

server.js

```

const Server = require('./framework/server-class'); // Server framework
class

let mainServer = new Server.Server('localhost','8080',{}); // Instantiate
Server
require('./database/init.js').initDB().then(() => { // Wait for the DB to
be initialised
    mainServer.openDB(__dirname + '/database/dev.db'); // Initliase DB in
mainServer
    // Placeholder db path for production db
    mainServer.run(); // Run the server
}); // Initialises DB and runs server

/* TODO -
1. Implement proper routing (making use of imported functions?) [server-
class.js] --DONE--
2. Add error handling so server doesnt crash on faulty request [server-
class.js] -- N/a --
3. Implement a proper DBMS [new files] -- 100% --
4. Connect DBMS to frontend [new files & frontend] -- 100% --
5. Refactor server side editor page to handle projectID in url -- 100% --
6. Edit account page and editor page to use session storage for password &
accountid -- 100% --
7. Rewrite the fronted and backend to use username as pk in accountTbl --
100% --
8. Rewrite server & backend class to handle res in resource functions --
100% --
9. Comment all functions etc. -- 50% --
*/

```

database/db-mgmt.js

```

const sqlite3 = require('sqlite3').verbose();
const sqlite = require('sqlite');
/** Class used to perform database operations and store connection */
class dbManager {
    /**
     * Opens the database and stores connection
     * @param {String} dbPath - An absolute file path to the DB
     * @constructor
     */
    constructor (dbPath) {
        this.db = sqlite.open({
            filename : dbPath,
            mode: sqlite3.OPEN_READWRITE,
            driver: sqlite3.cached.Database

```

```

        }).then((res) => {
            res.on('trace', (data) => {
                console.log(data);
            }); // For debugging, prints any SQL statements recieved by
the
                // DB to the console.
            res.exec('PRAGMA foreign_keys = ON;'); // Enables foreign
keys
                return res;
        }).catch((err) => {
            console.log('error in opening db');
            console.log(err);
            process.abort(); // Fail - failed to open DB - probably invalid
file path
        }); // Opens the DB - NOTE
            // THIS IS ASYNC
            // Essentially if a request is passed to this object AS it is
created,
            // or until however long it takes to open the db, it will fail.
        }

    /**
     * Runs some SQL statement and DOES NOT return result
     * @param {String} sql
     * @param {Object} params
     * @returns {Object}
     */
    async _dbExec(sql, params) {
        return await (await this.db).run(sql, params);
    }

    /**
     * Runs some SQL statement and returns the first result row
     * @param {String} sql
     * @param {Object} params
     * @returns {Object} Row
     */
    async _dbGet(sql, params){
        return await (await this.db).get(sql, params);
    }

    /**
     * Runs some SQL statement and returns all result rows
     * @param {String} sql
     * @param {Object} params
     * @returns {Array} All rows
     */
    async _dbAll(sql, params){
        return await (await this.db).all(sql, params);
    }
}

module.exports = {dbManager};

```

database/init.js

```
const sqlite3 = require('sqlite3');
const sqlite = require('sqlite');

async function initDB() {
  const db = await sqlite.open({
    filename : __dirname + '/dev.db',
    driver: sqlite3.Database
  })

  await db.exec(`CREATE TABLE IF NOT EXISTS accountTbl (
    username TEXT NOT NULL UNIQUE,
    password TEXT NOT NULL,
    salt TEXT NOT NULL,
    PRIMARY KEY (username)
  );`);

  await db.exec(`CREATE TABLE IF NOT EXISTS projectTbl (
    projectID INTEGER NOT NULL UNIQUE,
    username TEXT NOT NULL,
    projectName TEXT,
    PRIMARY KEY (projectID),
    CONSTRAINT fk_accountTbl
      FOREIGN KEY (username)
      REFERENCES accountTbl(username)
      ON DELETE CASCADE
  );`);

  await db.exec(`CREATE TABLE IF NOT EXISTS contentTbl (
    projectID INTEGER NOT NULL,
    type INTEGER NOT NULL,
    content TEXT,
    PRIMARY KEY (projectID, type),
    CONSTRAINT fk_projectTbl
      FOREIGN KEY (projectID)
      REFERENCES projectTbl(projectID)
      ON DELETE CASCADE
  );`);

  // Creates tables if they do not exist
  db.close();
}

module.exports = {initDB};
```

framework/database-class.js

```
const dbManagement = require('../database/db-mgmt');
const crypto = require('node:crypto');
```

```

/** Class to handle all database operations
 * @extends dbManager
 */
class DatabaseAccess extends dbManagement.dbManager { // inherits
dbManagement.dbManager
  constructor(db_path) {
    super(db_path); // PLACEHOLDER name for production db
  }

  /**
   * Generates a salt of the desired length
   * @param {Number} length
   * @returns {String} salt
   */
  static #generateSalt(length){
    return crypto.randomBytes(Math.ceil(length /
2)).toString('hex').slice(0,length);
    // https://blog.logrocket.com/building-a-password-hasher-in-node-
js/
  }

  /**
   * Uses HMAC with sha512 and a salt to hash some input data
   * @param {String} plaintext
   * @param {String} salt
   * @returns {String} hashed data
   */
  static #hash(plaintext, salt){
    let hash = crypto.createHmac('sha512', salt);
    hash.update(plaintext);
    return {hashedValue: hash.digest('hex'), salt: salt};
  }

  /**
   * Compares a plaintext password with a hashed password
   * @param {String} inputPassword
   * @param {String} salt
   * @param {String} desiredPassword
   * @returns {Boolean} boolean result
   */
  static #validatePassword(inputPassword, salt, desiredPassword){
    let hashedPassword = DatabaseAccess.#hash(inputPassword,
salt).hashedValue;
    return hashedPassword == desiredPassword;
  }

  /**
   * Creates an account -
   * Can fail, returning an errno of 19 if the username already exists,
   * or an errno of 0 if the password is invalid
   * @param {String} username - Account username
   * @param {String} password - Plaintext password
   * @returns {Object} Either:

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*           - {lastID, changes} for success
*           - {errno, errdsc} for fail
*/
createAccount(username, password){
  if (password.length < 8){
    return {errno: 0, errdsc: 'Password must be a minimum of 8
characters long.'};
  } // Fail - password not long enough
  if (username.length > 20 || username.length < 1) {
    return {errno: 0, errdsc: 'Username must be within 1-20
characters long.'};
  } // Fail - username invalid
  const hashInformation = DatabaseAccess.#hash(password,
DatabaseAccess.#generateSalt(128));
  return this._dbExec('INSERT INTO accountTbl (username, password,
salt) VALUES ($username,$password, $salt);', {
    $username : username,
    $password : hashInformation.hashedValue,
    $salt: hashInformation.salt
  }).then((result) => {
    if (result.changes == 1){
      return result; // Success - created account
    }
  }).catch((err) => {
    if (err.errno == 19){
      console.log("Username already exists.");
      return {errno: 0, errdsc: "Username already exists."};
    }
    console.log(err); // Dont log 'username already exists' errors
    return err; // Fail - unknown
  });
}

/**
* Attempts to login -
* Can fail, returning an errno of 0 if the password is incorrect or if
there are no accounts found
* @param {String} username - Account username
* @param {String} password - Plaintext password
* @returns {Object} Either:
*           - {username, success} if success
*           - {errno, errdsc} if failiure
*/
login(username, password){
  return this._dbGet('SELECT password, salt FROM accountTbl WHERE
accountTbl.username = $username;', {
    $username : username
  }).then((result) => {
    if (result){
      if (DatabaseAccess.#validatePassword(password, result.salt,
result.password)){
        return {username: username}; // Success
      } else {
        return {errno: 0, errdsc: 'Wrong password'}; // Fail -

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wrong password
    }
    } else {
        return {errno: 0, errdsc: 'No account found'}; // Fail - no
account found
    }
    }).catch((err) => {
        console.log(err);
        return err; // Fail - unkown
    });
}

/**
 * Returns all projects associated with a specific account -
 * Can fail, returning an errno of 0 if no projects are found
 * @param {String} username - Account username
 * @returns {Object} Either:
 *     - An array of {projectName, projectID} if success
 *     - {errno, errdsc} if failiure
 */
getProjects(username){
    return this._dbAll('SELECT projectName, projectID FROM projectTbl
WHERE projectTbl.username = $username;', {
        $username: username
    }).then((result) => {
        if (result.length != 0){
            return result; // Success
        } else {
            return this._dbGet('SELECT username FROM accountTbl WHERE
accountTbl.username = $username', {
                $username: username
            }).then((result) => {
                if (result){
                    return {errno: 0, errdsc: 'No projects found.'} //
Fail - no projects saved
                } else {
                    return {errno: 1, errdsc: 'No account found.'} //
Fail - no account found
                }
            })
        }
    }).catch((err) => {
        console.log(err);
        return err; // Fail - unkown
    });
}

/**
 * Attempts to delete an account
 * @param {String} username - Account username
 * @param {String} password - Plaintext password
 * @returns {Object} Either:
 *     - {lastID, changes} if success
 *     - {errno, errdsc} if failiure

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    */
    deleteAccount(username, password){
        return this.login(username, password).then((result) => {
            if (result.username == username){
                return this._dbExec('DELETE FROM accountTbl WHERE
accountTbl.username = $username;', {
                    $username: username
                }).then((result) => {
                    return result; // Success
                });
            } else {
                return result; // Fail - login failed
            }
        }).catch((err) => {
            console.log(err);
            return err; // Fail - unkown
        });
    } // Attempts to delete account

    /**
     * Creates a new project or updates an existing one
     * @param {String} username - Account username
     * @param {String} password - Plaintext password
     * @param {String} projectName - Project Name
     * @param {Array[String]} projectContent - Project content
     * @param {Number} projectID - Project ID
     * @returns {Object} Either:
     *     - {projectID} if success
     *     - {errno, errdsc} if failiure
     */
    saveProject(username, password, projectName, projectContent, projectID)
    {
        return this.login(username, password).then((result) => {
            if (result.username == username) {
                if (projectID){
                    return this._dbGet('SELECT projectName FROM projectTbl
WHERE projectTbl.projectID = $projectID and projectTbl.username =
$username;', {
                        $projectID: projectID,
                        $username: username
                    }).then(result => {
                        if (result && result.projectName == projectName) {
                            // Project already exists
                            projectContent.forEach((element, index) => {
                                this._dbExec('UPDATE contentTbl SET content
= $content WHERE contentTbl.projectID = $projectID AND contentTbl.type =
$type;', {
                                    $projectID: projectID,
                                    $type: index,
                                    $content: element
                                });
                            });
                        }
                        return {projectID: projectID}; // Success
                    } else { // Project is being forked (same ID

```

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different name)
        return this._dbExec(`INSERT INTO
projectTbl(projectName, username) VALUES (
        $projectName, $username
        );`, {
        $projectName: projectName,
        $username: username
    }).then((result) => {
        projectID = result.lastID;
        projectContent.forEach((element, index) =>
{
            this._dbExec('INSERT INTO contentTbl
VALUES ($projectID, $type, $content);', {
                $projectID: projectID,
                $type: index,
                $content: element
            });
        });
        return {projectID: projectID}; // Success
    });
    }
    });
    } else { // Project does not already exist
        return this._dbExec(`INSERT INTO
projectTbl(projectName, username) VALUES (
        $projectName, $username
        );`, {
        $projectName: projectName,
        $username: username
    }).then((result) => {
        projectID = result.lastID;
        projectContent.forEach((element, index) => {
            this._dbExec('INSERT INTO contentTbl VALUES
($projectID, $type, $content);', {
                $projectID: projectID,
                $type: index,
                $content: element
            });
        });
        return {projectID: projectID}; // Success
    });
    }
    } else {
        return result; // Fail - Login failed
    }
}).catch((err) => {
    console.log(err);
    return err; // Fail - unknown
});
}

/**
 * Gets all project data associated with a projectID
 * @param {Number} projectID - Project ID

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    * @param {boolean} metadata - Whether or not to only send metadata
    (project name)
    * @returns {Object} Either:
    *           - {projectContent, projectName} if success
    *           - {errno, errdsc} if failiure
    */
    loadProject(projectID){
        projectID = Number(projectID);
        if (Number.isNaN(projectID)) {return {errno: 0, errdsc: 'Invalid
project ID'}};
        return this._dbAll('SELECT content, type FROM contentTbl WHERE
contentTbl.projectID = $projectID;', {
            $projectID: projectID
        }).then(result => {
            if (result.length != 0){
                let projectContent = [0,0,0,0];
                result.forEach(element => {
                    projectContent[element.type] = element.content;
                });
                return this._dbGet('SELECT projectName FROM projectTbl
WHERE projectTbl.projectID = $projectID;',{
                    $projectID: projectID
                }).then(result => {
                    return {projectContent: projectContent, projectName:
result.projectName}; // Success
                })
            } else {
                return {errno: 0, errdsc: 'No project found'}; // Fail - no
project found
            }
        }).catch(err => {
            console.log(err);
            return err; // Fail - unkown
        });
    }

    /**
    * Delets the given project
    * @param {String} username - Account username
    * @param {String} password - Plaintext password
    * @param {Number} projectID - Project ID
    * @returns {Object} Either:
    *           - {lastID, changes} if success
    *           - {errno, errdsc} if failiure
    */
    deleteProject(username, password, projectID){
        projectID = Number(projectID);
        if (Number.isNaN(projectID)) {return {errno: 0, errdsc: 'Invalid
project ID'}};
        return this.login(username, password).then((result) => {
            if (result.username == username){
                return this._dbExec('DELETE FROM projectTbl WHERE
projectTbl.projectID = $projectID AND projectTbl.username = $username', {
                    $projectID: projectID,

```

```

        $username: username
    }).then(result => {
        if (result.changes !== 0){
            return result; // Success
        } else {
            return {errno: 0, errdsc: 'No project found on
account'}; // Fail - no project found
        }
    })
    } else {
        return result; // Fail - login failed
    }
}).catch((err) => {
    console.log(err);
    return err; // Fail - unknown
});
}
}

module.exports = {DatabaseAccess};

```

framework/server-class.js

```

const http = require('node:http'); // set to https later
const fs = require('node:fs');
const path = require('node:path');
const dataBaseClass = require('./database-class');

/**
 * Class containing HTTP server logic
 */
class Server {
    /**
     * @constructor
     * @param {String} hostname
     * @param {Number} port
     * @param {Object} options - Options to be passed to the HTTP server
     */
    constructor (hostname, port, options){
        this.hostname = hostname;
        this.port = port
        this.options = options;
    }

    /**
     * Creates an instance of DatabaseAccess to use for DB operations
     * @param {String} db_path - Absolute path to database file
     */
    openDB (db_path) {
        this.dbAccess = new dataBaseClass.DatabaseAccess(db_path);
    }
}

```

```

    /**
     * Gets all contents and MIME types of files in the specified directory
     and returns them as an object
     * @param {String} filePath - Path to search directory
     * @returns {Object} An object containing the contents of the provided
     directory and any subdirectories
     */
    static #recursiveReadDir(filePath){
        let data = {}
        fs.readdirSync(filePath).forEach((file) => {
            if (fs.statSync(filePath + file).isDirectory()){
                data[file] = Server.#recursiveReadDir(filePath + file +
                '/' );
            } else {
                data[file] = {content: fs.readFileSync(filePath + file),
                type:
                Server.#findMimeType(path.extname(file).slice(1))};
            }
        });
        return data
    }

    /**
     * Follows a search path provided in searchArray through a provided
     object
     * E.g: ['dir1','dir2','file'] corresponds to 'dir1/dir2/file'
     * @param {Object} obj Object to be searched
     * @param {Array} searchArray Search array
     * @returns {Object} An object containing the contents and MIME type of
     a file
     */
    static #recursiveObjSearch(obj, searchArray){
        try { var returnObj = obj[searchArray[0]]; }
        catch { return null; }
        if (searchArray.length == 1){
            return returnObj
        } else {
            return Server.#recursiveObjSearch(returnObj,
            searchArray.slice(1));
        }
    }

    /**
     * Converts file extensions into the appropriate MIME type
     * @param {String} fileExt The file extension
     * @returns {String} MIME type
     */
    static #findMimeType(fileExt){
        switch (fileExt){
            case 'js':
                return 'text/javascript';
            case 'html':
                return 'text/html';
        }
    }

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        case 'css':
            return 'text/css';
        case 'png':
            return 'image/png'
        default:
            return 'text/html'
    }
}

/**
 * Sends a resource specified in the url with http
 * @param {http.ServerResponse} res
 * @param {Object} resourceDirectory An object produced by
Server.#recursiveReadDir()
 * @param {String} url The target url
 */
static #getResource(res, resourceDirectory, url){
    url = decodeURIComponent(url);
    if (url == '/'){
        url = '/account_page.html'; // Default page
    }
    let urlArray = url.split('/').slice(1);
    let searchIndex = urlArray[0].indexOf('?');
    if (searchIndex != -1){
        urlArray[0] = urlArray[0].slice(0,searchIndex);
    }
    let tempResource = Server.#recursiveObjSearch(resourceDirectory,
urlArray);
    if (!tempResource) {
        let fofResource = Server.#recursiveObjSearch(resourceDirectory,
['404-page.html']);
        res.writeHead(404, {'Content-Type':'text/html'});
        res.end(fofResource.content);
    } else {
        if (tempResource.type == null){
            Server.#error(res, 500);
        } else {
            res.writeHead(200, {'Content-
Type':`${tempResource.type}`});
            res.end(tempResource.content);
        }
    }
}

/**
 * Handles a post request (probably by passing information to
this.dbAccess) and sends a response with http
 * @param {http.ServerResponse} res
 * @param {Object} body Body content of the request -> This is assumed
to be JSON encoded
 */
async #postResourceJSON(res, body){
    const reqBody = JSON.parse(body);
    console.log(reqBody);
}

```

```
    let resultContent = {};  
    switch (reqBody.method) {  
      case 'create-account':  
        if (reqBody.username && reqBody.password) {  
          resultContent = await  
this.dbAccess.createAccount(reqBody.username, reqBody.password);  
        }  
        break;  
      case 'log-in':  
        if (reqBody.username && reqBody.password) {  
          resultContent = await  
this.dbAccess.login(reqBody.username, reqBody.password);  
        }  
        break;  
      case 'get-projects':  
        if (reqBody.username) {  
          resultContent = await  
this.dbAccess.getProjects(reqBody.username);  
        }  
        break;  
      case 'delete-account':  
        if (reqBody.username, reqBody.password) {  
          resultContent = await  
this.dbAccess.deleteAccount(reqBody.username, reqBody.password);  
        }  
        break;  
      case 'save-project':  
        if (reqBody.username && reqBody.password &&  
reqBody.project_name && reqBody.project_content.length == 4 &&  
Array.isArray(reqBody.project_content)) {  
          resultContent = await  
this.dbAccess.saveProject(reqBody.username, reqBody.password,  
reqBody.project_name, reqBody.project_content, reqBody.projectID);  
        }  
        break;  
      case 'load-project':  
        if (reqBody.projectID) { // This will fail if project ID ==  
0, but as the ID's start from 1, not a problem  
          resultContent = await  
this.dbAccess.loadProject(reqBody.projectID);  
        }  
        break;  
      case 'delete-project':  
        if (reqBody.username && reqBody.password &&  
reqBody.projectID) {  
          resultContent = await  
this.dbAccess.deleteProject(reqBody.username, reqBody.password,  
reqBody.projectID);  
        }  
        break;  
      default:  
        break;  
    }  
    if (Object.keys(resultContent).length == 0){  
      /
```

```

        Server.#error(res, 500);
        return;
    }

    res.writeHead(200, {'Content-Type': 'application/json'});
    if (resultContent.errdsc) {
        res.end(JSON.stringify({error: resultContent, stmtResult:
null}));
    } else {
        res.end(JSON.stringify({error: null, stmtResult:
resultContent}));
    }
}

/**
 * Generic error method to send the given error code as the http
response
 * @param {http.ServerResponse} res
 * @param {Number} code Error code, i.e 405 - method not allowed etc.
 */
static #error(res, code){
    console.log(`Error ${code}`); // DEBUG
    res.writeHead(code);
    res.end();
}

/**
 * Initialises the http server, NOT THE DB, and runs it.
 */
run() {
    this.publicFiles = Server.#recursiveReadDir('./public/');

    this.server = http.createServer(this.options, (req, res) => {
        req.on('error', (err) => {
            console.log(err);
            Server.#error(res, 400);
        });
        res.on('error', (err) => {
            console.log(err);
            Server.#error(res, 400);
        })
        console.log({'method': req.method, 'url': req.url});
        switch (req.method){
            case 'GET':
                Server.#getResource(res, this.publicFiles, req.url);
                break;
            case 'POST':
                if (!this.dbAccess) {
                    console.log('Tried to access DB before
initialisation!');
                    Server.#error(res, 500); // DB is not initialised
                    break;
                }
                // https://nodejs.org/en/docs/guides/anatomy-of-an-

```

```

http-transaction
    let body = [];
    req.on('data', (chunk) => {
        body.push(chunk);
    }).on('end', () => {
        body = Buffer.concat(body).toString();
        switch (req.headers['content-type']) {
            case 'application/json':
                this.#postResourceJSON(res, body);
                break;
            default:
                console.log(body);
                Server.#error(res, 500);
                break;
        }
    });
    break;
default:
    Server.#error(res, 405);
    break;
}
});

this.server.listen(this.port, this.hostname, () => {
    console.log(`Server listening at
${this.hostname}:${this.port}`);
    // Some Exit logic here
});
}
}

module.exports = {Server};

```

public/account.js

```

// Different Modal Contents
const signInModalContent = `

# 


```

```

<input type="password" id="password" /><br>
<label>Re-enter Password:</label>
<input type="password" id="password-re-entry" /><br> <br>
<button id="submit-login" onclick="submitCreateAccount()">Submit</button>
<button id="switch-mode" onclick="showLoginModal()">Sign In</button>
<div id="modal_output"></div>`;

const accountMgmtModalContent = `

# 


```



```

    modalContent.innerHTML = `

# Delete Project</h1> <hr> <br> <p>Deleting a project will permanently delete all associated data, are you sure?</p> <button onclick="deleteProject(${projectId});hideModals()">Yes</button> <button onclick="hideModals()">Cancel</button>`; modal.style.display = 'block'; } function hideModals() { modal.style.display = 'none'; // Hides modal } function modalOutput(output){ document.getElementById('modal_output').innerText = output; } // Database operations async function submitCreateAccount(){ const passwordInput = document.getElementById('password'); const usernameInput = document.getElementById('username'); const passwordReentryInput = document.getElementById('password-re- entry'); if (passwordInput.value !== passwordReentryInput.value){ modalOutput('Passwords do not match.') return; } let inputed_username = usernameInput.value; if (inputed_username == ''){ modalOutput('Please enter a username.');


```

```
function login(){
  let inputed_username = document.getElementById('username').value;
  if (inputed_username == ''){
    modalOutput('Please enter a username.');
```

```
    return;
  }
  let inputed_password = document.getElementById('password').value;
  if (inputed_password == ''){
    modalOutput('Please enter a password.');
```

```
    return;
  }
  const dataToSubmit = {
    method: 'log-in',
    username: inputed_username,
    password: inputed_password
  }
  req('/', dataToSubmit).then(result => {
    if (result.error){ // If login fails
      if (result.error.errno == 0) {
        modalOutput(result.error.errdsc);
      } else {
        modalOutput('UNKOWN ERROR - Sign in failed.');
```

```
      }
    } else {
      hideModals();
      saveAccountInfo(result.stmtResult.username,
document.getElementById('password').value);
    }
  }).catch(error => {
    modalOutput('UNKOWN ERROR - Sign in failed.');
```

```
  });
}

function deleteAccount(){
  let inputed_password = document.getElementById('password').value;
  if (inputed_password == ''){
    modalOutput('Please enter a password.');
```

```
    return;
  }
  req(url = '/', {
    method: 'delete-account',
    username: accUsername,
    password: inputed_password
  }).then(res => {
    if (res.error){
      if (res.error.errno == 0) {
        modalOutput(res.error.errdsc);
      } else {
        modalOutput('UNKOWN ERROR - Delete account failed.');
```

```
      }
    } else {
      logout();
    }
  })
}
```

```
    });  
  }  
  
  function loadProjects(){  
    projectList.innerHTML = '';  
    if (!accUsername){  
      return;  
    }  
    req(url = '/', {  
      method: 'get-projects',  
      username: accUsername  
    }).then(res => {  
      if (!res.stmtResult){  
        if (res.error.errno == 0){  
          projectList.innerHTML = `Uh oh - looks like you dont have  
any saved projects!<br><a href='/editor.html'>Make a new project?</a><br><a  
href='http://localhost:8080/editor.html?projectid=1'>View an example  
project?</a>`;  
          return;  
        } else if (res.error.errno == 1){  
          window.sessionStorage.clear(); // Invalid account username  
in session storage  
          accUsername = null;  
          showLoginModal(); // Reload page  
          return;  
        }  
      }  
      res.stmtResult.forEach(project => {  
        projectList.innerHTML +=  
projectListTemplate(project.projectName, project.projectID);  
      });  
      projectList.innerHTML += '<br><button  
onclick="editProject(null)">Create New</button>';  
    });  
  }  
  
  function deleteProject(projectID){  
    req(url = '/', {  
      method: 'delete-project',  
      username: accUsername,  
      password: accPassword,  
      projectID: projectID  
    }).then(res => {  
      if (res.error){  
        if (result.error.errno == 0) {  
          alert(result.error.errrdsc);  
        } else {  
          alert('UNKOWN ERROR - Delete account failed.');        }  
      } else {  
        loadProjects();  
      }  
    });  
  }  
}
```

```

// Manages account information
function logout(){
    saveAccountInfo(null, null);
    showLoginModal();
}

function saveAccountInfo(username, password){
    accUsername = username;
    accPassword = password;
    // Could do something with cookies here to make account info
    // persist through pages, but not in project scope.
    if (username === null || password === null) {
        window.sessionStorage.clear();
        document.getElementById('page-info').innerText = "Not signed in.";
    } else {
        window.sessionStorage.setItem('password', password);
        window.sessionStorage.setItem('username', username);
        document.getElementById('page-info').innerText = username;
    }
    loadProjects();
}

// Project list management
function projectListTemplate(projectName, projectID){
    return `- 

```

public/editor_container.js

```

class EditorContainer {
    constructor(documentID, pages, defaultPage){ // Constructor method
        this.editor = CodeMirror(document.getElementById(documentID), {
            mode: "clike",
            lineNumbers: "true",
            matchBrackets: "true"

```

```

        }); // Codemirror 5 used for editor
        this.pageContent = pages;
        this.page = defaultPage;
        this.#loadPage();
    }

    switchPage(newPageID){ // Public method that swaps the currently
displayed page
        this.syncPages();
        this.page = newPageID;
        this.#loadPage();
    }

    syncPages(){ // Public method to sync the currently displayed content
with the stored content for that page
        this.pageContent[this.page] = this.editor.getValue();
    }

    #loadPage(){ // Private method to change currently displayed content
        this.editor.setValue(this.pageContent[this.page]);
    }
}

```

public/editor.js

```

// Modal Content
const signInModalContent = `

# Please Sign In</h1> <hr> <br> <label>Username:</label> <input type="text" id="username" /><br> <label>Password:</label> <input type="password" id="password" /><br> <label>Project Name:</label> <input type="text" id="project_name" /><br> <br> <button id="submit-login" onclick="login();">Submit</button> <button id="cancel" onclick="hideModals();">Cancel</button> <div id="modal_output"></div>`; const projectNameModalContent = ` <label>Project Name:</label> <input type="text" id="project_name" /><br> <br> <button id="submit-login" onclick="projectName = document.getElementById('project_name').value;hideModals();sendProjectData( );">Submit</button> <button id="cancel" onclick="hideModals();">Cancel</button> <div id="modal_output"></div>` // Initialising constants const modal = document.getElementById('login-modal'); const modalContent = document.getElementById('login-modal-content'); modal.style.display = 'none';


```

```

// Fetching account info
var accountInfo = null;
var projectName = null;

if (window.sessionStorage.getItem('username')){
    accountInfo = {
        username: window.sessionStorage.getItem('username'),
        password: window.sessionStorage.getItem('password')
    }
}

// Initialising glCanvas
glCanvas = new GLCanvas("glScreen");

var projectID = null;
var editorContainer = null;
if (window.location.search){
    let search = window.location.search;
    if (search.length > 1){search = search.slice(1);}
    let searchArray = search.split('=');
    if (searchArray[0] == 'projectid' && searchArray.length > 1){
        projectID = searchArray[1];
    }
} // There is probably a better way to do this, but it works

// Loading project
if (!projectID){
    loadDefaultPages();
} else {
    loadProjectPages();
}

function loadDefaultPages(){
    editorContainer = new EditorContainer("editor_container",
        [GLCanvas.defaultFragment,
        GLCanvas.defaultVertex,
        convertToPrettyString(GLCanvas.defaultVertices, 6),
        convertToPrettyString(GLCanvas.defaultIndices,3)],
        0
    );
    runCode();
}

function loadProjectPages(){
    req('/', {method:'load-project',projectID:projectID}).then(result => {
        if (!result.error){
            editorContainer = new EditorContainer("editor_container",
                [result.stmtResult.projectContent[0],
                result.stmtResult.projectContent[1],
                result.stmtResult.projectContent[2],
                result.stmtResult.projectContent[3]],
                0
            );
            document.getElementById('page-info').innerText =

```

```

result.stmtResult.projectName;
    projectName = result.stmtResult.projectName;
    runCode();
  } else {
    alert(`Error loading project ${projectID}`)
    loadDefaultPages();
  }
}).catch(error => {
  alert(`Error loading project ${projectID}`)
});
}

// Editor functions
function convertToArray(string_input){
  return string_input.toString().replace(/\[\] \n]/g,
  "").split(",").map(Number);
}

function convertToPrettyString(array_input, line_interval){
  let output = "";
  for (let i = 0; i < array_input.length; i++){
    output += `${array_input[i]},` + ((i + 1) % line_interval == 0 ?
  "\n" : "");
  }
  return output.slice(0, -2);
}

// Switching tabs
function fragmentTab(){
  editorContainer.switchPage(0);
}
function vertexTab(){
  editorContainer.switchPage(1);
}
function verticesTab(){
  editorContainer.switchPage(2);
}
function indicesTab(){
  editorContainer.switchPage(3);
}

// Player controls
function runCode(){
  editorContainer.syncPages();
  glCanvas.initProgram(editorContainer.pageContent[0],
    editorContainer.pageContent[1]);
  let vertices = convertToArray(editorContainer.pageContent[2]);
  let indices = convertToArray(editorContainer.pageContent[3]);
  glCanvas.initBuffers(vertices, indices);
  glCanvas.renderStart = performance.now();
  glCanvas.render();
}

// Initialising player variables

```

```

const debugInfoDiv = document.getElementById("debug_info");
debugInfoDiv.style.display = "none";
var debugInfoVis = false;
var nextAnimationFrameID = 0;
var debugInfoLast = 0;
const performanceInfo = document.getElementById("performance_info");
const uniformInfo = document.getElementById("uniform_info");

const resSlider = document.getElementById("resolution_slider");
const resDisplay = document.getElementById("resolution_display");

// Debug Info
function debugInfo(){
  if (!debugInfoVis){
    debugInfoDiv.style.display = "block";
    nextAnimationFrameID =
window.requestAnimationFrame(debugInfoUpdate);
  } else {
    debugInfoDiv.style.display = "none";
    window.cancelAnimationFrame(nextAnimationFrameID);
  }
  debugInfoVis = !debugInfoVis;
}

function debugInfoUpdate(time){
  nextAnimationFrameID = window.requestAnimationFrame(debugInfoUpdate);
  uniformInfo.innerText =
    `Mouse: ${Math.round(glCanvas.mouse.pos.x * 1000) /
1000},${Math.round(glCanvas.mouse.pos.y * 1000) /
1000},${glCanvas.mouse.buttons.lmb}}
    Time: ${Math.round(glCanvas.time - glCanvas.renderStart)) /
1000}`;
  if (time - debugInfoLast > 1000){ // Update every second
    debugInfoLast = time;
  } else{
    return;
  }
  performanceInfo.innerText =
    `FPS: ${Math.round(glCanvas.fps * 100) / 100}
MSPF: ${Math.round(glCanvas.mspf * 100) / 100}`;
}

// Resolution slider logic
function resChange(){
  newRes = resSlider.value;
  glCanvas.updateRes(newRes);
  resDisplay.innerText = `${newRes} px`;
}

// Save project
function saveCode(){
  if (!accountInfo){
    showModal();
  } else if (!projectId) {

```



```
        showProjectNameModal();
    } else {
        sendProjectData();
    }
}

function saveCodeAs() {
    if (!accountInfo){
        showModal();
    } else {
        showProjectNameModal();
    }
}

// Database operations
function login(){
    let inputed_username = document.getElementById('username').value;
    if (inputed_username == ''){
        modalOutput('Please enter a username.');
```

return;

```
    }
    let inputed_password = document.getElementById('password').value;
    if (inputed_password == ''){
        modalOutput('Please enter a password.');
```

return;

```
    }
    const dataToSubmit = {
        method: 'log-in',
        username: inputed_username,
        password: inputed_username
    }
    req('/', dataToSubmit).then(result => {
        if (result.error){ // If login fails
            if (result.error.errno == 0) {
                modalOutput(result.error.errdsc);
            } else {
                modalOutput('UNKOWN ERROR - Sign in failed.');
```

}

```
        } else {
            saveAccountInfo(result.stmtResult.username,
document.getElementById('password').value);
            hideModals();
            sendProjectData();
        }
    }).catch(error => {
        modalOutput('UNKOWN ERROR - Sign in failed.');
```

});

```
    }

function saveAccountInfo(username, password){
    projectName = document.getElementById('project_name').value;
    accountInfo = {
        username: username,
        password: password
```

```
};
if (username === null || password === null) {
    window.sessionStorage.clear();
} else {
    window.sessionStorage.setItem('password', password);
    window.sessionStorage.setItem('username', username);
}
}

function sendProjectData(){
    editorContainer.syncPages();
    if (!projectName) {
        showProjectNameModal();
        modalOutput("Please enter a project name.");
        return;
    }
    req(url = '/', {
        method: 'save-project',
        username: accountInfo.username,
        password: accountInfo.password,
        project_name: projectName,
        project_content: editorContainer.pageContent,
        projectID: projectID
    }).then(res => {
        if (res.error){
            if (res.error.errno == 0) {
                console.log(res);
                modalOutput(res.error.errdsc);
            } else {
                modalOutput('UNKOWN ERROR - Save project failed.');
```

```
function modalOutput(output){
  document.getElementById('modal_output').innerText = output;
}
```

public/global.js

```
/**
 * Sends a POST request to the server
 * @param {string} url
 * @param {JSON} data
 * @returns {JSON}
 */
async function req(url = '', data = {}) {
  const response = await fetch(url, {
    method: 'POST',
    credentials: 'omit',
    headers: {'content-type': 'application/json'},
    body: JSON.stringify(data),
  });
  if (response.ok){
    return response.json();
  }
}
```

public/404-page.html

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <title>404</title>
</head>
<style>
  * {
    font-family: Arial, Helvetica, sans-serif;
    text-align: center;
  }

  .fof {
    size: 10rem;
  }
</style>
<body>
  <div id="main">
    <div class="fof">
      <h1>Error 404</h1>
      <p>Resource not found</p>
    </div>
  </div>
</body>
</html>
```

```
        </div>
    </div>
</body>
</html>
```

public/account_page_style.css

```
body {
    display: flex;
    flex-direction: column;
    gap:0;
}

#content {
    display: flex;
    flex-direction: row;
    align-content: center;
    justify-content: center;
    gap: 1rem;
    flex:1;
}

#project-list {
    width: 75%;
    margin-top: 1rem;
}

#project-list-ul {
    list-style: none;
}

.project-list-li {
    border-style: solid;
    border-width: 1px;
    padding: 0.25rem;
    display: flex;
}

.project-delete-button {
    align-self: flex-end;
}

.project-name {
    flex-grow: 1;
    flex-basis: 0;
    text-align: center;
    align-self: center;
}

.project-list-li:hover {
```

```
border-style: solid;
border-width: 3px;
padding: 0.25rem;
}
```

public/account_page.html

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <link rel="stylesheet" href="global_style.css">
  <link rel="stylesheet" href="account_page_style.css">
  <script src="global.js"></script>
  <title>My Account</title>
</head>
<body>
  <div id="header">
    <span id="page-info">
      Not logged in.
    </span>
    <div id="account-info">
      
    </div>
  </div>
  <div id="content">
    <div id="login-modal" class="modal">
      <div id="login-modal-content">

      </div>
    </div>
    <div id="project-list">
      <ul id="project-list-ul">
      </ul>
    </div>
  </div>

  <script src="account.js"></script>
</body>
</html>
```

public/editor_style.css

```
body {
  display: flex;
```

```
    flex-direction: column;
    gap:0;
}

#content {
    display: flex;
    flex-direction: row;
    align-content: center;
    justify-content: center;
    gap: 1rem;
    flex:1;
}

#editor_master_container{
    flex-grow: 2;
    width: 60%;
    text-align: left;
    margin-top: 0.5rem;
    margin-right: 0.5rem;
    margin-bottom: 0.5rem;
    border: 1px;
    border-style: solid;
}

#editor_tabs {
    display: flex;
    align-items: center;
    border-bottom-style: solid;
    border-bottom-color: #dddddd;
}

.span-button {
    position: relative;
    padding:0.25rem;
    background-color: #f7f7f7;
    border-top-right-radius: 5px;
}

.span-button:hover{
    background-color: #dddddd;
}

.span-button:active {
    background-color: white;
}

#debug_info {
    position:absolute;
    left: 1rem;
    top: 1rem;
    background-color: white;
    padding: 0.1rem;
    text-align: left;
}
```

```
#editor_controls {
  margin-top: 0.5rem;
  margin-left: 0.5rem;
  margin-bottom: 0.5rem;
}
.CodeMirror {
  height: 100%;
  width: 100%;
}
#glScreen{
  border: 1px;
  border-style: solid;
  width: 40vw;
}
```

public/editor.html

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <link rel="stylesheet" href="lib/codemirror.css">
  <link rel="stylesheet" href="global_style.css">
  <link rel="stylesheet" href="editor_style.css">
  <script src="lib/codemirror.js"></script>
  <script src="lib/clike.js"></script>
  <script src="lib/matchbrackets.js"></script>
  <script src="engine.js"></script>
  <script src="editor_container.js"></script>
  <script src="global.js"></script>
  <title>Editor</title>
</head>
<body>
  <div id="header">
    <span id="page-info">
      Untitled
    </span>
    <span id="account-info">
      <a href="account_page.html">
        
      </a>
    </span>
  </div>
  <div id="content">
    <div id="editor_controls" class="flex_item">
      <canvas id="glScreen"></canvas>
      <div id="debug_info">
        <p id="performance_info"></p>
      </div>
    </div>
  </div>
</body>
</html>
```

```

        <p id="uniform_info"></p>
    </div>
    <div>
        <button onclick="runCode()">Run Code</button>
        <button onclick="debugInfo()">Info</button>
    </div>
    <div class="slider-container">
        <input type="range" class="slider" id="resolution_slider"
min="100" max="2000" value="500" oninput="resChange()">
        <p class="inline-label" id="resolution_display">500 px</p>
    </div>
    <div>
        <button onclick="saveCode()">Save Code</button>
        <button onclick="saveCodeAs()">Save As</button>
    </div>
</div>
<div id="editor_master_container" class="flex_item">
    <div id="editor_tabs">
        <span class="span-button no-highlight"
onclick="fragmentTab()">Fragment</span>
        <span class="span-button no-highlight"
onclick="vertexTab()">Vertex</span>
        <span class="span-button no-highlight"
onclick="verticesTab()">Vertices</span>
        <span class="span-button no-highlight"
onclick="indicesTab()">Indices</span>
    </div>
    <div id="editor_container"></div>
</div>
</div>
<div id="login-modal" class=".modal">
    <div id="login-modal-content">

    </div>
</div>
<script src="editor.js"></script>
</body>
</html>

```

public/global_style.css

```

* {
    margin: 0;
    padding: 0;
    box-sizing: border-box;
}

button {
    padding: 0.1rem;
}

```



```
body{
  color:black;
  font-family: Arial, Helvetica, sans-serif;
  font-size: 1em;
  text-align: center;
  gap: 1rem;
  min-height:100vh;
}

.no-highlight{
  user-select: none;
  -moz-user-select: none;
  -webkit-text-select: none;
  -webkit-user-select: none;
}

.modal {
  display: none;
  position: fixed;
  z-index: 1;
  left: 0;
  top: 0;
  width: 100%;
  height: 100%;
  overflow: auto;
  background-color: rgb(0,0,0);
  background-color: rgba(0,0,0,0.4);
} /* https://www.w3schools.com/howto/howto_css_modals.asp */

#login-modal-content {
  background-color: white;
  position: absolute;
  top:50%;
  left:50%;
  margin:auto;
  transform: translate(-50%, -50%);
  width:50%;
  padding: 1rem;
  border-radius: 1rem;
  border-style: solid;
  border-color: black;
  border-width: 0.1rem;
}

#modal_output {
  padding: 1rem;
  color: red;
}

#header {
  padding: 0.5rem;
  background-color: gray;
  display: flex;
```

```
        text-align: right;
    }

    #account_icon {
        align-self: flex-end;
        width: 2rem;
    }

    #page-info {
        align-self: center;
        flex-grow: 1;
        flex-basis: 0;
        text-align: center;
    }
}
```

public/index_style.css

```
#content {
    display: flex;
    flex-direction: column;
    justify-content: center;
    align-items: center;
    padding: 1rem;
    padding-top: 2rem;
}

#glScreen{
    border: 1px;
    border-style: solid;
    height: 30vw;
}

#header {
    padding: 0.5rem;
    background-color: gray;
}
```