ÇANKAYA UNIVERSITY
FACULTY OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

Project Report
Version 2

CENG 408
Innovative System Design and Development II

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RAD.IO - Online Radio Application for Mobile and Web Platforms

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Abstract

The internet usage has grown rapidly over the years and radio stations wanted to keep and increase it is user base so, online radios became a thing. This new medium comes with new advantages, such as analyzing the listening audience's demographics; active user count, age, gender, geolocation, behavior (is it previous user or a new user), user agent info, music taste and so on. Data like this allows online radio to give much more quality content, targeted advertising. By this way, online radio attracts more users and keeps the current user.And we want to develop radio application so users will be able to listen to their favourite radio musics.Our application name is Rad.io and we will launch it both web and mobile platform. We will use Flutter to develop the mobile app UI and Django for the web platform as our back-end and front-end we will use HTML, CSS, Bootstrap and other frameworks & libraries needed for the design.

Key Words

Online Radio, Web Platform, Mobile Application, Live Stream, Live Chat, Flutter, Django, Python, Android Studio, Xcode, Bootstrap, Materialize CSS, PostgreSQL, Docker, Google Cloud, Nginx.

Özet

İnternet kullanımı yıllar içerisinde hızla büyüdü ve radyo istasyonları bu büyümeyi korumak ve artırmak istediler.Bu yüzden de online radyolar bir ün haline geldi. Bu yeni ortam, dinleyicilerin demografik özelliklerini analiz etmek; aktif kullanıcı sayısı, yaş, cinsiyet, coğrafi konum, davranış (önceki kullanıcı mı yoksa yeni kullanıcı mı), kullanıcı aracısı bilgisi, müzik zevki vb. Bunun gibi

veriler çevrimiçi radyonun çok daha kaliteli içerik ve hedefli reklam sunmasına olanak tanıyor. Bu şekilde, çevrimiçi radyo daha fazla kullanıcı çeker ve mevcut kullanıcıyı tutar. Ve biz de bu radyo uygulamasını geliştirmek istiyoruz, böylece kullanıcılar en sevdikleri radyo müziklerini dinleyebilecekler.Uygulama adımız "Rad.io" ve hem mobil hem de web platformu için çıkaracağız.Mobil uygulama arayüzü geliştirmek için Flutter'ı, web platform arayüzü için Django'yu back-end; HTML, CSS, Bootstrap, framework ve tasarım için gerekli olan diğer kütüphaneleri de front-end olarak kullanacağız.

Anahtar Kelimeler

Çevrimiçi Radyo, Web Platformu, Mobil Uygulama, Canlı Yayın, Canlı Mesajlaşma, Flutter, Django, Python, Android Studio, Xcode, Bootstrap, Materialize CSS, PostgreSQL, Docker, Google Cloud, Nginx.

1. Introduction

Internet radio is being evolved day by day, new features are being added and new researches have been developed. It is these advancements in wireless telephony and other devices that led us to radio becoming the broadcasting medium we enjoy today. Radio as a broadcasting medium brought with it important cultural consequences that must be considered when examining the future of radio in today's context.

The internet radio involves a streaming media, presenting listeners with a dynamic stream of audio that cannot be paused or replayed, much like FM/AM radios that are found in cars. Internet radio includes both mobile application and web application. In these days, mobile applications are having a better advantage in comparison to website radio streaming services.

1.1 Problem Statement

Listening to online radio stations is easy due to development in technology. You can listen to radio using your phone or a physical radio device. But in online radios sometimes there are serious problems that can prevent users from listening to radio. Since we are working on online, our biggest problems are delays in stream or server downtime.

2. Literature Search

2.1 What Is Radio?

2.2 What Is Online Radio?

Online radio means listening to radio via the internet. The radio signal is not transmitted via AM or FM, but streamed via the internet. This means that your device needs to be connected to the internet to receive the radio station. The internet connection can be Wi-Fi or mobile data. These services are accessible via the internet on lots of devices, including smart TVs, tablets, computers, laptops and smartphones.

Streaming means the content that you are listening to is brought to you directly from the internet. If your internet is not fast enough then the radio station will start and stop playing. This is called buffering [6].

3. Summary

3.1 Technology Used

We propose a web and mobile application. Our mobile part will use Flutter and backend will use Django framework which is a high-level Python Web framework that encourages rapid development and clean, pragmatic design, and PostgreSQL as relational database management system, and we will deploy our application behind Nginx in cloud platform.

3.2 Mobile Platform

The radio application for the mobile platform will include mobile services as well as a mobile application development framework for the UI which will be programmed using Dart. The framework used to develop the mobile app UI is Flutter.

3.2.1 What is Flutter?

Flutter is a cross-platform mobile application development framework developed by Google that can be used for iOS and Android and is programmed using Dart programming language.

To develop Flutter applications, you will need an IDE apparently, some examples for Flutter IDEs are Visual Studio Code, IntelliJ, Android Studio, etc.. Such IDEs work on developing Android applications only, unfortunately, as for iOS development, we will need to have a Macintosh device to be able to develop a mobile application for iOS. iOS devices need Xcode IDE which is only available on Mac devices. In addition, other tools will be needed like Xcode simulator and Android emulator to display the UI of the mobile applications.

3.3 Web Platform

The radio application for web platform will include web services to allow radio broadcasting among listeners as well as a web application web page which will be coded using Django as our back-end and as for the front-end we will use HTML, CSS, Bootstrap and other frameworks & libraries needed for the design.

4. Software Requirements Specification

4.1 Introduction

4.1.1 Purpose

This document provides detailed information about the requirements of the radio system software. It will include the vision statement and domain analysis regarding the project. As well as designs and detailed description of the system for both mobile and web platforms. Our intended audience is streamers and listeners.

4.1.2 Scope of Project

Nowadays, radio has become less popular because of some applications like Spotify. Users can reach any song at any time and they listen to people instead of radio streamers from applications like Youtube and Twitch. We think the radio concept needs innovation to keep up with the times. For this reason, we aimed to develop a fast, interactive, user-friendly and innovative online radio application for both web and mobile platforms which allows users and listeners more interactivity.

The purpose of Rad.io project is to design a “Online Radio Application for Mobile and Web Platforms“ which gives users more socialization chances with different additions. Our platform will use modern solutions and functionalities such as analyzing the audience and improving our user experience based on it. Minimalist and responsive design to improve usability. Scalable server infrastructure to handle the incoming traffic using modern solutions.

There are new points of view for a radio application. We aimed to combine radio concept with new ideas which are suitable for the internet age. The Rad.io system provides people a basic and functional online radio broadcasting station with a convenient UI and new things to learn and fun timings with others.

4.1.5 Overview of Document

In the first part, purpose and scope are described. The second part of the document describes functionalities and the third part describes requirement specifications of the Project Rad.io: Online Radio Application for Mobile and Web Platforms. Both parts describe the same application, but they include different explanations due to different audiences. The second part is written for general and non-technical explanations. The third part is written for developers with technical and detailed information.

4.2 Overall Description

4.2.1 Product Perspective

Project Rad.io is an internet radio application which has a new perspective for internet radio. Both mobile and computer users access the platform with an internet connection. To keep connecting with new technology and platforms, there is Spotify registration possibility. There are beneficial features for both streamer and users. Streamers can ask questions anytime and see answers at the same time. Users can add songs to their Spotify playlist if they like it or like the song for new song recommendations. With this new feature and perspective, radio concept will become popular again.

4.2.2 Product Functions

This part includes major functions of the Project Rad.io with non-technical explanations.

4.2.2.1 Live Radio Broadcast

The main purpose of the project is live radio broadcast. It allows users to listen to live radio broadcasting.

4.2.2.2 Non-Live Radio Broadcast

Users are able to listen to music from a playlist prepared before by admin when there is no live broadcast.

4.2.2.3 Membership

There are two membership opportunities: Normal registration and Spotify registration.

4.2.2.4 Live Chat

All users able to read the chat, but just registered users can write to the chat.

4.2.2.5 Song Recommendation

Registered users able to see song recommendations on their profiles according to their likes.

4.2.2.6 Live Survey

Users can vote for streamer's instant surveys.

4.2.2.7 Adding Songs to Spotify Playlist

Users, which registered with Spotify account, can add playing songs to their playlist.

4.2.2.8 User Ban

Admin able to ban users.

4.2.2.9 Events and News

Admin able to add news or events for users. Users can read this news from new page.

4.2.2.10 Podcasts

Users are able to listen to old records of streams.

4.2.2.11 Voice Chat (Optional)

Streamer able to invite any member from live chat to voice chat for a conversation.

4.2.2.12 Event Recommendation (Optional)

Application recommend events according to user's location with notifications on mobile platforms.

4.2.3 User Characteristics

4.2.3.1 Streamer/Admin

- Admin should know how to use computer for broadcast.

- Admin should know how to use mixer software (SAM 2).

4.2.3.2 Unregistered User

- Unregistered user should know how to use computer or smartphone with Android or iOS.

4.2.3.3 Registered User

- Registered user should know how to use computer or smartphone with Android or iOS.

4.2.3.4 Spotify-Registered User

-Spotify-Registered user should know how to use computer or smartphone with Android or iOS.

- Spotify-Registered user must have a Spotify account.

4.2.4 Constraints

Rad.io is limited to the data, it will use the internet.Also, storage capacity of the device as it takes up space in the device to be used.

4.2.5 Risks

- High network traffic.

- Connectivity issues about broadcast. If streamer disconnects as b plan player will play automatic music.

- Cross-platform incompatibilities. Some functions may not work on other platform, as b plan we may use wrapper for platform specific features.

4.3 Requirements Specification

4.3.1 External Interface Requirements

4.3.1.1 User interfaces

The user interface will be worked on Android, iOS and web browsers (Google Chrome, Firefox etc.).

4.3.1.2 Hardware interfaces

A computer and microphone for streamer

Users must have a computer or smartphone with Android or iOS.

4.3.1.3 Software interfaces

Streamer must have SAM 2 software on his/her computer.

4.3.1.4 Communications interfaces

Internet connection for both admin and users.

4.3.2 Performance Requirements

The minimum system requirements for smartphones:

Operating System: Android 4.4 or better - iOS 10 or better.

Storage: 100 - 200 MB

Ram: 1 GB or better

4.3.3 Software system attributes

4.3.3.1 Performance

Good internet connections may give better results and application usually sends audio data, so it will not spend so much data.

4.3.3.2 Availability

Rad.io available for web browsers and mobile platforms. Some functions available just for registered users.

4.3.3.3 Usability

- Users can directly starts the player.
- Users can like the song with one touch.
- Menu is very simple and there are not many different options.
- Users can connect with their Spotify accounts with one button.
- Music continues on background when user change the application.

4.3.3.4 Scalability

We aimed not to encounter a user limitation problem. For now, we can host 500-1000 users at the same time, but it may increase.

4.3.3.5 Portability

Rad.io designed for also mobile platforms (Android and iOS) so it can work with both operating systems.

4.3.3.6 Ease of Use

Project Rad.io is a user-oriented project. It will have a UI that will provide simple usage to user and this UI will be understandable and user- friendly.

4.4 Requirements Specification

4.4.1.3 Use Case Diagram

Figure 1 presents a use case diagram for the Rad.io application. The system shows the operations that end users can perform.

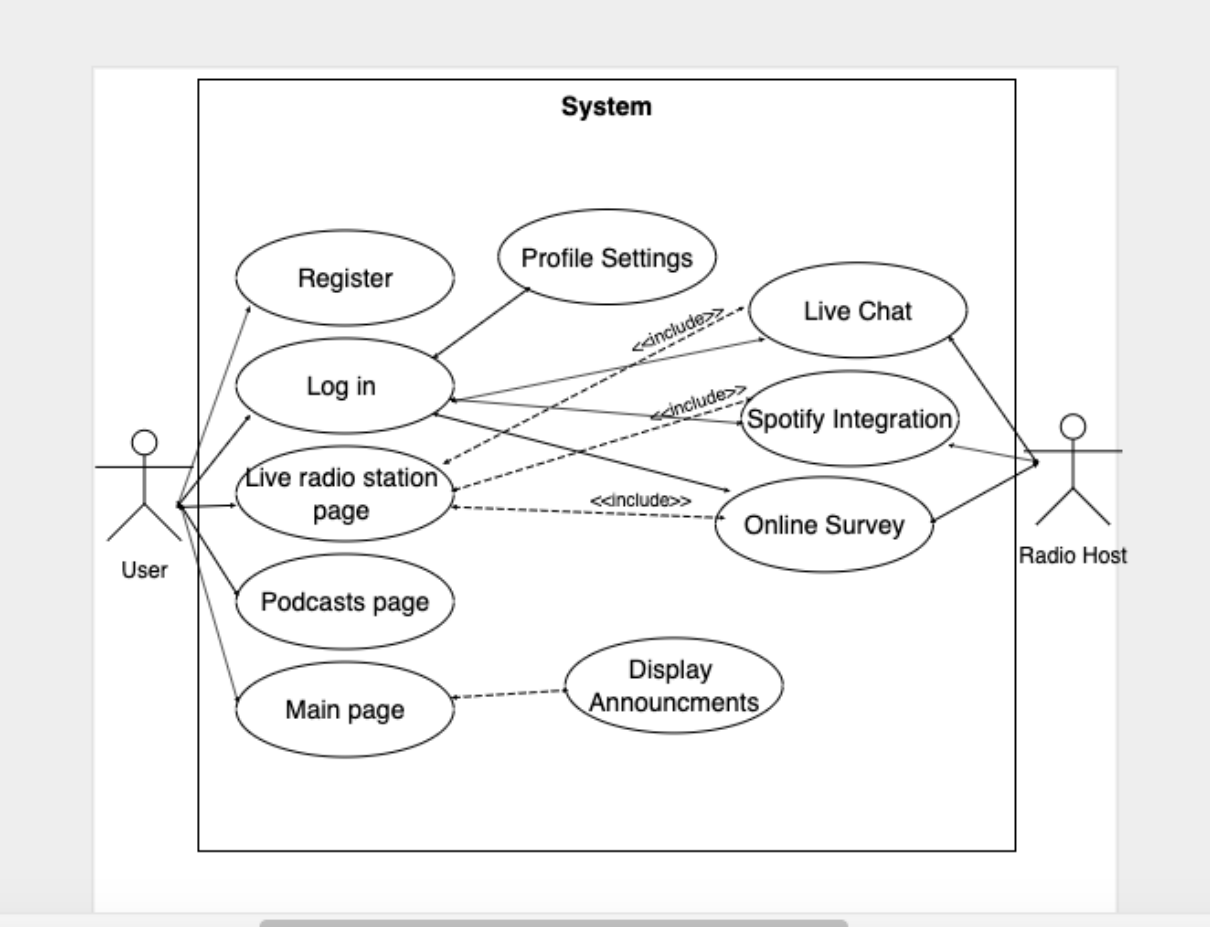


Figure 1 Rad.io Use Case Diagram

4.4.1.4 Brief Description of Use Case Diagram

The use-case diagram shows us the web pages that the user and radio host can access. The user can register to the website to gain more features, non-members can also access the website but cannot have the extra features. As shown, when the user accesses the "Live Radio station page" he/she can see the features but cannot use them unless they are registered to the system. Non-

members can read the live chat messages but will not able to chat with other members, they can see surveys but cannot participate, and so on. The radio host has the opportunity to take control of actions and operations over the live chat, spotify integration, and online survey during live streaming of the station.

4.4.2 Key - Use Cases

4.4.2.1 Membership Use Case

User Registration

User Agreement

Login

Check Information About User

Login Failed

Change Password

Brief Description:

Using this application requires an account.If users don't have an account they can create an account by pressing "Sign in" button.Users who want to use the Rad.io application, has to create an account to use main feature like chatting with other users.

Step-By-Step Description:

1) When users want to use Rad.io app, first they need to download from App Store or Google Play Store. Also, users can access Rad.io from the Web Platform. After entering the app they can listen to broadcasts, view chat but they have to register to Rad.io for more features.

2) In registration part user has to write their information about themselves like username, email, password etc.After writing e-mail , verification about registration will be sent to their email address and user confirms this to continue Rad.io app.

3) After confirmation , users can use the full features of Rad.io app like chatting with other users, adding songs to Spotify account(if they entered with the Spotify registration).

4) After registration, users can log in to the app but if they forget their password, they will be able to change password.

4.4.2.2 Dashboard Use Case

Announcements

Survey Result

Statistics

Brief Description:

In Dashboard, users will be able to see the statistics ,announcements about site, music and time of broadcasts. Also they will be able to know the results of the surveys that they voted or others' vote.

4.4.2.3 Host Use Case

Login for admin

Ban User

Create/Delete Announcement

Create Survey

Brief Description:

Admin of the system has to log in to make changes like adding/deleting announcements. He/she can arrange the time for broadcast and start/stop it. In broadcast there will be a chat for users. If some of users disrespect(or worse) to other users, admin will be able to ban those users. Also during broadcast or later admin will be able to create survey for songs, etc.

4.4.3 UML Class Diagram

Figure 2 presents a class diagram for the Rad.io application.

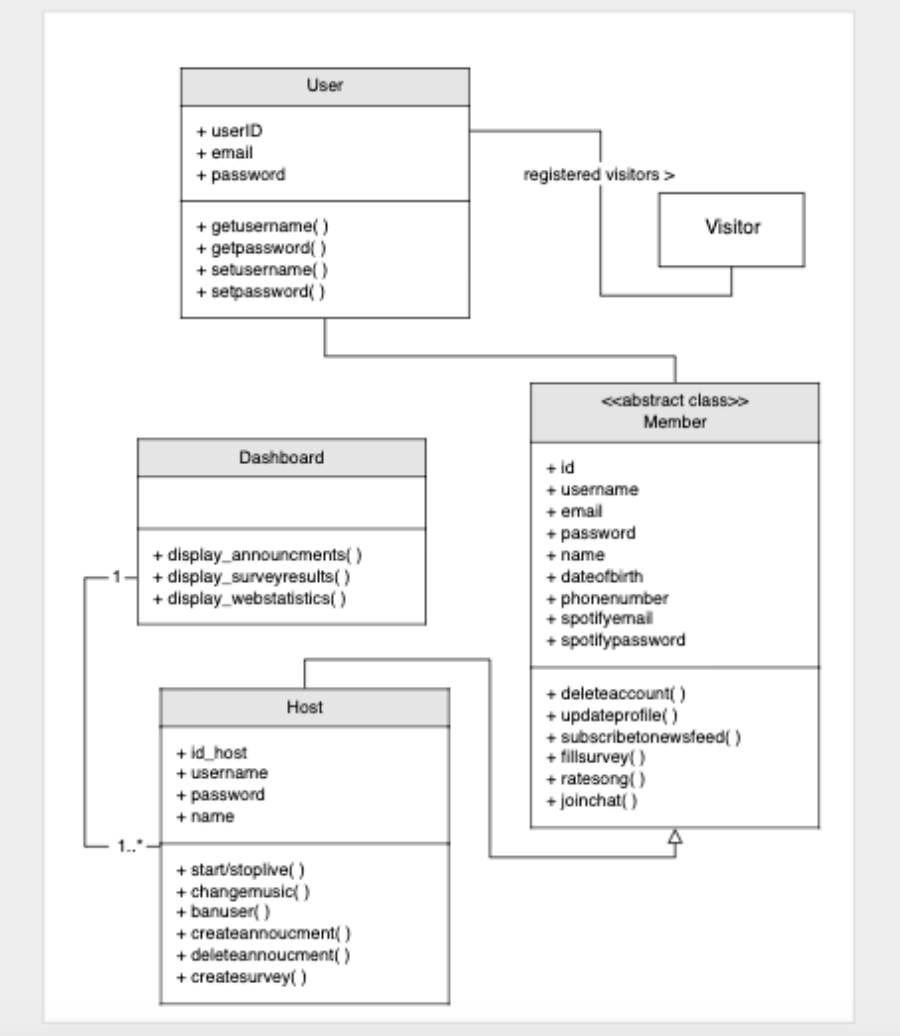


Figure 2 Rad.io Class Diagram

4.4.4 UI Sketches

Figure 3 presents UI sketches for the Rad.io application. Sketches shows the menu and tabs of the project Rad.io.

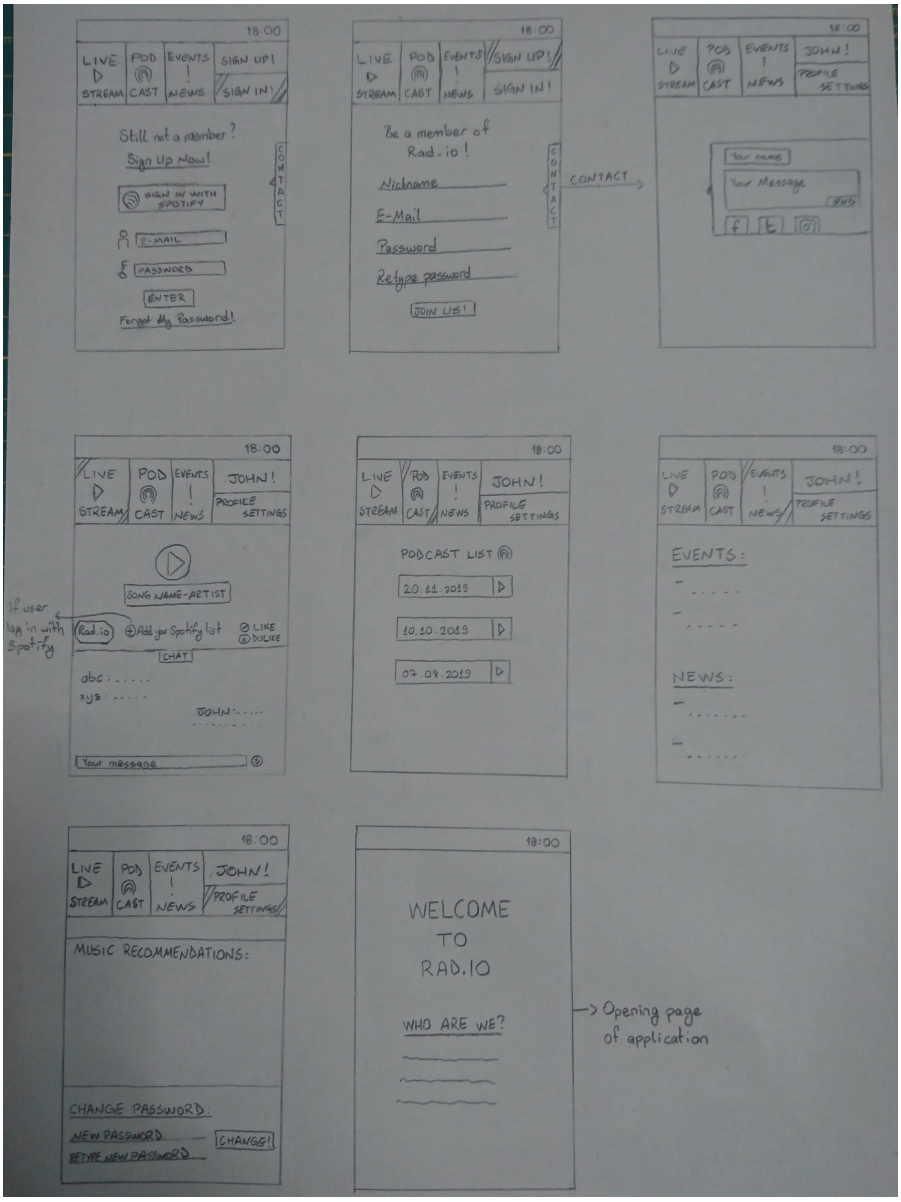


Figure 3 Rad.io UI Sketches

5. Software Design Description

5.1 Introduction

This document provides detailed information about the requirements of the radio system software. It will include the vision statement and domain analysis regarding the project. As well as designs and detailed description of the system for both mobile and web platforms.

5.1.1 Purpose

We aimed to develop a fast, interactive, and user-friendly online radio application that works on both web and mobile platforms. Our platform will use modern solutions and functionalities such as analyzing the audience and improving our user experience based on it. Minimalist and responsive design to improve usability. Scalable server infrastructure to handle the incoming traffic using modern solutions.

5.1.2 Scope and Design Goals

Nowadays, radio becomes less popular because of some applications like Spotify. Users can reach any song at anytime and they listen to people instead of radio streamers from applications like Youtube and Twitch. We think radio concept needs innovation to keep up with the times. For this reason, we aimed to develop a fast, interactive, user-friendly and innovative online radio application for both web and mobile platforms which allows users and listeners more interactivity.

The purpose of Rad.io project is to design a “Online Radio Application for Mobile and Web Platforms“ which gives users more socialization chance with different additions. Our platform will use modern solutions and functionalities such as analyzing the audience and improving our user experience based on it. Minimalist and responsive design to improve usability. Scalable server infrastructure to handle the incoming traffic using modern solutions.

There are new points of view for a radio application. We aimed to combine radio concept with new ideas which are suitable for the internet age. The Rad.io system provides people a basic and functional online radio broadcasting station with a convenient UI and new things to learn and fun timings with others.

The project is designed to be convenient, secure, helpful, and provides functionalities.

Convenient: UI of the project will be as simple as possible. Users will use this application easily to find their intended web resource as well as it minimizes the amount of tabs and pages of the user.

Security: application will have captcha system which is useful to prevent against login brute-force attacks with that even if the user has a simple password we are preventing attacker to find that out easily.

Helpful: the application will be provided a helping service through email for users who have a report or complain about an action and are free to ask and send an email whenever they want.

Functionality: application will include everything needed for the radio application. Users have their freedom to become a member of the application as they get new features provided by the system. The application will include live radio streaming service, live chat, joining surveys, listening to missed live streams (podcasts) and listening to music through Spotify integration.

5.1.3 Glossary

Table 2 Glossary of SDD

Term	Definition
UI	User Interface
Convenient	Easy to use
Brute-force attack	A brute-force attack consists of an attacker submitting many passwords or passphrases

	with the hope of eventually guessing correctly
Tab	Marker used to select additional web page(s) that has been opened in the browser window
API	Set of functions used by applications to communicate between other services
Module	Is a software component or part of a program that contains one or more routines
Hashes	A salt is random data that is used as an additional input to a one-way function that "hashes" data, a password, or passphrase
Services	Is a software distribution model in which a third-party provider hosts application and makes them available to customers over the internet
Subsystems	A self-contained system within a larger system
U-users	Unregistered users
R-users	Registered users
S-users	Registered users with Spotify accounts

5.1.4 References

[1]https://m204wiki.rocketsoftware.com/index.php/Application_Subsystem_development# Subsystem_procedures

5.1.5 Overview of document

This section provides information about the contents of the rest of the document as follows: Section 2, 3, 4 , and 5 describes the subsystems and services used for this project as well as the details of the design of the system. Section 6 and 7 displays, explains and shows the design of the user interface as well as UML diagrams of the system.

5.2 Architecture design

5.2.1 Hardware/software mapping

We are proposing server client application our application will run on server.

5.2.2 Persistent data management

In our project, for persistent data management we will use PostgreSQL which is relational database management system.

5.2.3 Access control and security

We are using builtin Django authentication middleware for user authentication and authenticate decorator. We are storing passwords on database in hashed format and we are enforcing user to use difficult passwords and we are using csrf tokens in required pages to prevent from csrf attacks.

5.2.4 Global software control

Our software controls handled by used web-framework Django.

5.2.5 Boundary conditions

Our system is working 7/24 we are proposing client-server application.

5.3 Subsystem Services

5.5 Main Subsystem Includes:

User Management Subsystem

Admin Management Subsystem

5.5.1 User Management Subsystem

This subsystem provides the facilities that covers all the user management functionality.Main use case that comes under this subsystem includes:

User Registration

User Login(With Spotify or normal log in)

Chatting With Users(Only for registered users)

Listening to Broadcasts(For registered users or unregistered users)

Adding Songs to the Spotify playlist that you "like"

5.5.2 Admin Management Subsystem

This subsystem provides the facilities that covers all the admin management functionality. Main use case that comes under this subsystem includes:

Admin Log in

Start/Stop Broadcasts

Change Music

Ban User

Create/Delete Announcement

Create Survey

5.6 UML Diagrams

User: The user is the person who will use the project after the project is finished. User is the person who gives an idea to the project developer about the needs of the project and be reference in the project development process. The User's Goals are;

Accessing the desired radio station in a fast way.
Self entertaining by chatting with other members/radio host.
Accessing spotify songs and sharing it among other members.

Use Case Diagram Figure 1 presents a use case diagram for the Rad.io application. The system shows the operations that end users can perform.

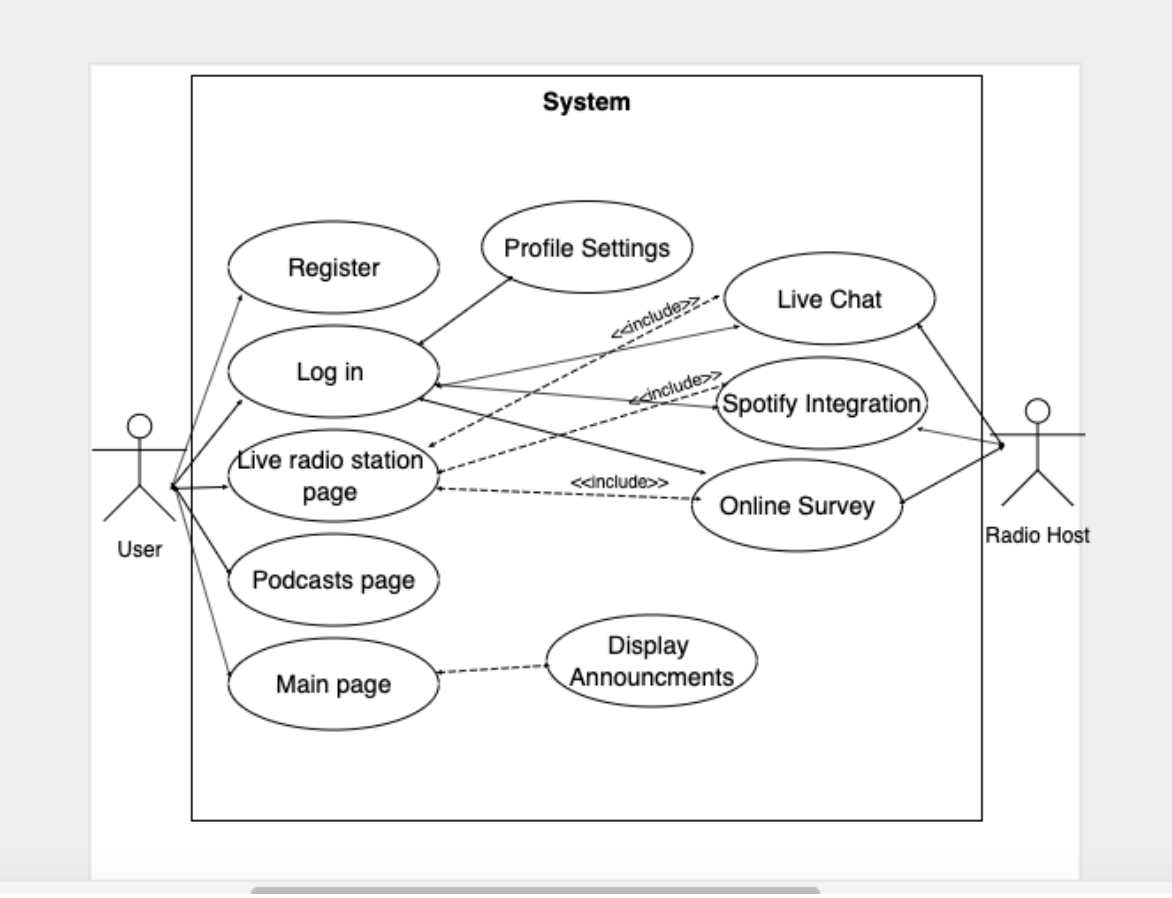


Figure 1 System Use case Diagram

Brief Description of Use Case Diagram

The use-case diagram shows us the web pages that the user and radio host can access. The user can register to the website to gain more features, non-members can also access the website but cannot have the extra features. As shown, when the user accesses the "Live Radio station page" he/she can see the features but cannot use them unless they are registered to the system. Non-members can read the live chat messages but won't be able to chat with other members, they can see surveys but cannot participate, and so on. The radio host has the opportunity to take control of actions and operations over the live chat, spotify integration, and online survey during live streaming of the station.

5.6.2 Class Diagram

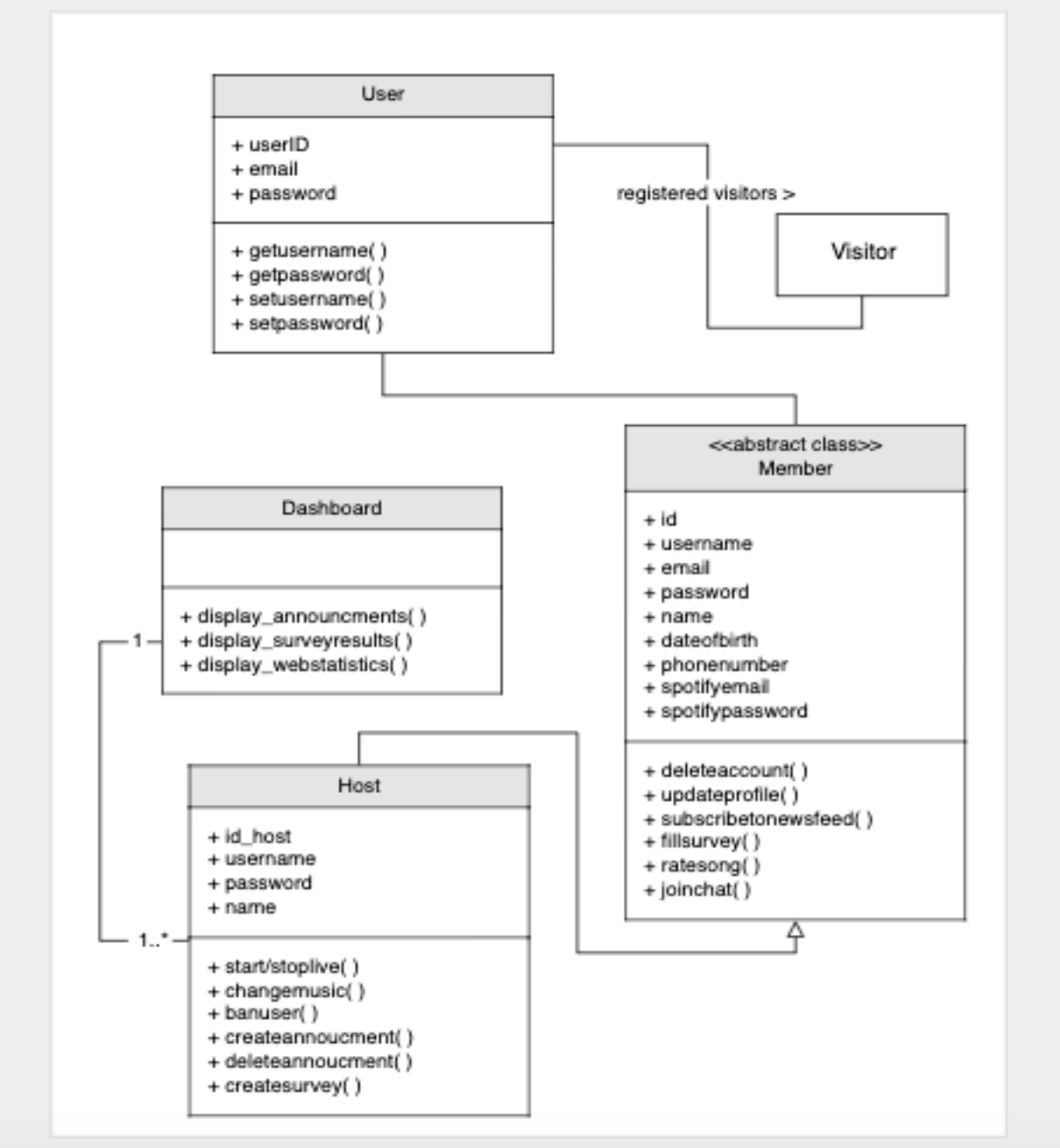


Figure 2 System Class Diagram

Brief Description of Class Diagram

The class diagram shows us the functions that the member and radio host can use. The user can register to the website to gain more features, non-members (visitors) can also access the website but cannot have the extra features. As shown above, members who are registered to the system gain more features as shown under the "Member" entity, these functions below represent the

features and actions that can be done by the entity. As we see, the “Host” entity which is the subclass, inherits the “Member” entity since you need to be a member to be a host as well but instead, in special cases, the “Host” entity acts as an admin for the system which gives him control over other users, and includes special functions in order to manage or create operations.

5.7 Interface design

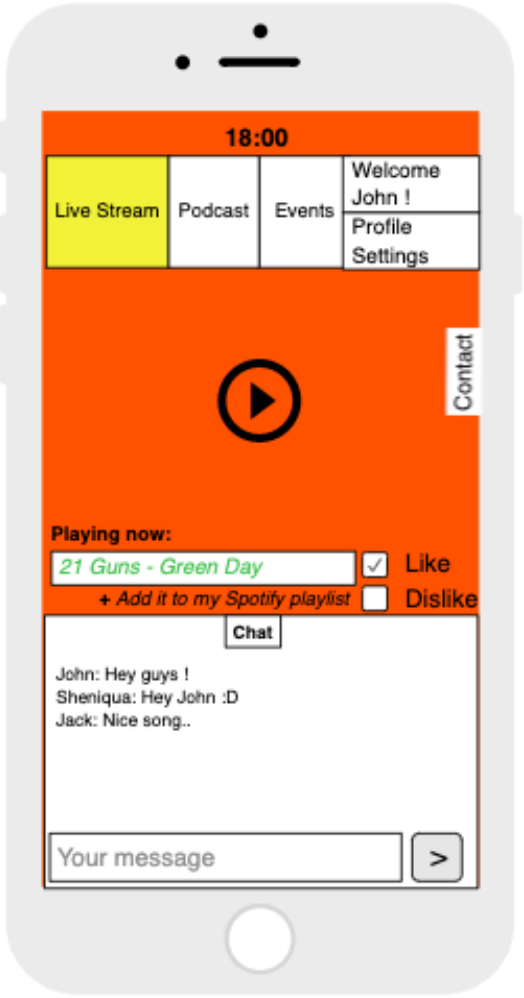
5.7.1 Overview of User Interface

In this section of the document, the layout of the pages are presented in below figures. From now on unregistered users will be referred as **U-user**, registered user will be referred as **R-user**, users which registered with Spotify will be referred as **S-user** and ‘**users**’ word will be used for all type of users.

5.7.2 Opening Page

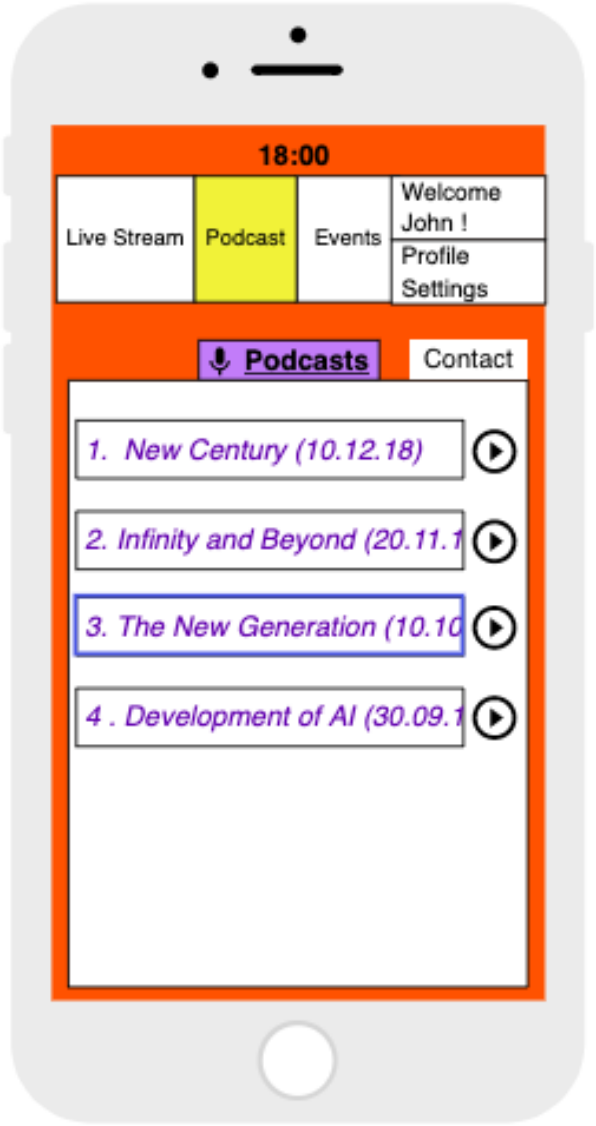
The opening page has the information about the group.

5.7.3 Live Stream Page



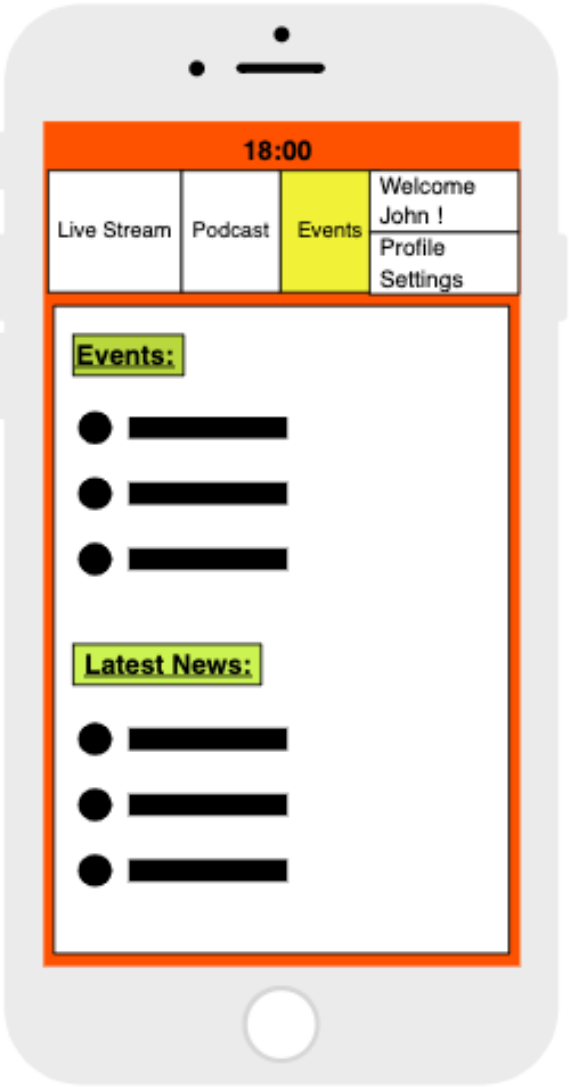
The Live Stream Page is the interface that the users will play the song with play button. All users can write a report, a statement, or ask for information by clicking on the contact button. R-users and S-users can like or dislike options for music recommendations. Also S-users can add the song to their playlist on Spotify. There is a live chat on the main page which is active at the on air time but U-users can not write on chat, they just can read the conversation.

5.7.4 Podcasts Page



The Podcasts Page includes records of old streams or special conversations about different topics. Users can listen with play buttons.

5.7.5 Events Page

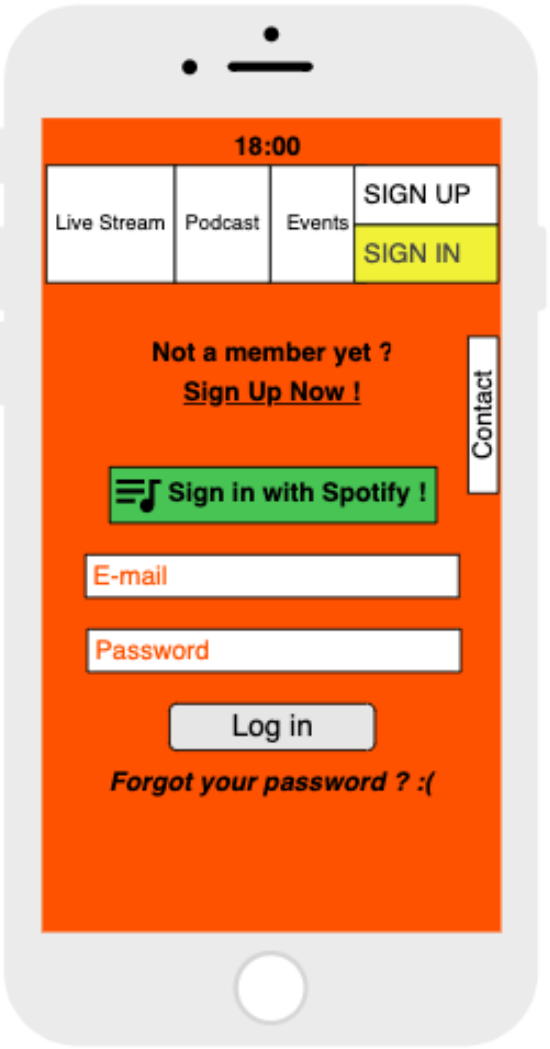


The Events Page shows the events or news about the weekly stream program. Users can read every new improvement from this page.

5.7.6 Sign Up Page

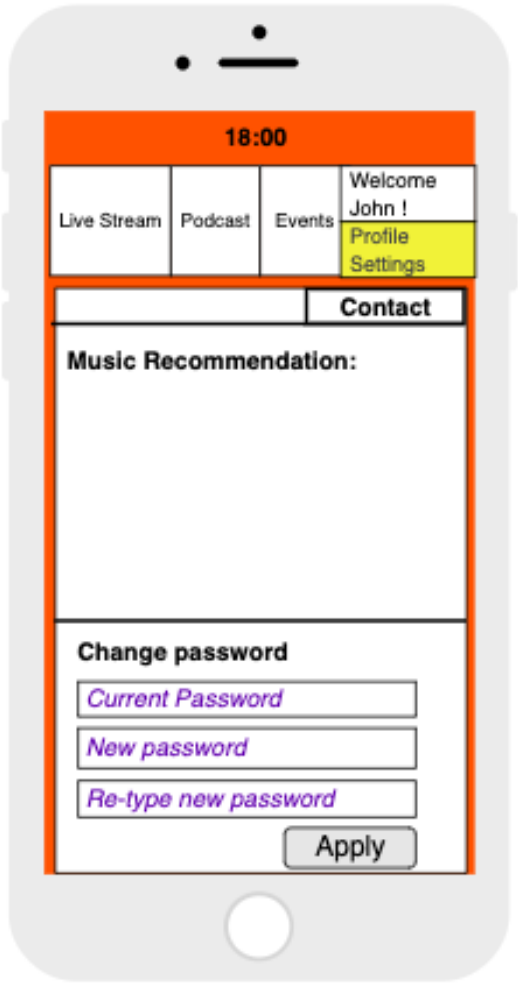
The Sign Up Page is for registration. New users can sign up from this page with their information. After a user logged in, this button will be inactive and show Profile Settings button.

5.7.7 Sign In Page



The Sign In Page includes two different types of log in. First type is ‘Sign in with Spotify’. With this type, users can add the songs to their Spotify playlists. With second type they do not have this feature. Also, in this page there is a link to Sign Up Page and a button for users which forgets his/her password. After a user logged in, this button will be inactive and show his/her nickname.

5.7.8 Profile Settings Page



Just S-users and R-users can access this page. It has music recommendations for S-users and R-users. Also they can change their passwords from this page.

6. Test Plan

6.1 Introduction

6.1.1 Version Control

Table 3 control version

Version No.	Description of Change	Date
1.0	First version	March 2020

6.1.2 Overview

The use case of Rad.io: Rad.io application system including software, hardware, and users namely participant and admin which had been mentioned in the SRS document will be tested.

6.1.3 Scope

This document encapsulates the test plan of the use cases, test design specifications and the test cases correspond to the test plan, it will include details about the application functionalities and specifications that are used.

6.1.4 Terminology

Table 4 Terminology

Acronym	Definition
GUI	Graphical User Interface (GUI)

6.2 FEATURES TO BE TESTED

6.2.1 Graphical User Interface (GUI)

In the project, graphical user interface components are used. The GUI part is divided into Radio Streaming page, Login page, Registration page, Events page, Podcast page, and so on. Each part of the GUI includes their subfeatures. GUI part includes testing of the functions of GUI components which are used in the project such as buttons, drop-down list, text, etc.

6.3 TEST DESIGN SPECIFICATIONS

6.3.1 Graphical User Interface (GUI)

6.3.1.1 Login (GUI.LG)

Users who are registered to the system are able to Login using their email and password

6.3.1.2 Registration (GUI.R)

Users who wish to be part of the system can register by entering a valid email and password and must verify their email to make sure the email belongs to the user.

6.3.1.3 Live Radio Broadcast (GUI.LRB)

Any user can listen to the broadcast when it goes live.

6.3.1.4 Live Chat (GUI.LC)

Upon logging in, only users who are registered to the system are able to chat synchronously with other registered users, sharing their thoughts, and making new friends.

6.3.1.5 Spotify API (GUI.S-API)

Users who are registered to the system and have a Spotify account are able to login with Spotify and add their desired music depending on their interest.

6.3.1.6 Profile Settings(GUI.PS)

Registered users are able to see their profile information and make changes including the change of nickname or password.

6.3.1.7 Event Handler (GUI.EH)

Registered users are able to check events and latest news about the live broadcast and follow the schedule of the weekly broadcast and what's coming up.

6.3.1.8 Podcast (GUI.P)

Registered users are able to check podcast streams that have been missed from the past weeks.

6.3.1.9 Test Cases

TC ID	Requirements	Priority	Scenario Description
GUI.LG	3.1	H	Enter a valid email and password that matches the credentials of the system. Press "Sign In", if successful it will redirect you to the live broadcast page.
GUI.R	3.1	H	Enter a valid email,nickname, and password then press "Sign Up" to register to the system, if successful it will redirect you to the login page.
GUI.LC	3.1	H	Enter a message inside the input box, and send it using the ">" button, the message will be delivered to the chat box where it will be shared among all users.
GUI.S-API	3.1	H	Enter a Spotify email and password that matches the credentials of the Spotify system.
GUI.PS	3.1	H	Press the Profile Settings menu, settings will be displayed for changes.
GUI.EH	3.1	M	Press the Event menu, events and news about the live broadcast will be displayed.
GUI.P	3.1	M	Press the Podcast menu, podcasts that have been missed will be displayed.

6.3.2 Login (GUI.LG)

Subfeatures to be tested

6.3.2.1 Login Button (GUI.LG.LB)

When the user writes his email and password and presses the login button, the system checks if the email and password match the following credentials found in the database so the user can continue using the system.

6.3.2.3 Test Cases

TC ID	Requirements	Priority	Scenario Description
GUI.LG.LB	3.2	H	User presses the login/"Sign in" button, when valid credentials are entered, redirects to the broadcast page.

6.3.2.4 Registration (GUI.R)

Subfeatures to be tested

6.3.2.5 Register Button (GUI.R.RB)

When the user writes his message and presses the register button, the system checks if the email and password is valid and user's information must be added to the database.

6.3.2.6 Test Cases

TC ID	Requirements	Priority	Scenario Description
GUI.R.RB	3.2	H	User presses the register/"Sign up" button, if valid email,nickname,and password, redirect to the login page.

6.3.2.7 Live Chat (GUI.LC)

Subfeatures to be tested

6.3.2.8 Send Message Button (GUI.LC.SMB)

When the user writes his message and presses the send button, it should display the message inside the chat box and must be shared among other users.

6.3.2.9 Test Cases

TC ID	Requirements	Priority	Scenario Description
GUI.LC.SMB	3.2	H	User enters a message and presses the send message button, the message gets displayed inside the chat box.

6.3.3 Spotify API (GUI.S-API)

Subfeatures to be tested

6.3.3.1 Spotify Login (GUI.S-API.SL)

Users with a Spotify account will sign in depending on their Spotify email and password, if valid, Spotify account details of the user will be connected with the system.

6.3.3.2 Test Cases

Here list all the related test cases for this feature

TC ID	Requirements	Priority	Scenario Description
GUI.S-API.SL	3.2	H	Users that have a spotify account enters email and password, if successful, redirects to a live broadcast page with spotify functionalities.

6.3.3.3 Profile Settings (GUI.PS)

Subfeatures to be tested

6.3.3.4 Change Password (GUI.PS.CP)

Users are able to change their password by typing the old password and new password and pressing the Change Password button.

6.3.3.5 Change Nickname (GUI.PS.CN)

Users are able to change their nicknames by typing the new nickname and pressing the Change Nickname button.

6.3.3.6 Test Cases

TC ID	Requirements	Priority	Scenario Description
GUI.PS.CP	3.2	H	User inputs old password and new password, presses Change Password, database updates the password.
GUI.PS.CN	3.3	M	User inputs new nickname, presses Change Nickname, database updates the nickname.

6.4 Detailed Test Cases

6.4.1 GUI.LG

TC_ID	GUI.LG
Purpose	Enter a valid user email and password
Requirements	3.1
Priority	High
Estimated Time Needed	1 minute
Dependency	GUI.R test case should pass.
Setup	User gets redirected to live broadcast page
Procedure	[A01] Go to the login page
	[A02] Enter a valid user email
	[A03] Enter the valid password for this user
	[A04] Click on the “Sign In” button.
	[V01] Observe that the login is successful and the live broadcast page appears
Cleanup	Logout

6.4.2 GUI.R

TC_ID	GUI.R
Purpose	Enter a valid email, nickname, and password
Requirements	3.1
Priority	High.
Estimated Time Needed	1-2 minutes
Dependency	Depends on the user's choice of matter
Setup	A new account is created for the user
Procedure	[A01] Go to the registration page.
	[A02] Enter a valid user email
	[A03] Enter a valid nickname
	[A04] Enter a valid password
	[A05] Click on "Sign Up" button
	[V01] Observe that the registration is successful and the login page appears -
Cleanup	Exit Application

6.4.3 GUI.LC

TC_ID	GUI.LC
Purpose	Enter a text message to the input box to chat
Requirements	3.1
Priority	High.
Estimated Time Needed	>1 minute
Dependency	GUI.LG test case should pass.
Setup	A message by the user gets send to the chat box
Procedure	[A01] Go to live broadcast page
	[A02] Enter a text message inside input box
	[A03] Press “>” button or “Enter” key
	[V01] Observe that message is sent and that the message is displayed inside the chat box.
Cleanup	Escape button

6.4.4 GUI.S-API

TC_ID	GUI.S-API
Purpose	Enter a valid Spotify email and password
Requirements	3.1
Priority	High.
Estimated Time Needed	1 minute
Dependency	GUI.R test case should pass
Setup	User gets Spotify functionalities
Procedure	[A01] Go to login page
	[A02] Press “Login with Spotify”
	[A03] Enter the valid email
	[A04] Enter the valid password
	[A05] Press “Login” button
	[V01] Observe that the login is successful, and the live broadcast page appears with Spotify functionalities -
Cleanup	Logout

6.4.5 GUI.PS

TC_ID	GUI.PS
Purpose	Change user profile settings
Requirements	3.1
Priority	High.
Estimated Time Needed	1-2 Minutes
Dependency	GUI.LG test case should pass.
Setup	The user should see his profile information
Procedure	[A01] Go to the profile settings page.
	[A02] Choose the settings you want to change
	[A03] Change whether it is nickname or password
	[A04] Click on the “Save”
	[V01] Observe that the setting is saved and update user’s information
Cleanup	Logout / Change Page

6.4.6 GUI.EH

TC_ID	GUI.EH
Purpose	Checking events depending on broadcast timing
Requirements	3.1
Priority	Medium
Estimated Time Needed	>1 Minutes
Dependency	GUI.LG test case should pass
Setup	The user should see upcoming events
Procedure	[A01] Go to the event page.
	[V01] Observe the upcoming events
Cleanup	Logout / Change Page

6.4.7 GUI.P

TC_ID	GUI.P
Purpose	Checking live broadcasts that have been missed
Requirements	3.1
Priority	High.
Estimated Time Needed	>1 minute
Dependency	GUI.LG test cases should pass
Setup	The user should see past weeks live broadcasts
Procedure	[A01] Go to the podcast page.
	[V01] Observe the podcast
	[V01] Choose desired podcast and click on it
	[V02] Start listening
Cleanup	Logout / Change Page

6.4.8 GUI.LG.LB

TC_ID	GUI.LG.LB
Purpose	Verify email and password from database
Requirements	3.1
Priority	High.
Estimated Time Needed	>1 minute
Dependency	GUI.R test cases should pass
Setup	User gets redirected to live broadcast page
Procedure	[A01] Go to the login page.
	[A02] Enter a valid user email
	[A03] Enter the valid password for this user
	[A04] Click on the “Login” button.
	[V01] Observe that the login is successful and the admin page appears
Cleanup	Logout

6.4.9 GUI.R.RB

TC_ID	GUI.R.RB
Purpose	Add a new user to the database.
Requirements	3.1
Priority	High.
Estimated Time Needed	>1 minute
Dependency	Depends on user's choice of matter
Setup	A new account is created for the user
Procedure	[A01] Go to the registration page.
	[A02] Enter a valid user email
	[A03] Enter a valid nickname
	[A04] Enter a valid password
	[A05] Click on "Sign Up" button
	[V01] Observe that registration is successful and the login page appears
Cleanup	Exit Application

6.4.10 GUI.LC.SMB

TC_ID	GUI.LC.SMB
Purpose	Sending user's message to chat box
Requirements	3.1
Priority	High.
Estimated Time Needed	>1 minute
Dependency	GUI.LG test case should pass.
Setup	An message by the user gets send to the chat box
Procedure	[A01] Go to live broadcast page
	[A02] Enter a text message inside input box
	[A03] Press ">" button or "Enter" key
	[V01] Observe that message is sent and that the message is displayed inside the chat box.
Cleanup	Escape button

6.4.11 GUI.S-API.SL

TC_ID	GUI.S-API.SL
Purpose	Verify Spotify email and password from Spotify server.
Requirements	3.1
Priority	High.
Estimated Time Needed	1 minute
Dependency	GUI.R test case should pass
Setup	User gets Spotify functionalities
Procedure	[A01] Go to login page
	[A02] Press “Login with Spotify”
	[A03] Enter the valid email
	[A04] Enter the valid password
	[A05] Press “Login” button
	[V01] Observe that the login is successful and the live broadcast page appears with Spotify functionalities -
Cleanup	Logout

6.4.12 GUI.PS.CP

TC_ID	GUI.PS.CP
Purpose	Change user's password
Requirements	3.1
Priority	High.
Estimated Time Needed	1-2 Minutes
Dependency	GUI.LG test case should pass.
Setup	The user should see his profile page
Procedure	[A01] Go to the profile settings page.
	[A02] Go to change password
	[A03] Enter old password and new password
	[A04] Click on the "Save"
	[V01] Observe that the setting is saved and update user's information
Cleanup	Logout / Change Page

6.4.13 GUI.PS.CN

TC_ID	GUI.PS.CN
Purpose	Change user's nickname
Requirements	3.1
Priority	Medium
Estimated Time Needed	1 minute
Dependency	GUI.LG test case should pass.
Setup	The user should see his profile page
Procedure	[A01] Go to the profile settings page.
	[A02] Go to change nickname
	[A03] Enter a new nickname.
	[A04] Click on the "Save"
	[V01] Observe that the setting is saved and update user's information
Cleanup	Logout / Change Page

7. Conclusion

In this CENG408 project, we talked about the requirements specification needed for both mobile and web platforms and features for hardware and software, as well as performance requirements for the radio application. We included definitions and feature designs for the application. The proposed radio application works on both web and mobile platforms which will be established by a dedicated API on the server side which allows mobile platforms to use the same functionalities, databases in web applications. Both web and mobile platforms offer users a registration and login system to allow users to use more functionalities that are required authentication. Also, we took security measures such as captcha in login, register pages, rate-limiting in input submissions, csrf protection in form submissions, general input validation and more. We got three types of user model: administrative user, streamer, and standard user but we allow some functionalities to be performed without user authentication such as listening to livestream. After user login we collected data with permission by asking users to fill up some questions, and passive data collection based on user's network data for improving quality of platform and increasing user experience. Also, the platform has an online chat that can allow to build a community around streams. According to collected data, current streamers can decide what to do next, or can give targeted advertisements to the audience. In administrative pages streamers can perform given operations easily with user-friendly UI. We are developing a modular system that allows us to integrate microservices around the base platform and allow developers to easily add new modules and functionalities. This provides people a basic and functional online radio broadcasting station with a convenient UI and new things to learn and fun timings with others.