

CPSC-449-Web Backend Engineering Project-3

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Project Description:

This project is intended to effectively build a RESTful Web back-end API for a game which is similar to the very well known game "Wordle", with difference of few conditions or features from the original game. Some of these features which are included are creating a new scoreboard service, and duplicating the game database to achieve read replication.

In this project we are creating a new service for keeping a leaderboard, which makes use of Python's Quart web framework, and redis for data storage. This service is currently decoupled from the other services implemented in the first two projects.

In this project we also used litefs to replicate our database for the games service and implemented read replication. This utilized Python's Quart web framework, it also uses litefs for database replication, Python's itertools library to assist in read replication, NginX for load balancing, and as a proxy to handle authentication.

Configuration files and service startup:

1. Install the necessary files
 - a. `sudo apt update`
 - b. `sudo apt install --yes nginx-extras`
 - c. `pip install redis`
2. Initialization (run these commands at the project root directory)
 - a. `./bin/init_litefs.sh`
 - b. `./bin/init_auth.sh`
3. Start the services
 - a. `foreman start`
4. Initialize the game database, only needed if running the services for the first time (run these commands at the project root directory)
 - a. `./bin/init_game.sh`

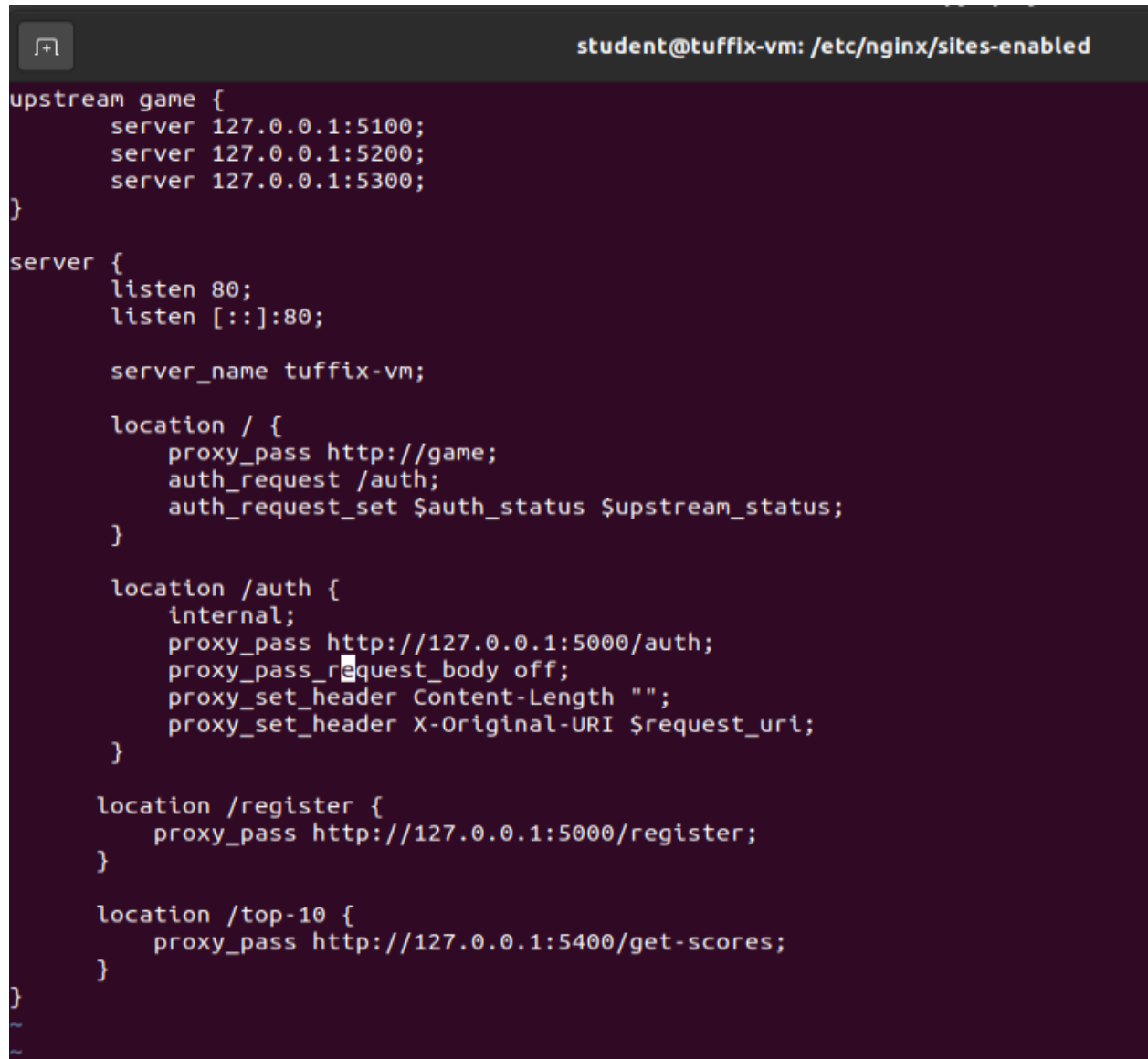
Configure Nginx

The nginx configuration file is in /nginx_config

You can either copy /nginx_config/tutorial from the project root folder to /etc/nginx/sites-enabled

Or

Create a new nginx configuration file with the following settings

A terminal window with a dark background and light green text. The title bar at the top reads 'student@tuffix-vm: /etc/nginx/sites-enabled'. The terminal displays the following nginx configuration code:

```
upstream game {  
    server 127.0.0.1:5100;  
    server 127.0.0.1:5200;  
    server 127.0.0.1:5300;  
}  
  
server {  
    listen 80;  
    listen [::]:80;  
  
    server_name tuffix-vm;  
  
    location / {  
        proxy_pass http://game;  
        auth_request /auth;  
        auth_request_set $auth_status $upstream_status;  
    }  
  
    location /auth {  
        internal;  
        proxy_pass http://127.0.0.1:5000/auth;  
        proxy_pass_request_body off;  
        proxy_set_header Content-Length "";  
        proxy_set_header X-Original-URI $request_uri;  
    }  
  
    location /register {  
        proxy_pass http://127.0.0.1:5000/register;  
    }  
  
    location /top-10 {  
        proxy_pass http://127.0.0.1:5400/get-scores;  
    }  
}
```

```
upstream game {
```

```
    server 127.0.0.1:5100;
```

```
server 127.0.0.1:5200;  
server 127.0.0.1:5300;  
}
```

```
server {  
    listen 80;  
    listen [::]:80;  
  
    server_name tuffix-vm;  
  
    location / {  
        proxy_pass http://game;  
        auth_request /auth;  
        auth_request_set $auth_status $upstream_status;  
    }  
  
    location /auth {  
        internal;  
        proxy_pass http://127.0.0.1:5000/auth;  
        proxy_pass_request_body off;  
        proxy_set_header Content-Length "";  
        proxy_set_header X-Original-URI $request_uri;  
    }  
  
    location /register {  
        proxy_pass http://127.0.0.1:5000/register;
```

```
}
```

```
location /top-10 {
```

```
    proxy_pass http://127.0.0.1:5400/get-scores;
```

```
}
```

```
}
```

Services

User Microservice

Register

Endpoint	http://tuffix-vm/register
Method	POST
Http Basic Auth	No
Body	No

Game Microservice

Create new game

Endpoint	http://tuffix-vm/game
Method	POST
Http Basic Auth	Yes
Body	No

Make a guess to a game

Endpoint	http://tuffix-vm/game/:gameId
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Method	PATCH
Http Basic Auth	Yes
Body	Yes
Example Body	{"word": "apple"}

Get game state

Endpoint	http://tuffix-vm/game/:gameId
Method	GET
Http Basic Auth	Yes
Body	No

Get user's games

Endpoint	http://tuffix-vm/my-games
Method	GET
Http Basic Auth	Yes
Body	No

Score Microservice

Top 10

Endpoint	http://tuffix-vm/top-10
Method	GET
Http Basic Auth	No
Body	No

Add Score

Endpoint	http://localhost:5400/add-score
Method	POST
Http Basic Auth	No
Body	{"username": "name", "guesses": 0-5, "win": True or False}

Examples:

Replace <http://mirdiland> with <http://tuffix-vm>

```
spmcCarthy4@mirdiland:~/cpsc449/proj3/other/cpsc449-project3$ http --follow POST http://mirdiland/register username=joe password=buck
HTTP/1.1 200
Connection: keep-alive
Content-Length: 55
Content-Type: application/json
Date: Sat, 03 Dec 2022 03:13:16 GMT
Server: nginx/1.18.0 (Ubuntu)
```

```
{
  "message": "Successfully registered!",
  "statusCode": 200
}
```

```
spmcCarthy4@mirdiland:~/cpsc449/proj3/other/cpsc449-project3$ http --follow -a joe:buck POST http://mirdiland/game
HTTP/1.1 201
Connection: keep-alive
Content-Length: 61
Content-Type: application/json
Date: Sat, 03 Dec 2022 03:14:26 GMT
Server: nginx/1.18.0 (Ubuntu)
```

```
{
  "gameId": "bd0e9543-54ce-4022-bab6-b7c50b02dc2b",
  "guesses": 6
}
```

```
spmcCarthy4@mirdiland:~/cpsc449/proj3/other/cpsc449-project3$ http --follow -a joe:buck PATCH http://mirdiland/game/bd0e9543-54ce-4022-bab6-b7c50b02dc2b word=almes
HTTP/1.1 200
Connection: keep-alive
Content-Length: 294
Content-Type: application/json
Date: Sat, 03 Dec 2022 03:15:39 GMT
Server: nginx/1.18.0 (Ubuntu)
```

```
{
  "data": [
    {
      "a": {
        "inSecret": false,
        "wrongSpot": false
      }
    },
    {
      "l": {
        "inSecret": false,
        "wrongSpot": false
      }
    },
    {
      "n": {
        "inSecret": false,
        "wrongSpot": false
      }
    },
    {
      "e": {
        "inSecret": false,
        "wrongSpot": false
      }
    }
  ],
}
```

```
spmccarthy4@mirdiland:~/cpsc449/proj3/other/cpsc449-project3$ http --follow -a joe:buck GET http://mirdiland/my-games
HTTP/1.1 200
Connection: keep-alive
Content-Length: 96
Content-Type: application/json
Date: Sat, 03 Dec 2022 03:17:01 GMT
Server: nginx/1.18.0 (Ubuntu)
```

```
[
  {
    "finished": false,
    "gameId": "bd0e9543-54ce-4022-bab6-b7c50b02dc2b",
    "guessesLeft": 5,
    "won": false
  }
]
```

```
spmccarthy4@mirdiland:~/cpsc449/proj3/other/cpsc449-project3$ http POST http://127.0.0.1:5400/add-score username=joe guesses=6 win=true
HTTP/1.1 200
content-length: 25
content-type: application/json
date: Sat, 03 Dec 2022 03:20:13 GMT
server: hypercorn-h11
```

```
{
  "Success": "Added Score"
}
```

```
student@tuffix-vm:~$ http --follow http://tuffix-vm/top-10
HTTP/1.1 200
Connection: keep-alive
Content-Length: 112
Content-Type: application/json
Date: Sat, 03 Dec 2022 04:23:26 GMT
Server: nginx/1.18.0 (Ubuntu)
```

```
{
  "Top10leaderboard": [
    {
      "place": "1",
      "score": "4.0",
      "username": "jun"
    },
    {
      "place": "2",
      "score": "3.0",
      "username": "apr"
    }
  ]
}
```

```

spmcCarthy4@mirdiland:~/cp449/proj3/other/cpsc449-project3$ foreman start
19:05:29 auth.1 | started with pid 2893
19:05:29 game_1.1 | started with pid 2894
19:05:29 game_2.1 | started with pid 2895
19:05:29 game_3.1 | started with pid 2896
19:05:29 score.1 | started with pid 2897
19:05:29 primary.1 | started with pid 2898
19:05:29 secondary1.1 | started with pid 2900
19:05:29 secondary2.1 | started with pid 2901
19:05:33 primary.1 | Using static primary: is-primary=true hostname=localhost advertise-url=http://mirdiland:20202
19:05:33 secondary2.1 | Using static primary: is-primary=false hostname=localhost advertise-url=http://mirdiland:20202
19:05:33 secondary1.1 | Using static primary: is-primary=false hostname=localhost advertise-url=http://mirdiland:20202
19:05:34 secondary1.1 | existing primary found (localhost), connecting as replica
19:05:34 secondary2.1 | existing primary found (localhost), connecting as replica
19:05:34 primary.1 | primary lease acquired, advertising as http://mirdiland:20202
19:05:34 secondary1.1 | LiteFS mounted to: ./var/secondary1/mount
19:05:34 secondary1.1 | http server listening on: http://localhost:20203
19:05:34 secondary1.1 | waiting to connect to cluster
19:05:34 secondary2.1 | LiteFS mounted to: ./var/secondary2/mount
19:05:34 secondary2.1 | http server listening on: http://localhost:20204
19:05:34 secondary2.1 | waiting to connect to cluster
19:05:34 primary.1 | LiteFS mounted to: ./var/primary/mount
19:05:34 primary.1 | http server listening on: http://localhost:20202
19:05:34 primary.1 | waiting to connect to cluster
19:05:34 primary.1 | connected to cluster, ready
19:05:34 primary.1 | stream connected
19:05:34 primary.1 | stream connected
19:05:34 secondary2.1 | recv frame<ready>
19:05:34 secondary1.1 | recv frame<ready>
19:05:34 secondary2.1 | connected to cluster, ready
19:05:34 secondary1.1 | connected to cluster, ready
19:05:55 game_3.1 | [2022-12-02 19:05:55 -0800] [2965] [INFO] Running on http://127.0.0.1:5300 (CTRL + C to quit)
19:05:56 game_1.1 | [2022-12-02 19:05:56 -0800] [2967] [INFO] Running on http://127.0.0.1:5100 (CTRL + C to quit)
19:05:56 game_2.1 | [2022-12-02 19:05:56 -0800] [2966] [INFO] Running on http://127.0.0.1:5200 (CTRL + C to quit)
19:05:56 score.1 | [2022-12-02 19:05:56 -0800] [2970] [INFO] Running on http://127.0.0.1:5400 (CTRL + C to quit)
19:05:56 auth.1 | [2022-12-02 19:05:56 -0800] [2968] [INFO] Running on http://127.0.0.1:5000 (CTRL + C to quit)

```