

Overview

The goal of this project is to create a Reddit clone using microservices. The REST (REpresentational State Transfer) architectural design for web APIs is used to make requests to the database in the form of a JSON blob. These web services are created using Python and Flask.

Teams

Project 1

Name	Role	Contact Info
Javier Melendrez	Developer 1	javim1224@csu.fullerton.edu
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Project 2

Name	Role	Contact Info
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Production Stack

This project is written in Python 3 and the deployment environment is in Tuffix 2019 Edition r2 (Xubuntu). Start by updating the Tuffix repo location by opening a terminal and running `sudo sed -i -re 's/([a-z]{2})?archive.ubuntu.com/security.ubuntu.com/old-releases.ubuntu.com/g' /etc/apt/sources.list`. Enter your password if prompted. You can check the version of Python by running the command `python3 --version`. If Python 3 is not installed you can get it using the command `sudo apt-get install python3`. Once you have installed Python check the version of Pip you have by running the command `pip3 --version`. Python includes Pip upon installation but if Pip cannot be found you can install it using the `sudo apt-get install pip3` command. Flask is a lightweight Python framework for web applications that provides the basics for URL routing and page rendering. To install, run `pip3 install flask`. The database is handled by the microservices using SQLite3 and is viewed using API requests, DB Browser for SQLite, or any database viewer of your choice. For this project we are using DB Browser for SQLite to visually show the database. You can install it by running the command `sudo apt-get install sqlitebrowser`. CURL (Client URL Request Library) requests are created using Postman. Requests update/retrieve information to/from the database. The retrieved information is outputted in JSON format.

These are the libraries/dependencies that are required for the project to run and test it. A shell script is provided at the end of the SETUP section to easily install all of them.

- Unicorn 3
- Caddy
- Foreman

Architecture

Hosts

Environment	Microservice	Hostname
Test	Post (Project 1)	http://127.0.0.1:5000
Test	User (Project 1)	http://127.0.0.1:5000
Test	Message (Project 2)	http://127.0.0.1:5000
Test	Vote (Project 2)	http://127.0.0.1:5000
Prod	Post (Project 1)	http://localhost:2015/posts
Prod	User (Project 1)	http://localhost:2015/users
Prod	Message (Project 2)	http://localhost:2015/messages
Prod	Vote (Project 2)	http://localhost:2015/votes

Caddy configuration

Post Microservice Proxy (Production)	User Microservice Proxy (Production)
127.0.0.1:5000	127.0.0.1:5100
127.0.0.1:5001	127.0.0.1:5101
127.0.0.1:5002	127.0.0.1:5102
Message Microservice Proxy (Production)	Vote Microservice Proxy (Production)
127.0.0.1:5300	127.0.0.1:5200
127.0.0.1:5301	127.0.0.1:5201
127.0.0.1:5302	127.0.0.1:5202

Setup

These instructions will only work for Linux based distributions, specifically Tuffix. These steps will help create a working environment while installing all libraries and dependences.

Open a terminal and create a directory:

```
$ mkdir reddit_clone
```

Change the current directory:

```
$ cd reddit_clone/
```

Clone repository:

```
$ git clone https://github.com/antonio-lopez/cspc-449-project-1.git
```

Change the current directory:

```
$ cd cspc-449-project-1/
```

Create a virtual environment:

```
$ sudo apt-get update
```

```
$ sudo apt-get install python3-venv
```

```
$ python3 -m venv ENV
```

Activate the virtual environment:

```
$ source ENV/bin/activate
```

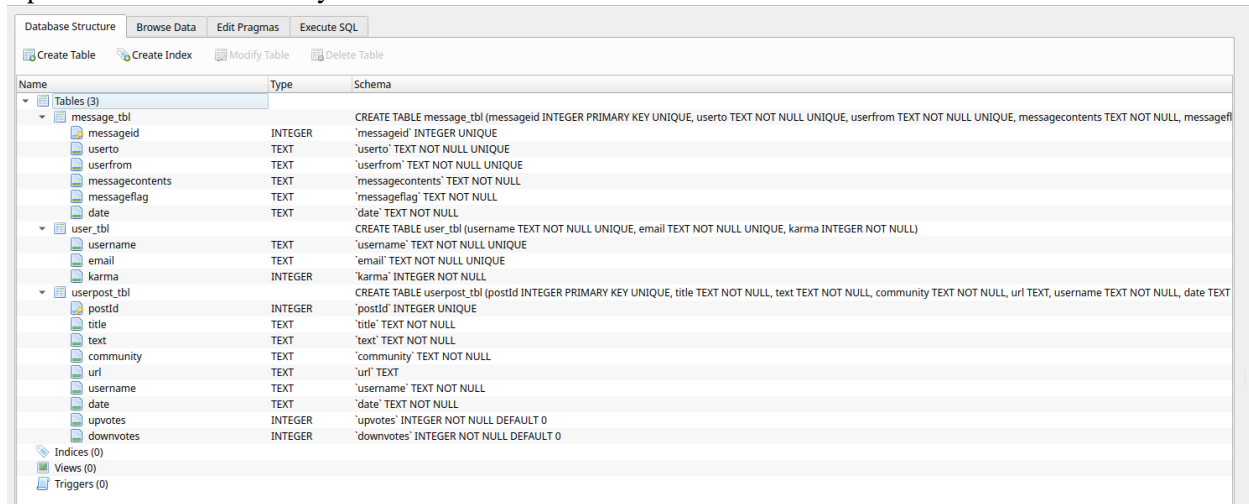
Create the database by running the python file:

```
$ python3 create_db.py
```

Run shell script to download and install requirements:

```
$ bash requirements.sh
```

Open DB Browser to verify the Database has been created:



Run

To verify the setup is complete run any microservice.

```
$ python3 post.py
```

Or

```
$ python3 user.py
```

Or

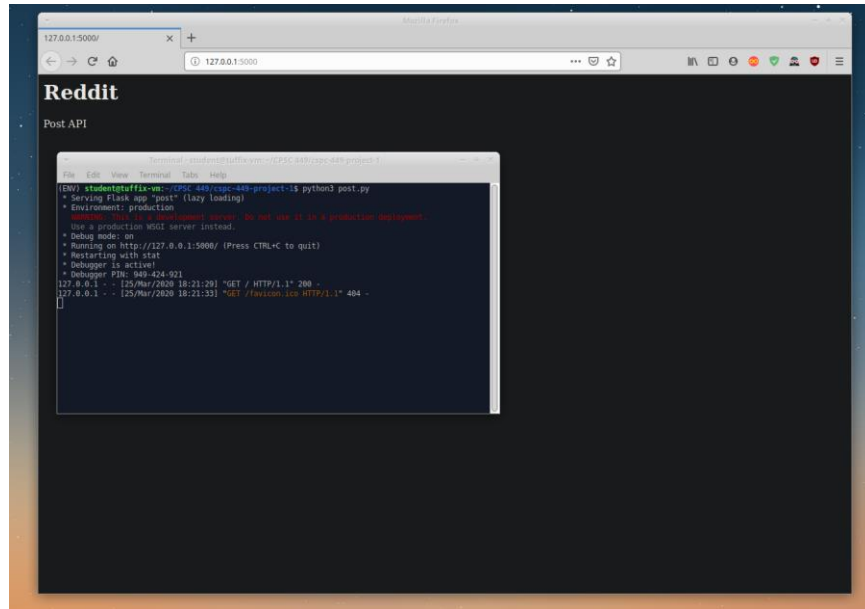
```
$ python3 vote.py
```

Or

```
$ python3 message.py
```

Follow the link provided (ctrl + left click). Your browser will open with the main page greeting for the chosen microservice. Cancel the microservice (Ctrl + c).

Ex. Post microservice:



Testing

Testing can be done in either non-production or production. In the initial testing for either, make sure you are using a newly created database to view successful codes, otherwise you'll see conflict codes for duplicates. The testing scripts create new users and posts, send messages to users, and manipulates post voting operations. If you are following the instructions and have completed the SETUP and RUN sections continue with testing. If the database is populated, delete it and create a new one using the `$ python3 create_db.py` command.

Testing (Non-production):

Non-production testing is done using the Flask Development Server.

Post Microservice Testing:

Run the Post microservice on a terminal from the `cspc-449-project-1` directory:

```
$ python3 post.py
```

Open a new terminal from the `cspc-449-project-1` directory, change to the testing directory, and run the Post testing shell script:

```
$ cd testing_non-prod/
```

```
$ bash post_test.sh
```

```

Terminal - student@tuffix-vm: ~/CPSC 449/cpsc-449-project-1
(ENV) student@tuffix-vm:~/CPSC 449/cpsc-449-project-1$ python3 post.py
* Serving Flask app "post" (lazy loading)
* Environment: production
WARNING: This is a development server. Do not use it in a production deployment.
Use a production WSGI server instead.
* Debug mode: on
* Running on http://127.0.0.1:5000/ (Press CTRL+C to quit)
* Restarting with stat
* Debugger is active!
* Debugger PIN: 949-424-921
127.0.0.1 - - [25/Mar/2020 18:34:01] "POST /api/v1/resources/post/create_post HTTP/1.1" 200 -
127.0.0.1 - - [25/Mar/2020 18:34:01] "POST /api/v1/resources/post/create_post HTTP/1.1" 200 -
127.0.0.1 - - [25/Mar/2020 18:34:01] "POST /api/v1/resources/post/create_post HTTP/1.1" 200 -
127.0.0.1 - - [25/Mar/2020 18:34:01] "POST /api/v1/resources/post/create_post HTTP/1.1" 200 -
127.0.0.1 - - [25/Mar/2020 18:34:01] "POST /api/v1/resources/post/create_post HTTP/1.1" 200 -
127.0.0.1 - - [25/Mar/2020 18:34:01] "POST /api/v1/resources/post/delete_post HTTP/1.1" 200 -
127.0.0.1 - - [25/Mar/2020 18:34:01] "POST /api/v1/resources/post/retrieve_post HTTP/1.1" 200 -
127.0.0.1 - - [25/Mar/2020 18:34:01] "POST /api/v1/resources/post/listNthToCommunity HTTP/1.1" 200 -
127.0.0.1 - - [25/Mar/2020 18:34:01] "POST /api/v1/resources/post/listNthToAny HTTP/1.1" 200 -

Terminal - student@tuffix-vm: ~/CPSC 449/cpsc-449-project-1/testing_non-prod
student@tuffix-vm:~/CPSC 449/cpsc-449-project-1$ cd testing_non-prod/
student@tuffix-vm:~/CPSC 449/cpsc-449-project-1/testing_non-prod$ ls
post_test.sh user_test.sh
student@tuffix-vm:~/CPSC 449/cpsc-449-project-1/testing_non-prod$ bash post_test.sh
Creating post....
{"message": "create CoronaVirus post success!"}
200
Creating post....
{"message": "create Computer Status post success!"}
200
Creating post....
{"message": "create Mac VS PC post success!"}
200
Creating post....
{"message": "create RGB post success!"}
200
Creating post....
{"message": "create Websites post success!"}
200
Creating post....
{"message": "create Testing post success!"}
200
Creating post....
{"message": "create Water Rules post success!"}
200
Deleting postId = 6....
{"message": "delete successfully"}
200
Retrieving postId = 3....
{
  "Mac VS PC",
  "Are Macs good for coding?",
  "Computer",
  "null",
  "Tony",
  "2020-03-25 18:34:01"
}
200
Listing 2 posts from the Computer community....
{
  "community": "Computer",
  "date": "2020-03-25 18:34:01",

```

Running the script tests the following API requests:

- Create a new post
- Delete an existing post given a postId
- Retrieve an existing post given a postId
- List the n most recent posts to a particular community
- List the n most recent posts to any community

To verify if the posts were added to your database, open DB Browser and select the “Browse Data” tab and select the “userpost_tbl” table.

Database Structure Browse Data Edit Pragmas Execute SQL									
Table: userpost_tbl									
	postId	title	text	community	url	username	date	upvotes	downvotes
Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter
1	1	CoronaVirus	Things are going better!	Corona-19	null	Zexin	2020-04-26 18:08:06	0	0
2	2	Computer Status	are super ...	Computer	null	Zexin2	2020-04-26 18:08:06	0	0
3	3	Mac VS PC	good for ...	Computer	null	Tony	2020-04-26 18:08:06	0	0
4	4	RGB	RGB is overhyped	Computer	null	Tom	2020-04-26 18:08:06	0	0
5	5	Websites	website is ...	Web	null	Bob	2020-04-26 18:08:06	0	0
6	7	Water Rules	Drink lots of water fam.	Water	null	Bill	2020-04-26 18:08:06	0	0

User Microservice Testing:

Cancel the Post microservice (Ctrl + C) and run the User microservice in the same terminal:

```
$ python3 user.py
```

On the other terminal run the User testing shell script:

```
$ bash user_test.sh
```

```
Terminal - student@tuffix-vm: ~/CPSC 449/cpsc-449-project-1
File Edit View Terminal Tabs Help
[ENV] student@tuffix-vm:~/CPSC 449/cpsc-449-project-1$ python3 user.py
* Serving Flask app "user" (lazy loading)
* Environment: production
  WARNING: This is a development server. Do not use it in a production deployment.
  Use a production WSGI server instead.
* Debug mode: on
* Running on http://127.0.0.1:5000/ (Press CTRL+C to quit)
* Restarting with stat
* Debugger is active!
* Debugger PIN: 849-424-921
127.0.0.1 - - [25/Mar/2020 21:41:46] "POST /api/v1/resources/users/create HTTP/1.1" 201 -
127.0.0.1 - - [25/Mar/2020 21:41:46] "POST /api/v1/resources/users/create HTTP/1.1" 201 -
127.0.0.1 - - [25/Mar/2020 21:41:46] "POST /api/v1/resources/users/create HTTP/1.1" 201 -
127.0.0.1 - - [25/Mar/2020 21:41:46] "POST /api/v1/resources/users/create HTTP/1.1" 201 -
127.0.0.1 - - [25/Mar/2020 21:41:46] "POST /api/v1/resources/users/create HTTP/1.1" 201 -
127.0.0.1 - - [25/Mar/2020 21:41:46] "PUT /api/v1/resources/users/email HTTP/1.1" 200 -
127.0.0.1 - - [25/Mar/2020 21:41:47] "PUT /api/v1/resources/users/inc HTTP/1.1" 200 -
127.0.0.1 - - [25/Mar/2020 21:41:47] "PUT /api/v1/resources/users/dec HTTP/1.1" 200 -
127.0.0.1 - - [25/Mar/2020 21:41:47] "DELETE /api/v1/resources/users/remove HTTP/1.1" 200 -

Terminal - student@tuffix-vm: ~/CPSC 449/cpsc-449-project-1/testing_non-prod
File Edit View Terminal Tabs Help
student@tuffix-vm:~/CPSC 449/cpsc-449-project-1/testing_non-prod$ ls
post_test.sh user_test.sh
student@tuffix-vm:~/CPSC 449/cpsc-449-project-1/testing_non-prod$ bash user_test.sh
Creating user....
{
  "message": "bob was added successfully."
}
201
Creating user....
{
  "message": "bill was added successfully."
}
201
Creating user....
{
  "message": "lisa was added successfully."
}
201
Creating user....
{
  "message": "mayra was added successfully."
}
201
Creating user....
{
  "message": "jeff was added successfully."
}
201
Creating user....
{
  "message": "larry was added successfully."
}
201
Updating email....
{
  "message": "Email updated."
}
200
Incrementing karma....
{
  "message": "Karma incremented"
}
200
Decrementing karma....
{
  "message": "Karma decremented"
}
200
Deactivating account....
{
  "message": "bob was successfully deleted."
}
200
student@tuffix-vm:~/CPSC 449/cpsc-449-project-1/testing_non-prod$
```

Running the script tests the following API requests:

- Create user
- Update email
- Increment Karma
- Decrement Karma
- Deactivate account

Check DB Browser to verify if the data was inserted into the database by selecting the “user_tbl” table.

New Database Open Database Write Changes Revert Changes			
Database Structure Browse Data Edit Pragmas Execute SQL			
Table: user_tbl			
	username	email	karma
	Filter	Filter	Filter
1	bill	bill@gmail.c...	0
2	lisa	lisa@gmail....	0
3	mayra	mayra@gm...	0
4	jeff	jeff@gmail....	0
5	larry	larry@gmail...	0

100 User Testing:

On the same terminal where you ran the User testing shell script, run the 100 Users Test shell script:

```
$ bash 100_users_test.sh
```

Refresh DB Browser and verify the 100 users were added to the database:

Message Microservice Testing:

```
$ python3 message.py
```

```
$ bash message_test.sh
```

The image shows two terminal windows side-by-side. The left window is titled 'Terminal - student@tuffix-vm: ~/Documents/cspc-449-project-1' and shows the output of running 'python3 message.py'. It displays a Flask application running on http://127.0.0.1:5000/ in production mode. The right window is titled 'Terminal - student@tuffix-vm: ~/Documents/cspc-449-project-1/testing_non-prod' and shows the output of running 'bash message_test.sh'. It displays the results of API tests: sending a message, showing favorite messages, and deleting a message.

```

[ENV] student@tuffix-vm:~/Documents/cspc-449-project-1$ python3 message.py
* Serving Flask app "message" (lazy loading)
* Environment: production
WARNING: This is a development server. Do not use it in a production deployment.
Use a production WSGI server instead.
* Debug mode: on
* Running on http://127.0.0.1:5000/ (Press CTRL+C to quit)
* Restarting with stat
* Debugger is active!
* Debugger PIN: 267-251-400
127.0.0.1 - - [26/Apr/2020 18:17:19] "POST /api/v1/resources/message HTTP/1.1" 201 -
127.0.0.1 - - [26/Apr/2020 18:17:19] "POST /api/v1/resources/message HTTP/1.1" 201 -
127.0.0.1 - - [26/Apr/2020 18:17:19] "GET /api/v1/resources/message/favorite HTTP/1.1" 200 -
127.0.0.1 - - [26/Apr/2020 18:17:19] "DELETE /api/v1/resources/message/delete HTTP/1.1" 200 -

[ENV] student@tuffix-vm:~/Documents/cspc-449-project-1/testing_non-prod$ bash message_test.sh
Sending message....
{
  "message": "Message Sent."
}
201
Sending message....
{
  "message": "Message Sent."
}
201
Showing favorite messages....
{
  "1": {
    "alice",
    "bob",
    "hello alice :)",
    "favorite",
    "2020-04-26 18:17:19"
  }
}
200
Deleting message....
{
  "message": "Message Deleted."
}
200
[ENV] student@tuffix-vm:~/Documents/cspc-449-project-1/testing_non-prod$

```

Running the script tests the following API requests:

- Send message
- Delete message
- Favorite message

Check DB Browser to verify if the data was inserted into the database by selecting the “message_tbl” table.

The image shows a screenshot of the DB Browser for SQLite application. The 'Table' dropdown is set to 'message_tbl'. The table structure is displayed with columns: messageid, userto, userfrom, messagecontent, messageflag, and date. The data row shows a message with id 1, sent to 'rey' by 'kylo', with content 'hello rey :)', flag 'discussion', and date '2020-04-26 18:17:19'.

messageid	userto	userfrom	messagecontent	messageflag	date
1	rey	kylo	hello rey :)	discussion	2020-04-26 18:17:19

Voting Microservice Testing:

Cancel the Message microservice (Ctrl + C) and run the Voting microservice in the same terminal:

\$ python3 vote.py

On the other terminal run the Voting testing shell script:

\$ bash vote_test.sh


```
Terminal - student@tuffix-vm:~/Documents/csp-449-project-1
File Edit View Terminal Tabs Help
(ENV) student@tuffix-vm:~/Documents/csp-449-project-1$ python3 vote.py
+ Serving Flask app "vote" (lazy loading)
+ Environment: production
+ Use a production WSGI server instead. Do not use it in a production deployment.
+ Debug mode: on
+ Running on http://127.0.0.1:5000/ (Press CTRL-C to quit)
+ Restarting with stat
+ Debugger is active!
+ Debugger PIN: 257 321 400
127.0.0.1 - - [26/Apr/2020 18:26:21] "PUT /api/v1/resources/post/upvote HTTP/1.1" 200 -
127.0.0.1 - - [26/Apr/2020 18:26:21] "PUT /api/v1/resources/post/downvote HTTP/1.1" 200 -
127.0.0.1 - - [26/Apr/2020 18:26:21] "GET /api/v1/resources/post/retrieve_vote HTTP/1.1" 200 -
127.0.0.1 - - [26/Apr/2020 18:26:21] "GET /api/v1/resources/post/topNthScore HTTP/1.1" 200 -
5
[{"id": 1, "score": 0, "community": "null"}]
127.0.0.1 - - [26/Apr/2020 18:26:21] "GET /api/v1/resources/post/sortedByScore HTTP/1.1" 200 -
127.0.0.1 - - [26/Apr/2020 18:26:44] "GET / HTTP/1.1" 200 -

Terminal - student@tuffix-vm:~/Documents/csp-449-project-1/testing_non-prod
File Edit View Terminal Tabs Help
(ENV) student@tuffix-vm:~/Documents/csp-449-project-1/testing_non-prod$ bash vote_test.sh
Upvoting post....
{"message": "Upvote successfully"}
Downvoting post....
{"message": "Downvote successfully"}
200
Retrieving post score....
{"downvotes": -1, "postid": "2", "upvotes": 0}
200
Retrieving top scored posts....
[{"community": "null", "date": "2020-04-26 18:08:00", "downvotes": 0, "postid": 2, "title": "Computer Status", "upvotes": 1, "username": "null"}, {"community": "null", "date": "2020-04-26 18:08:00", "downvotes": -1, "postid": 3, "title": "Mac VS PC", "upvotes": 0, "username": "null"}, {"community": "null", "date": "2020-04-26 18:08:00", "downvotes": 0, "postid": 1, "title": "Coronavirus", "upvotes": 0, "username": "null"}, {"community": "null", "date": "2020-04-26 18:08:00", "downvotes": 0, "postid": 4, "title": "Mac", "upvotes": 0, "username": "null"}]
200
Retrieving post with identifiers....
{"sorted list": "3,7,1"}
200
```

Running the script tests the following API requests:

- Upvote a post
- Downvote a post
- Report the number of upvotes and downvotes for a post
- List the n top-scoring posts to any community
- Given a list of post identifiers, return the list sorted by score.

Check DB Browser to verify if the data was updated in the database by selecting the “userpost_tbl” table. The post scores will have been updated.

Testing (Production)

Production testing is done using a WSGI server called Gunicorn. Foreman is used to run a Procfile that manages the Gunicorn and Caddy processes for each microservice. 3 instances are created for each microservice. The Caddyfile proxies’ direct requests for “http://localhost:2015/posts” to the Posts microservice, requests for “http://localhost:2015/users” to the Users microservice, http://localhost:2015/messages” to the Messages microservice, and http://localhost:2015/votes” to the Votes microservice. It also handles the load balancing method which in this case is round robin. The script tests are the same tests that were executed in non-production testing, besides the `test_all.sh` script.

Be sure to have a fresh database to view the successful HTTP status codes, delete existing database and run `python3 create_db.py`, otherwise you will be getting the conflict status codes.

Individual Microservice Testing:

Check DB Browser to verify if the data was inserted into the database.

On the sixth terminal run the Message testing shell script:

```
$ bash message_test.sh
```

Check DB Browser to verify if the data was inserted into the database.

On the sixth terminal run the Vote testing shell script:

```
$ bash vote_test.sh
```

Check DB Browser to verify if the data was updated in the database.

All Microservice Testing:

On the sixth terminal run the shell script to test all the microservices:

```
$ bash test_all.sh
```

Check DB Browser to verify if the data was inserted into the database.

API Requests

CURL commands for User microservice (non-production)

- For production commands, change `http://127.0.0.1:5000` → `http://localhost:2015/users`
- Ex: `http://127.0.0.1:5000/api/v1/resources/users/create` → `http://localhost:2015/users/api/v1/resources/users/create`

HTTP Method	CURL Command Example
POST	<pre>#Create user curl --location --request POST 'http://127.0.0.1:5000/api/v1/resources/users/create' \ --header 'Content-Type: application/json' \ --data-raw '{"email":"bob@gmail.com","username":"bob","karma":"0"}' \ --write-out '%{http_code}\n'</pre>
PUT	<pre>#Update email curl --location --request PUT 'http://127.0.0.1:5000/api/v1/resources/users/email' \ --header 'Content-Type: application/json' \ --data-raw '{"username":"bob","email":"b@gmail.com"}' \ --write-out '%{http_code}\n'</pre>
PUT	<pre>#Increment Karma curl --location --request PUT 'http://127.0.0.1:5000/api/v1/resources/users/inc' \ --header 'Content-Type: application/json' \ --data-raw '{"username":"bob"}' \ --write-out '%{http_code}\n'</pre>
PUT	<pre>#Decrement Karma curl --location --request PUT 'http://127.0.0.1:5000/api/v1/resources/users/dec' \ --header 'Content-Type: application/json' \ --data-raw '{"username":"bob"}' \ --write-out '%{http_code}\n'</pre>
DELETE	<pre>#Deactivate account curl --location --request DELETE 'http://127.0.0.1:5000/api/v1/resources/users/remove' \ --header 'Content-Type: application/json' \</pre>

	<pre>--data-raw '{"username":"bob"}' \ --write-out '%{http_code}\n'</pre>
--	---

CURL commands for Post microservice (non-production)

- For production commands, change `http://127.0.0.1:5000` → `http://localhost:2015`
- Ex: `http://127.0.0.1:5000/api/v1/resources/post/create_post` → `http://localhost:2015/posts/api/v1/resources/post/create_post`

HTTP Method	CURL Commands Example
POST	<pre>#Create a new post curl --location --request POST 'http://127.0.0.1:5000/api/v1/resources/post/create_post' \ --header 'Content-Type: application/json' \ --data-raw '{"community": "Corona-19", "text": "Things are going better!", "title": "CoronaVirus", "url": "null", "username": "Zexin"}' \ --write-out '%{http_code}\n'</pre>
DELETE	<pre>#Delete an existing post curl --location --request DELETE 'http://127.0.0.1:5000/api/v1/resources/post/delete_post' \ --header 'Content-Type: application/json' \ --data-raw '{"postId": "6"}' \ --write-out '%{http_code}\n'</pre>
GET	<pre># Retrieves a post based on the id of a post curl --location --request GET 'http://127.0.0.1:5000/api/v1/resources/post/retrieve_post' \ --header 'Content-Type: application/json' \ --data-raw '{"postId": "3"}' \ --write-out '%{http_code}\n'</pre>
GET	<pre>#List the n most recent posts to a particular community curl --location --request GET 'http://127.0.0.1:5000/api/v1/resources/post/listNthToACommunity' \ --header 'Content-Type: application/json' \ --data-raw '{"nth": 2,"community": "Computer"}' \ --write-out '%{http_code}\n'</pre>
GET	<pre>#List the n most recent posts to any community curl --location --request GET 'http://127.0.0.1:5000/api/v1/resources/post/listNthToAny' \ --header 'Content-Type: application/json' \ --data-raw '{"nth": 5}' \ --write-out '%{http_code}\n'</pre>

CURL commands for Message microservice (non-production)

- For production commands, change `http://127.0.0.1:5000` → `http://localhost:2015`
- Ex: `http://127.0.0.1:5000/api/v1/resources/post/message` → `http://localhost:2015/messages/api/v1/resources/post/message`

HTTP Method	CURL Commands Example
POST	<pre>#send a message curl --location --request POST 'http://127.0.0.1:5000/api/v1/resources/message' \ --header 'Content-Type: application/json' \ --data-raw '{"userto":"alice","userfrom":"bob","messagecontents":"hello alice :)", "messageflag":"favorite"}' \ --write-out '%{http_code}\n'</pre>
GET	<pre>#show favorite messages curl --location --request GET 'http://127.0.0.1:5000/api/v1/resources/message/favorite' \ --header 'Content-Type: application/json' \ --data-raw '{"messageflag":"favorite"}' \ --write-out '%{http_code}\n'</pre>
DELETE	<pre>#delete message curl --location --request DELETE 'http://127.0.0.1:5000/api/v1/resources/message/delete' \ --header 'Content-Type: application/json' \ --data-raw '{"messageid":"1"}' \ --write-out '%{http_code}\n'</pre>

CURL commands for Vote microservice (non-production)

- For production commands, change `http://127.0.0.1:5000` → `http://localhost:2015/votes`
- Ex: `http://127.0.0.1:5000/api/v1/resources/post/upvote` → `http://localhost:2015/votes/api/v1/resources/post/upvote`

HTTP Method	CURL Commands Example
PUT	<pre># Upvote a post curl --location --request PUT 'http://127.0.0.1:5000/api/v1/resources/post/upvote' \ --header 'Content-Type: application/json' \ --header 'Content-Type: application/json' \ --data-raw '{"postId": "2"}'</pre>
PUT	<pre># Downvote a post curl --location --request PUT 'http://127.0.0.1:5000/api/v1/resources/post/downvote' \ --header 'Content-Type: application/json' \ --data-raw '{"postId": "3"}' \ --write-out '%{http_code}\n'</pre>
GET	<pre># Report the number of upvotes and downvotes for a post curl --location --request GET 'http://127.0.0.1:5000/api/v1/resources/post/retrieve_vote' \ --header 'Content-Type: application/json' \ --data-raw '{"postId": "3"}' \ --write-out '%{http_code}\n'</pre>
GET	<pre># List the n top-scoring posts to any community curl --location --request GET 'http://127.0.0.1:5000/api/v1/resources/post/topNthScore' \</pre>

	--header 'Content-Type: application/json' \ --data-raw '{"nth": 4}' \ --write-out '%{http_code} \n'
GET	# Given a list of post identifiers, return the list sorted by score. curl --location --request GET 'http://127.0.0.1:5000/api/v1/resources/post/sortedByScore' \ --header 'Content-Type: application/json' \ --data-raw '{"list": "1,3,7"}' \ --write-out '%{http_code} \n'

Supplemental Issues

Virtual Machine Issues in Setup

Tuffix is known to have some errors when trying to download, update, or install many packages at a given time. If you are having locking issues when trying to install packages/dependences in the virtual environment, follow the instructions below.

See which processes are running:

```
$ ps aux | grep -l apt
```

```
student@tuffix-vm:~/Desktop/CPSC449$ ps aux | grep -l apt
root      525  0.0  0.0  4628  816 ?        Ss   21:23   0:00 /bin/sh /usr/lib/apt/apt.systemd.daily install
root      560  0.0  0.0  4628 1684 ?        S    21:23   0:00 /bin/sh /usr/lib/apt/apt.systemd.daily lock_is_held install
student   1656  0.0  0.0  22000 1148 pts/0    S+   21:29   0:00 grep --color=auto -i apt
```

Kill all root processes:

```
$ sudo kill <PID>
```

```
student@tuffix-vm:~/Desktop/CPSC449$ sudo kill 525
student@tuffix-vm:~/Desktop/CPSC449$ sudo kill 560
```

To kill the remaining process, we must identify the real PID of the process in the lock-frontent folder

```
$ sudo lsof /var/lib/dpkg/lock-frontent
```

```
student@tuffix-vm:~/Desktop/CPSC449$ sudo lsof /var/lib/dpkg/lock-frontent
lsof: WARNING: can't stat() fuse.gvfsd-fuse file system /run/user/1000/gvfs
Output information may be incomplete.
COMMAND  PID USER  FD  TYPE DEVICE SIZE/OFF  NODE NAME
unattende 1010 root   5uW REG   8,1      0 264117 /var/lib/dpkg/lock-frontent
```

Kill all the remaining process with PID you discovered from the previous command

```
$ sudo kill <PID>
```

Everything should be good to go. Install virtual environment with this command

```
$ sudo apt-get install python3-venv
```