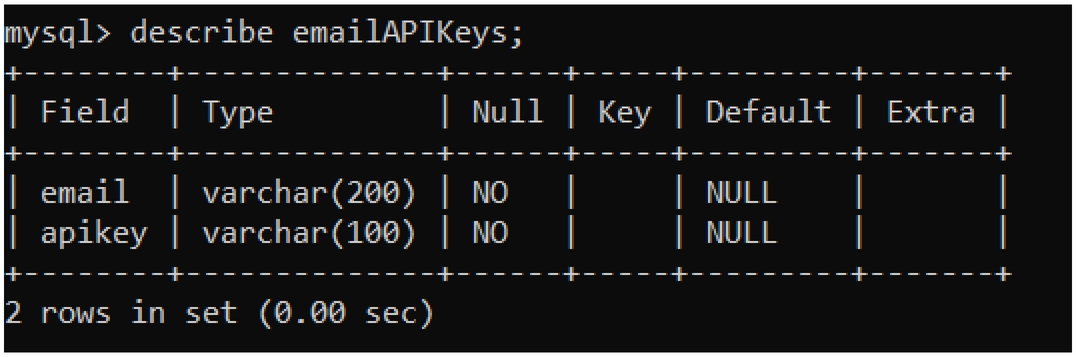
```
mysql> describe urlMap;
+---------------------+--------------+------+-----+---------+-------+
| Field               | Type         | Null | Key | Default | Extra |
+---------------------+--------------+------+-----+---------+-------+
| url                 | varchar(500) | NO   |     | NULL    |       |
| shortenedurl        | varchar(20)  | NO   | PRI | NULL    |       |
| creation_timestamp  | timestamp    | NO   |     | NULL    |       |
| ttl                 | bigint       | NO   |     | 30      |       |
| num_of_redirections | bigint       | NO   |     | 0       |       |
| email               | varchar(50)  | YES  |     | NULL    |       |
+---------------------+--------------+------+-----+---------+-------+
6 rows in set (0.01 sec)
```



```
mysql> describe readWriteCount;
+------------+--------+------+-----+---------+-------+
| Field      | Type   | Null | Key | Default | Extra |
+------------+--------+------+-----+---------+-------+
| currDate   | date   | NO   | PRI | NULL    |       |
| readCount  | bigint | NO   |     | 0       |       |
| writeCount | bigint | NO   |     | 0       |       |
+------------+--------+------+-----+---------+-------+
3 rows in set (0.01 sec)
```



```
mysql> describe emailOTP;
+-------+--------------+------+-----+---------+-------+
| Field | Type         | Null | Key | Default | Extra |
+-------+--------------+------+-----+---------+-------+
| email | varchar(100) | NO   | PRI | NULL    |       |
| otp   | bigint       | NO   |     | NULL    |       |
| time  | timestamp    | NO   |     | NULL    |       |
+-------+--------------+------+-----+---------+-------+
3 rows in set (0.01 sec)
```


```
mysql> describe emailAPIKeys;
+--------+--------------+------+-----+---------+-------+
| Field  | Type         | Null | Key | Default | Extra |
+--------+--------------+------+-----+---------+-------+
| email  | varchar(200) | NO   |     | NULL    |       |
| apikey | varchar(100) | NO   |     | NULL    |       |
+--------+--------------+------+-----+---------+-------+
2 rows in set (0.00 sec)
```

CURL Functionality:

We use a Public REST API Service:

4 API calls will be created.

In all the calls, ":apiKey" is a variable which a premium user will have to provide to run his curl requests. This key will be provided to him the moment his first authentication is complete, after which the key enables him to use the service without worrying about future authentication.

1. To Read:

route:- '/api/readshorten/:apiKey'

data:- {shorturl: "short LINK of which we want full long URL "}

2. To Delete:

route:- '/api/deleteurl/:apiKey'

data:- {shorturl: "short LINK of which we want to delete DB entry and have access of that link "}

3. To Shorten:

route:- '/api/createshorten/:apiKey'

data:- {urldata: "LINK_TO shorten"}

4. To Create Custom

route:- '/api/createcustomshorten/:apiKey'

data:- {customurldataa: "custom short LINK of which we want link",

longurldata: "LINK_TO shorten",

ttl: "Time to live in number of days"}

Refer to the performance.py file for the execution of more details in CURL and the ReadMe file.

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