



Daffodil
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illus1onCTF: An Online CTF Platform

Submitted by

MD Khairul Hasan Sajid

ID: 191-35-407

Department of Software Engineering

Daffodil International University

Supervised by

Mr. Md Rajib Mia

Lecturer

Department of Software Engineering

Daffodil International University

This project report has been submitted in fulfillment of the requirements for the Degree of Bachelor of Science in Software Engineering.

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APPROVAL

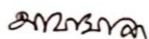
This Project titled on “illus1onCTF: An online Capture The Flag platform”, submitted by **MD Khairul Hasan Sajid (ID: 191-35-407)** to the Department of Software Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of Bachelor of Science in Software Engineering and approval as to its style and contents.

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Head and Associate Professor
Department of Software Engineering
Faculty of Science and Information Technology
Daffodil International University



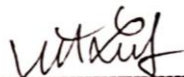
Internal Examiner 1

Afsana Begum
Assistant Professor
Department of Software Engineering
Faculty of Science and Information Technology
Daffodil International University



Internal Examiner 2

Dr. Md. Fazle Elahe
Assistant Professor
Department of Software Engineering
Faculty of Science and Information Technology
Daffodil International University



External Examiner

Mohammad Abu Yousuf, PhD
Professor
Institute of Information Technology
Jahangirnagar University

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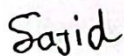
I announce that I am writing this study document under Mr. Md Rajib Mia, Lecturer, Department of Software Engineering, Daffodil International University. I therefore state that this work or any portion of it was not proposed here therefore for Bachelor's degree or any graduation.

Supervised by:



Mr. Md Rajib Mia
Lecturer
Department of Software Engineering
Daffodil International University

Submitted by:



MD. Khairul Hasan Sajid
ID: 191-35-407
Department of Software Engineering
Daffodil International University

ACKNOWLEDGEMENT

In today's world of competition there is a race for survival in which they have to come forward for success. The project is a bridge between theoretical and practical work. It is with this desire that I join this special project. First of all, I would like to thank the Almighty Allah who has clearly guided me to do the right thing in life. Without His grace this project could not have become a reality. And my parents, whom I am extremely indebted to for bringing me to this stage with love and encouragement.

I feel compelled to talk about the opportunity to study at Daffodil International University. I would like to sincerely thank Prof. Dr. Imran Mahmud, Head of the Department of Software Engineering. Full of all the respected teachers who enjoy teaching me an interesting and understandable way. I am grateful for having them on my journey.

I am exceptionally obligated to guide Daffodil International University to guide them through the constant supervision of Mr. Md Rajib Mia to provide the necessary information as well as to honor the initiative and additionally their help in completing the project. Finally, I would like to express my love for my friend who has helped me to accomplish this task.

ABSTRACT

This system will provide a platform to learn hacking and organize “Capture The Flag” contest. This platform is created intentionally vulnerable which will help people to attack vulnerable machines and learn to hack and improve their hacking skills. Hackers are always thinking of new and creative ways to get into data, so it's the job of information security analysts to find risks before hackers do. If they want to keep up with the constantly changing environment in which cyber-attacks happen, they will need constant training (especially in secure coding). This training will be available on our website.

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CHAPTER 1: INTRODUCTION

1.1 Project overview

“illus1onCTF” is a fun and addicting way to learn about cyber security. You can earn points by taking part in CTF contests, solving challenges, and taking short lessons to keep your hacking streak going.

The “illus1onCTF” is an online CTF platform that will provide some services related to cyber security, such as CTF challenges, and CTF contests, which will help users learn new and upgraded technology related to cybersecurity. This system also provides an efficient way of managing CTF contests. Organizations can host their contests on our website.

"illus1onCTF" goes way beyond textbooks and focuses on fun, interactive lessons that help you put theory into practice. Simulations, intentionally weak technology based on real-world examples, and more will give you an immersive learning experience. Leaderboard makes a competitive way to learn to hack. That knowledge can be used to make our application secure.

1.2 Project Purpose

The purpose of “illus1onCTF” is to serve Users to learn hacking in a practical way. Penetration testing or trying to hack websites is illegal in Bangladesh doesn't if it's for learning or any other that's a crime. “illus1onCTF” provides a legal way where users can hack our website or penetrate for learning purposes. “illus1onCTF” provides an intentionally created vulnerable machine which is created to be hacked, if someone can hack that machine he/she will get a flag. If someone can capture the flag he/she will get points according to the difficulty and will acquire position according to the score.

Functionality Provided by “illus1onCTF”

- Many Challenges to Practice.
- Will be a new platform for organizing new CTF contests.
- Opportunity to play offensive, exploiting the same types of vulnerabilities
- Help you to think like a hacker.
- Competitive way of practicing.
- Step By Step Learning Path for new users.
- Can solve challenges according to categories like XSS, cryptography, etc.
- All of the challenges are set up so that they can be exploited. So it's a great way to get real-world experience in a legal way.

1.3 Background

We live in a time when there are more and more cyberattacks every day. In the cyber world, it's become more important than anything else to have a security team that is reliable, active, and aware. And this security team needs constant training, especially in secure coding, to keep up with the constantly changing environment in which cyberattacks happen. Hackers are always thinking of new and creative ways to get into data, so it's the job of information security analysts to find risks before hackers do. They have to think like hackers and act before the hacker does. So, for constant training, we need machines where we can attack and learn. But it's totally illegal in Bangladesh. So, how can we learn? To overcome this issue and create a platform where there will be a CTF contest and also where machines were created to be hacked which makes a legal way to train learners.

1.4 Benefits and Beneficiaries

This platform will be helpful for persons who are stuck in the midway of learning to hack, and who are looking for a guide to learn to hack. or that person, who wants to practice his skill by attacking real machines but can't find a way to as it's illegal. Also, help some organizations who want to organize CTF contests, but don't have any platform where they can host their contests.

1.5 Stakeholders

A stakeholder is someone who can be influenced or influenced by an organization, strategy, or project. They can come from inside or outside the company, and they can be senior or junior.

I have some stakeholders for this platform.

- User
- Author
- Contest Manager
- Admin

1.6 Project Schedule

Considering the short time, I had to create a schedule in order to complete the project before the deadline. It also describes the action that must be taken to finish the task.. I used Trello for tracking.

1.6.1 Release plan and Milestone

The plans are given below:

Table: Release Plan

Activities	Duration in Week	Total Week
Research	W1, W2	2
Planning	W2, W3, W4, W5	4
Design	W5, W6, W7, W8	4
Development	W9, W10, W11, W12	4
Testing	W13, W14	2
Documentation	W14, W15, W16	3
Software release	W17	1

1.7 Objective

The main objective of this project is to make it legal for people to attack and learn to hack.

- Gain knowledge about introductory through advanced level cybersecurity principles in our non-competitive && competitive features of the illusionCTF.
- Learn by following a structured path and reinforce your skills in a real-world environment by completing guided objective-based tasks and challenges.
- Everything can be accessed for free without organizing the contest.
- Help you to learn how hackers will hack the system, which will help you to write secure code for applications.
- As it's a web application, it can be accessed from anywhere.

CHAPTER 2: REQUIREMENT ENGINEERING

Functional requirements define a system or its components. It tells "what the system should do." Functional requirements are set by the user. Meeting these requirements is mandatory. The use case talks about it.

2.1 The functional requirements of “illus1onCTF” are:

User:

- This Website will allow the User to Sign Up & Sign in.
- This Website will not allow Users to Signup or Sign in without a valid Credential.
- This Website will be able to remember User Credentials.
- This Website will allow Users to reset these Credentials.
- This Website will allow Users to add and update their info and Credentials.
- User Can Solve CTF challenges.
- User will get points for solving challenges.
- User can follow, view, and chat with other Users.
- Users can Rate Challenges and can share on social media.
- User Can write editorials to help the community.
- This website will allow the User to become an Author when he gets a specific point .
- This website will not allow the User to view anything outside of his role.
- User Can search, view, and share challenges without even Signing in.

Author:

- Author can do everything like the User.
- A User will get Author Permission when he gets specific points or the admin makes him.
- Author Can Create-Read-Update-Delete his Challenges(published or unpublished).
- Author Can publish their challenges to the website but it's required Admin Approval.
- Unpublished Challenges won't be visible to other users except for The creator.

Contest Manager:

- Can do everything like Author only in Contest.
- Can Manage Contest Can manage roles like Moderator, Author etc for the contest.
- Can manage users who can participate in contests.
- Can ban Participants in contests.
- Can freeze scoreboard.
- Can create a dummy account for testing purposes.
- All contributors can add published or unpublished Challenges to the contest .

Admin:

- Can Sign with predefined Credentials.
- Can Create New Admin.
- Can Update info and credentials.
- Can manage Categories.
- Can Manage Users.
- Can approve or reject Challenges.

- Can change user Role.
- Can control almost everything.

2.2 Non-functional Requirements

Non-functional requirements define the quality attributes of a system. It specifies, “How should the system fulfill the functional requirements?” A non-functional requirement is specified by technical people or software developers. It is mandatory to meet these requirements. It is captured as a quality attribute.

The non-functional requirements of “illusionCTF” are:

- The Website should Be Highly Responsive and states should be managed perfectly.
- Third-Party Integrations Consistency on the website shall be maintained across all the web pages.
- Users must change the initially assigned login password immediately after the first successful login.
- Moreover, the initial should never be reused. Advanced encryption algorithms must be integrated.
- Should Have a Firewall to detect malicious activity.
- Advanced access control shall be included on this website.
- Every unsuccessful attempt by a user to access an item of data shall be recorded.
- If an unsuccessful attempt is more than 10 then ip should be banned for some time.
- This website should be capable enough to handle at least 20k users without affecting its performance.
- Websites should load as fast as possible.
- Developers should use only the required size of images.
- Large-resolution images can take more time to load.
- Should have database backup.

CHAPTER 3: SYSTEM ANALYSIS, DESIGN & SPECIFICATION

3.1 Development Model

In order to develop the project “illus1onCTF,” we have adopted Agile SDLC Models. As we know the agile model is best for medium to large projects. Because there can be multiple updates and upgrades. Whenever we have new requirements or new upgrades, we can easily adopt them. As we are creating a CTF platform, we need to adopt cutting-edge technologies. If there are any issues found, they can be resolved easily in the agile model.

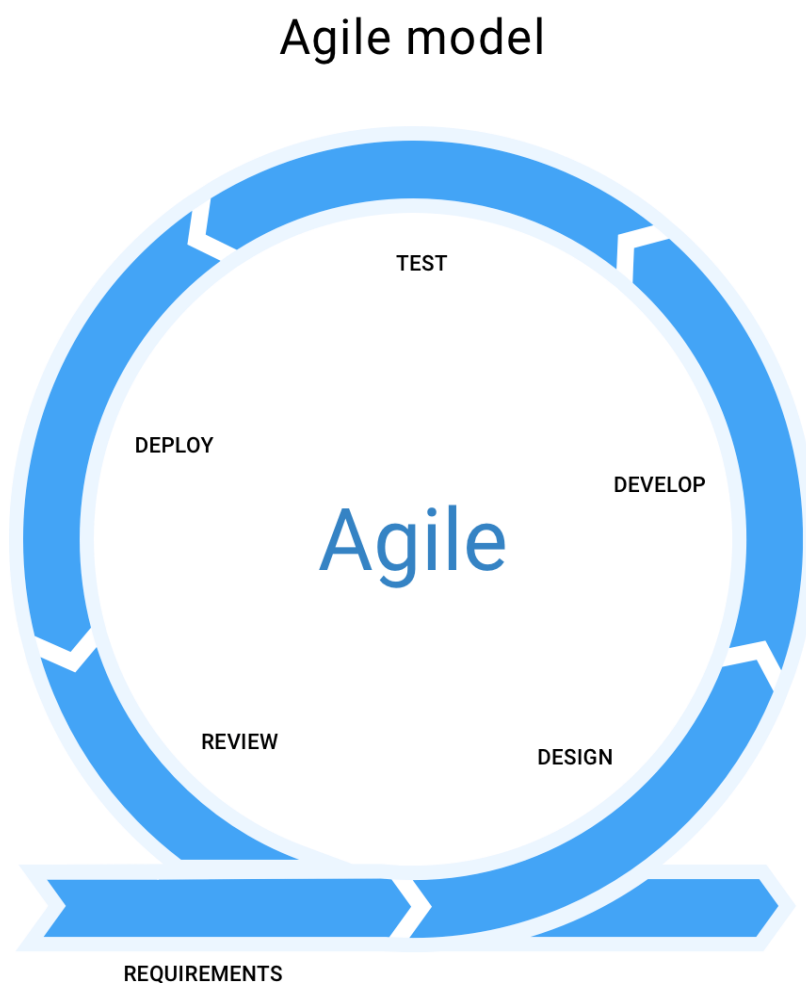


Figure 3.1: Agile Model

3.2 Use Case Diagram

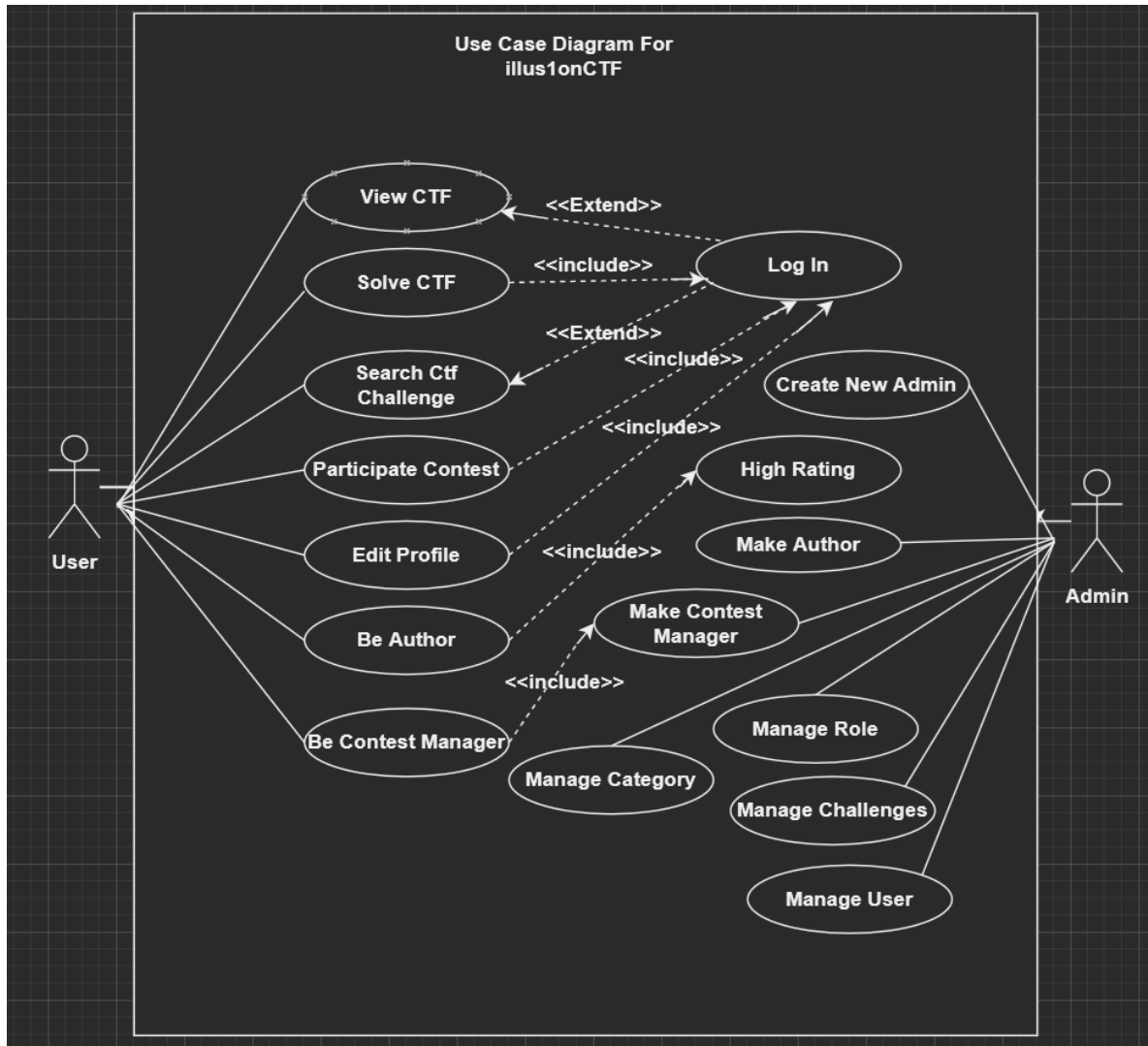


Figure 3.2.1: Use case diagram for illus1onCTF

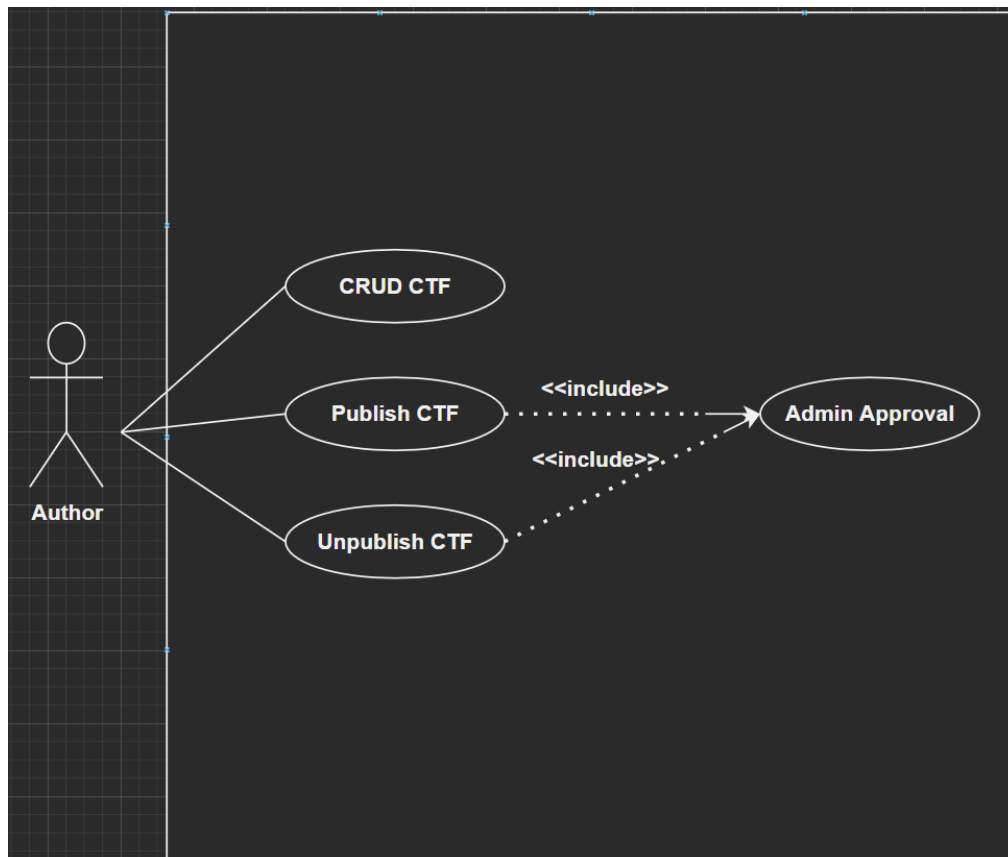


Figure 3.2.2: Use case diagram for Author

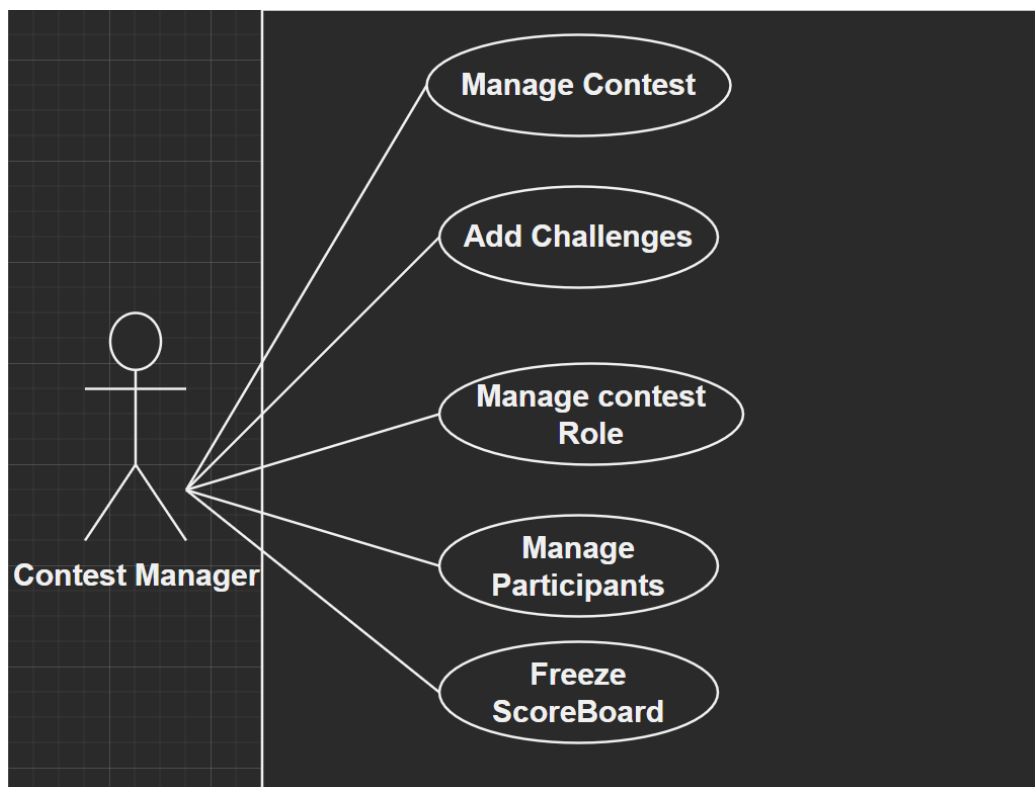


Figure 3.2.3: Use case diagram for Contest Manager

Use Case description

3.2.1 Registration

Description	This system has a registration form that users and service requesters can fill out to sign up and send in service requests.
-------------	---

3.2.2 Log-In

Description	This module is used to log in/signup in to the list of the illus1onCTF.
-------------	---

3.2.3 View challenges

Description	Users can view challenges and browse to machines to capture the flag of those challenges.
-------------	---

3.2.4 Submit challenges

Description	After capturing the flag, users can submit that flag to verify that, that's the flag of that challenge.
-------------	---

3.2.5 Filter/Search

Description	Users can choose specific challenges using filters.
-------------	---

3.2.6 Participate Contest

Description	Users can participate in contests to increase their skills, and practice competitive hacking.
-------------	---

3.2.7 Manage Challenges

Description	Admin and Contest manager can manage challenges. But admin can manage all challenges except Contest challenges, but the Contest manager can manage Contest challenges but can't manage outside of the contest.
-------------	--

3.2.8 Manage Role

Description	Admin can manage the Role of the user. And also can update the user Role.
-------------	---

3.2.9 CRUD CTF

Description	Author can Create, Read, Update, and Delete challenges that he created. But those are initially unpublished.
-------------	--

3.2.10 Publish CTF

Description	Author Challenges are initially unpublished. If he wants to publish his challenges, He can request to publish on Public pages. But the admin needs to approve that.
-------------	---

3.2.11 UnPublish CTF

Description	After Published Author can unpublish for changes but that also needs admin approval.
-------------	--

3.2.12 UnPublish CTF

Description	After Published Author can unpublish for changes but that also needs admin approval.
-------------	--

3.2.13 Manage Contest

Description	After getting access to the contest, the contest manager has full access to the contest.
-------------	--

3.2.14 Manage Role

Description	Contest manager can add moderators, Authors, and Judges for the Contest and can change roles if he wants.
-------------	---

3.2.15 Manage Participants

Description	Contest manager can create private contests and can generate custom users for the contest.
-------------	--

3.2.16 Manage ScoreBoard

Description	Contest manager can Freeze or UnFreeze the scoreboard to make the contest more interesting.
-------------	---

3.3 Activity Diagram

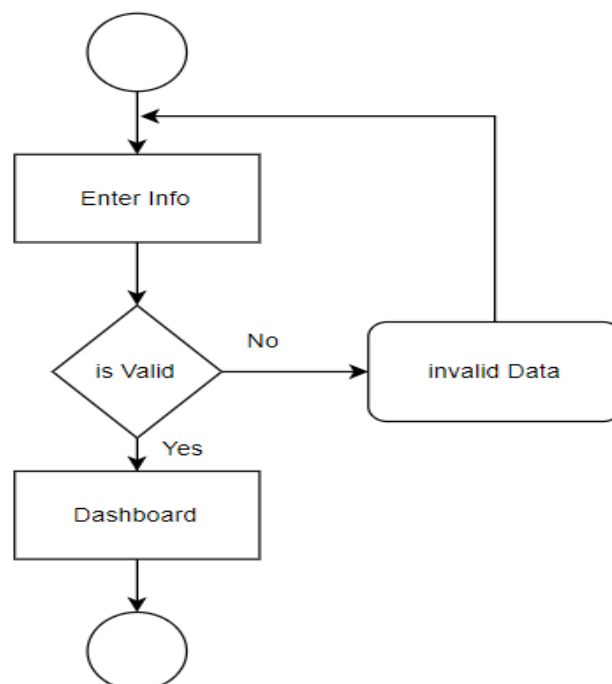


Figure 3.3.1: Registration Activity Diagram

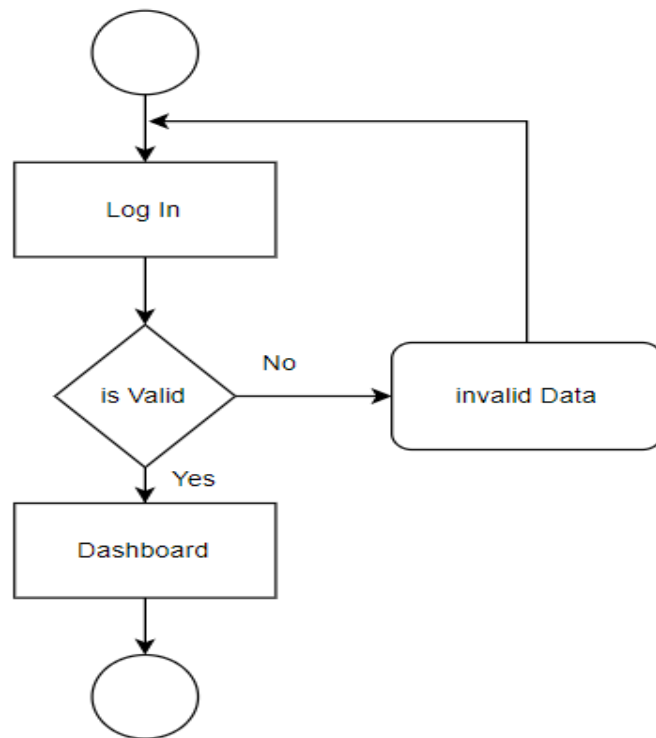


Figure 3.3.2: Login Activity Diagram

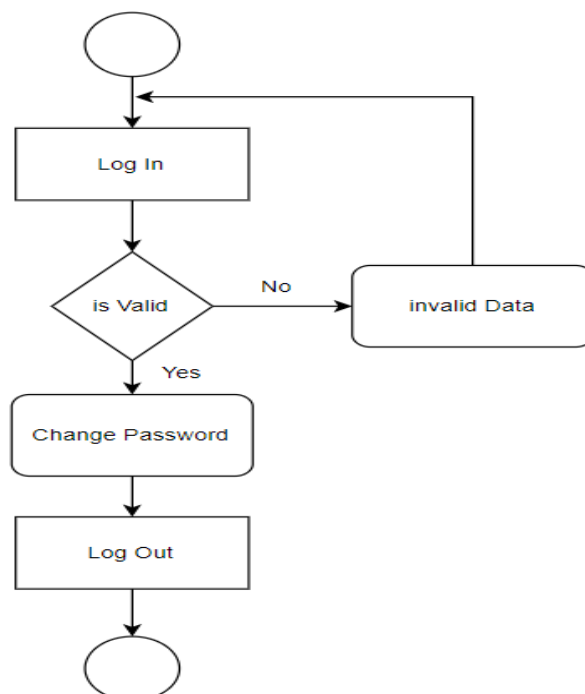


Figure 3.3.3: UpdateActivity Diagram

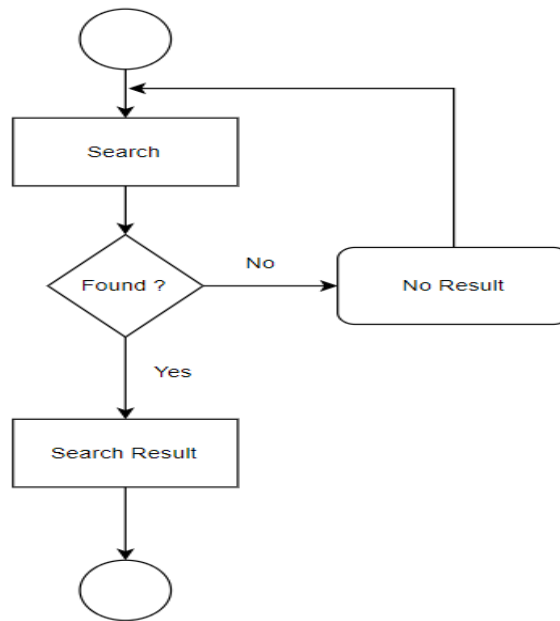


Figure 3.3.4: Searching Activity Diagram

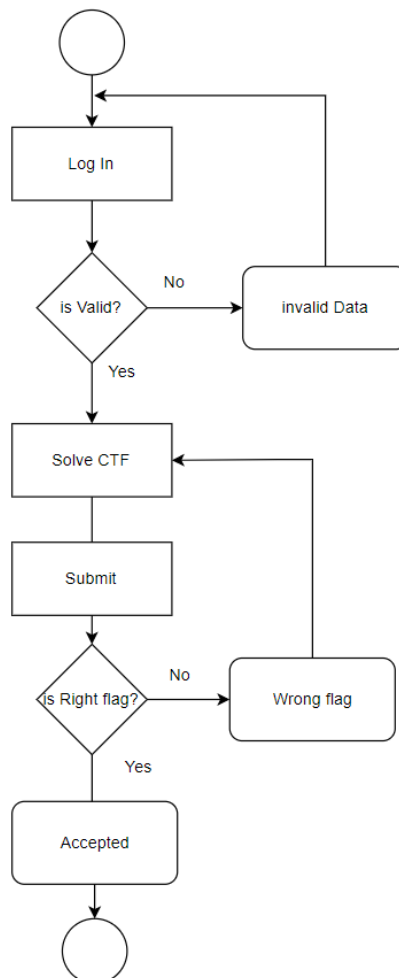


Figure 3.3.5: Solve CTF Activity Diagram

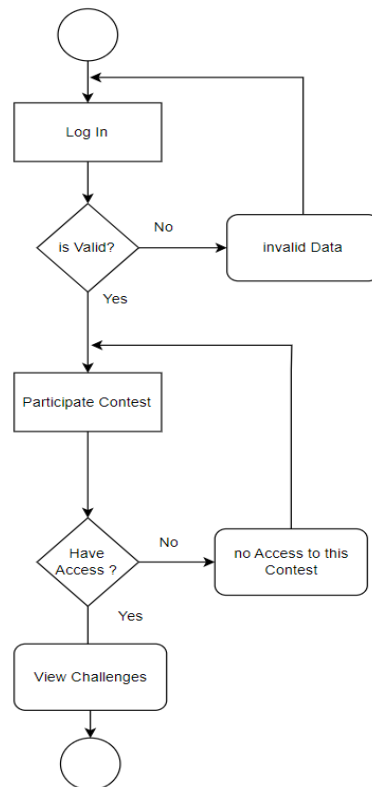


Figure 3.3.6: Participate Contest Activity Diagram

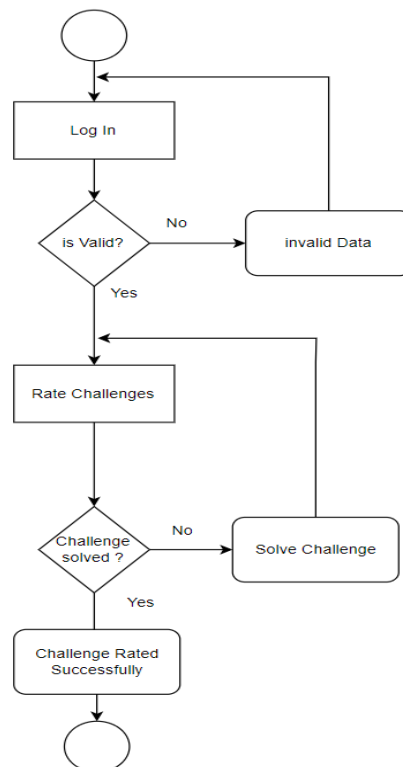


Figure 3.3.7: Rate Challenges Activity Diagram

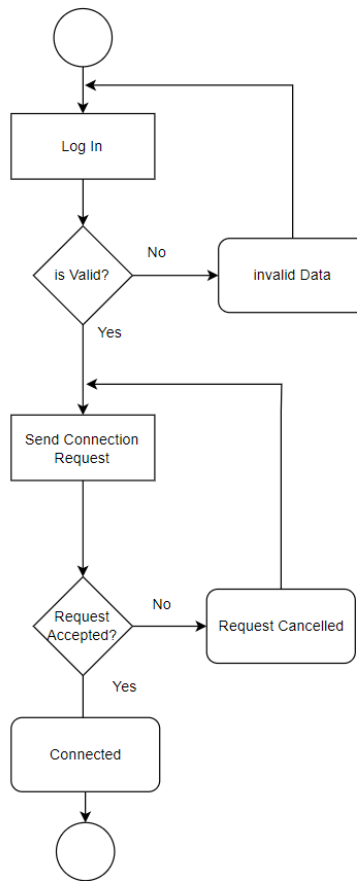


Figure 3.3.8: Connection Activity Diagram

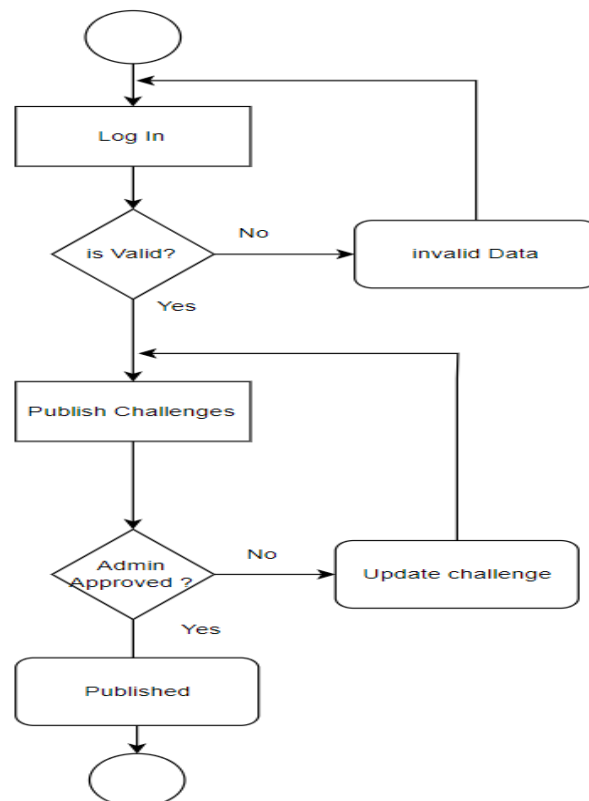


Figure 3.3.9: Publish Challenges Activity Diagram

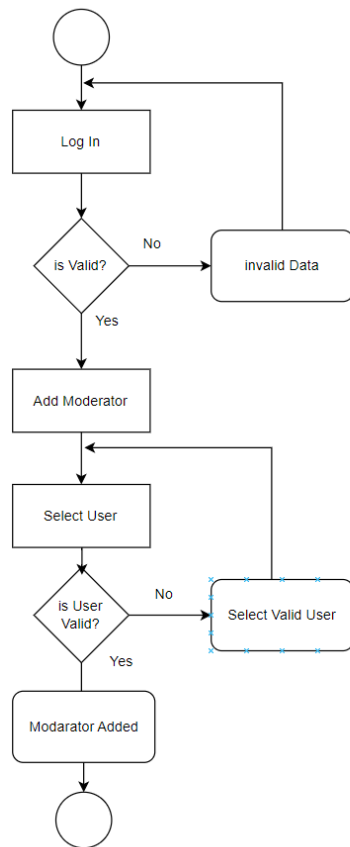


Figure 3.3.10:Contest Moderator Activity Diagram

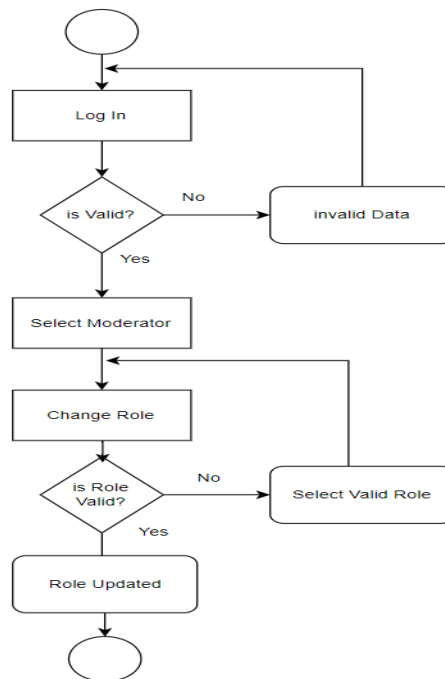


Figure 3.3.11: Role Update Activity Diagram

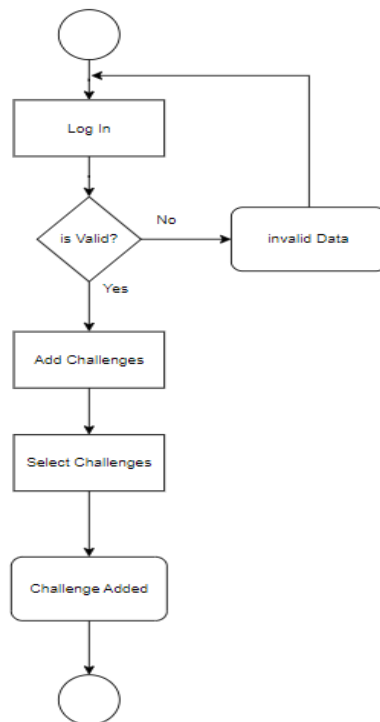


Figure 3.3.12: Add Challenges Activity Diagram

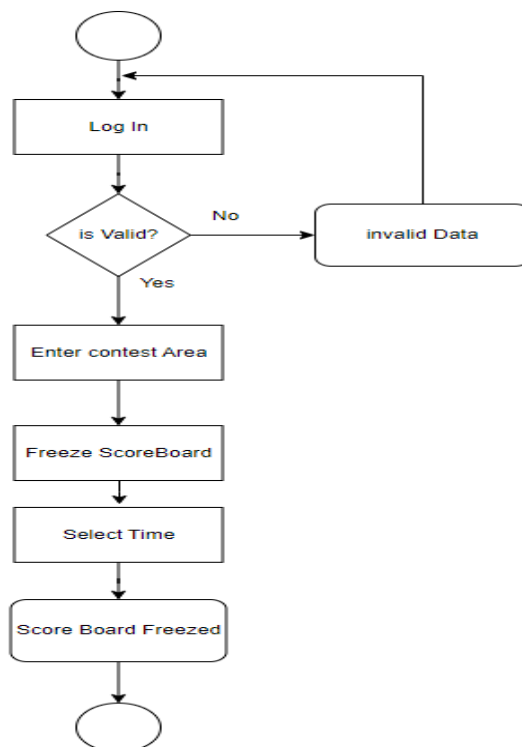


Figure 3.3.13: Freeze Scoreboard Activity Diagram

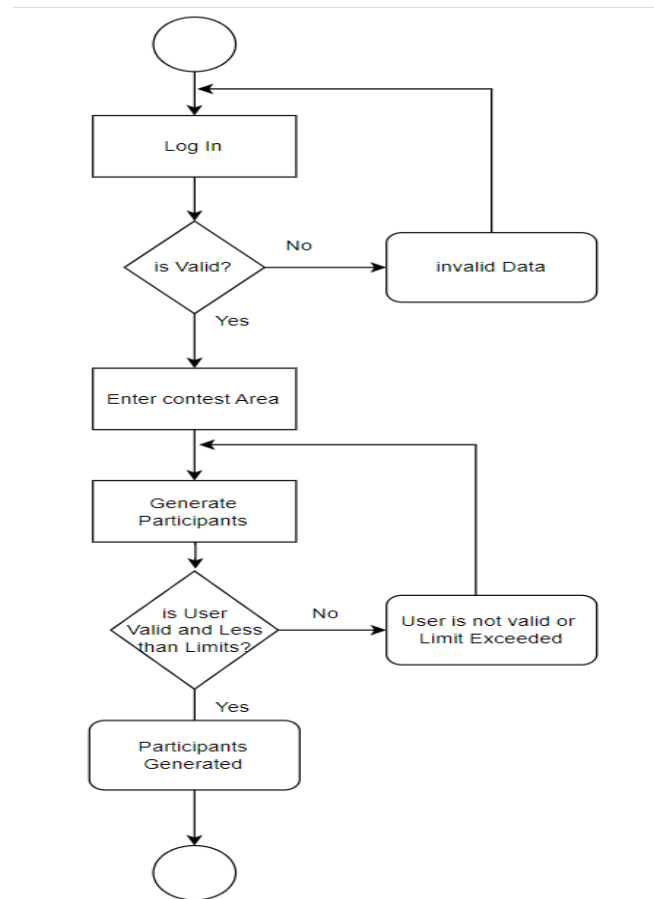


Figure 3.3.14: Generate Participant Activity Diagram

User Panel:

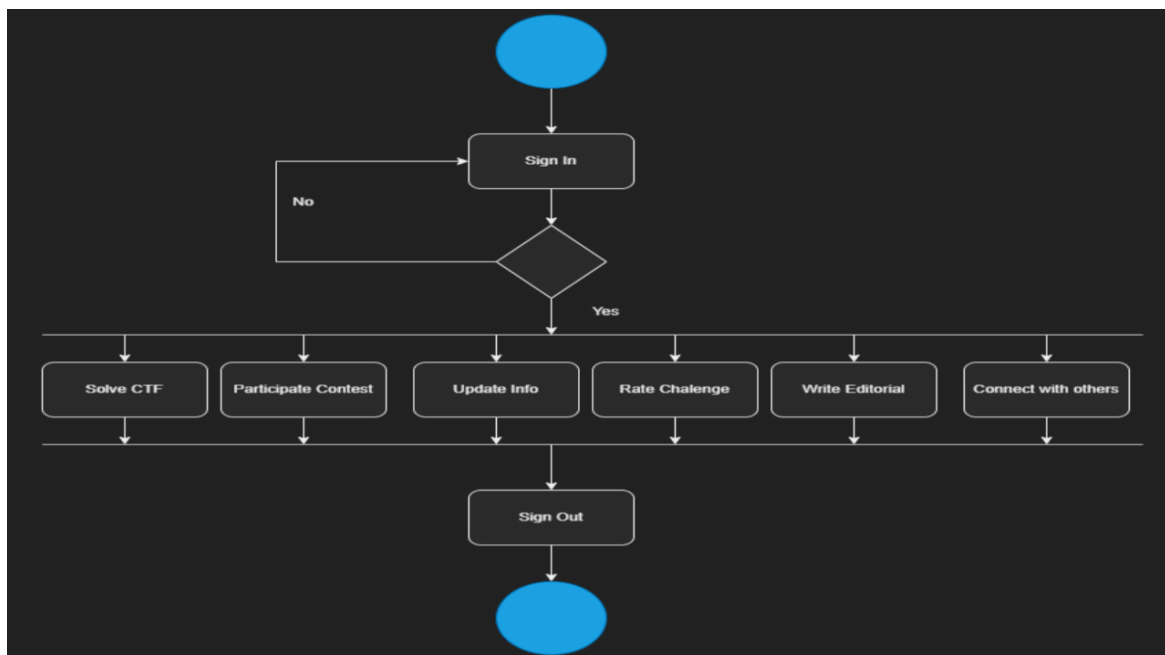


Figure 3.3.15: Activity Diagram of User Panel

Author Panel:

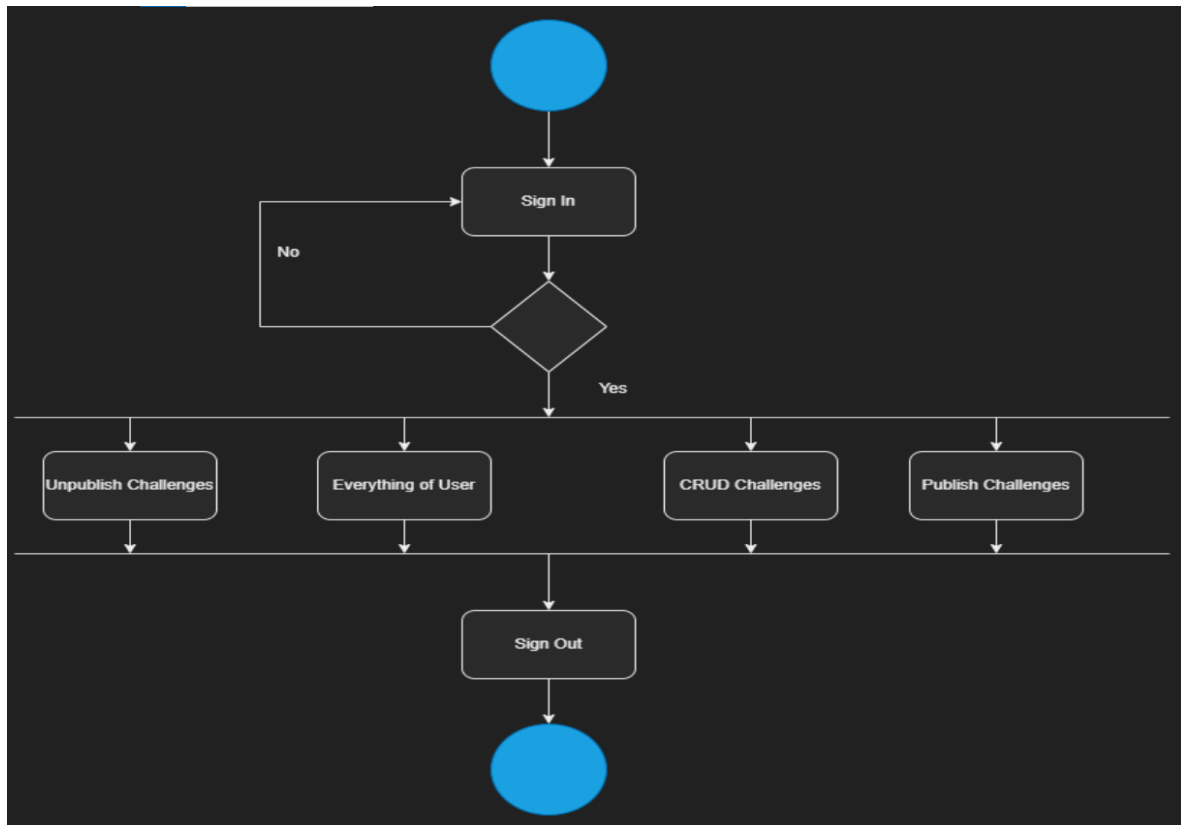


Figure 3.3.16: Activity Diagram of Admin Panel

Contest Manager Panel:

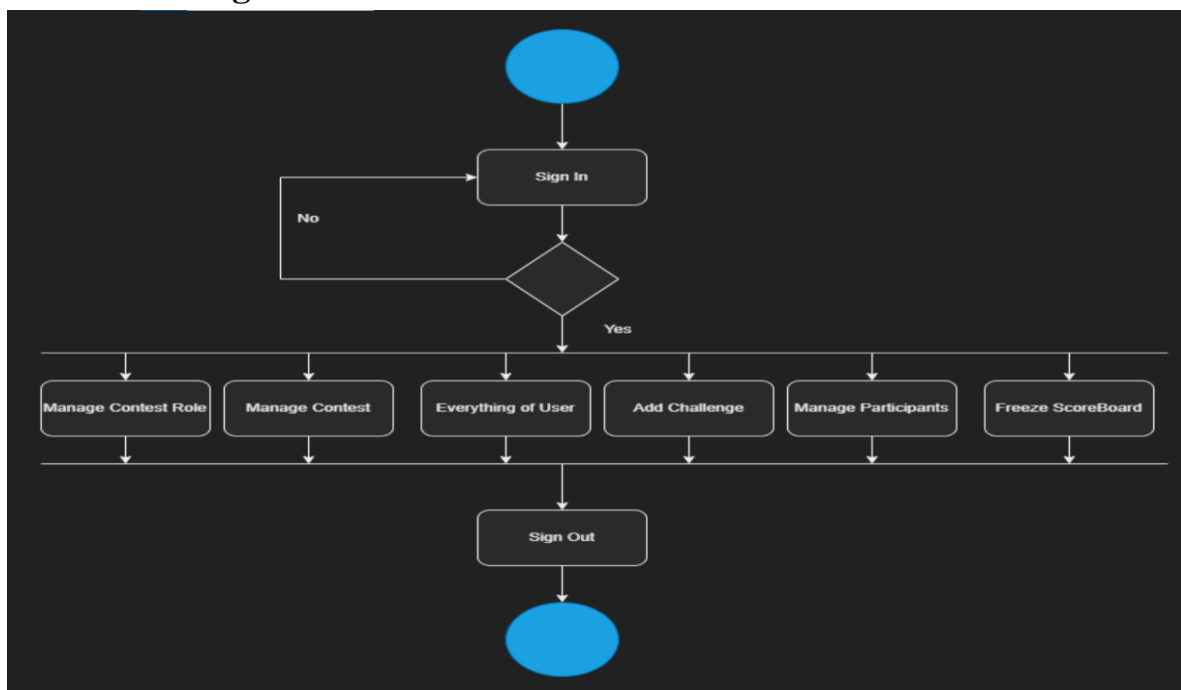


Figure 3.3.17: Activity Diagram of Contest Manager Panel

Admin Panel:

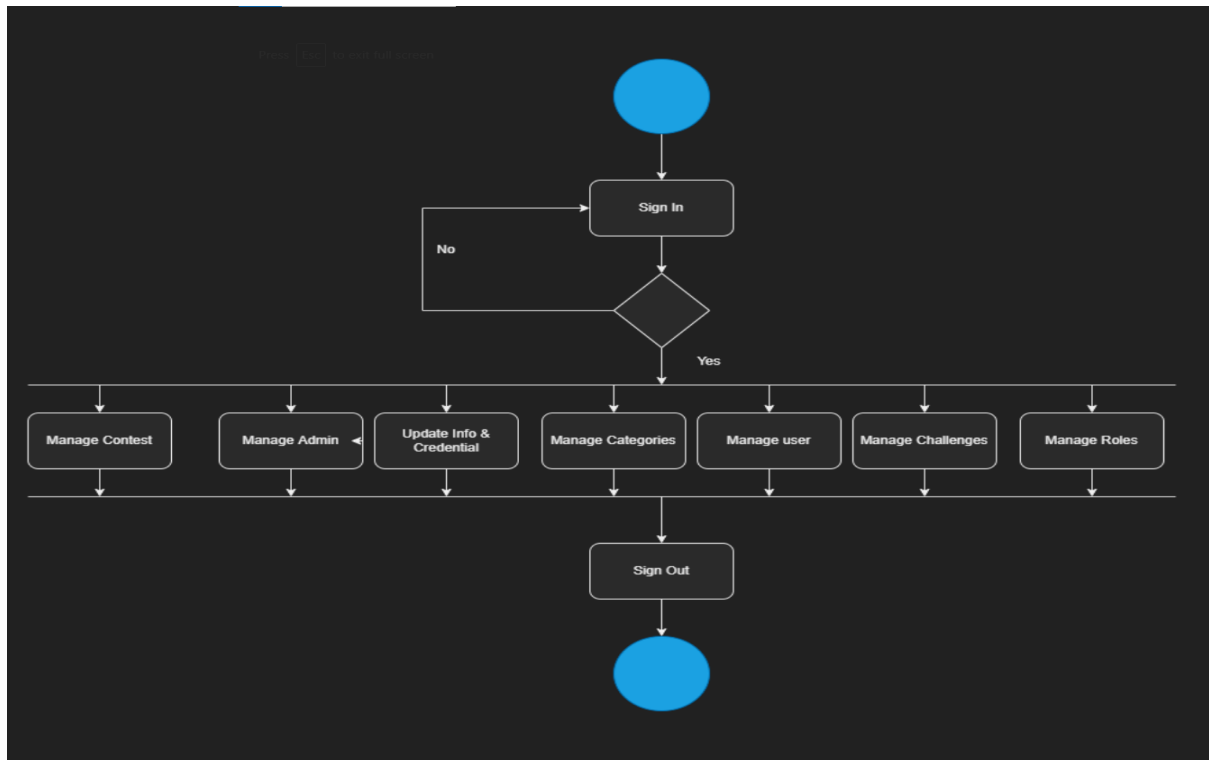


Figure 3.3.18: Activity Diagram of Admin Panel

3.4 Entity Relationship Diagram

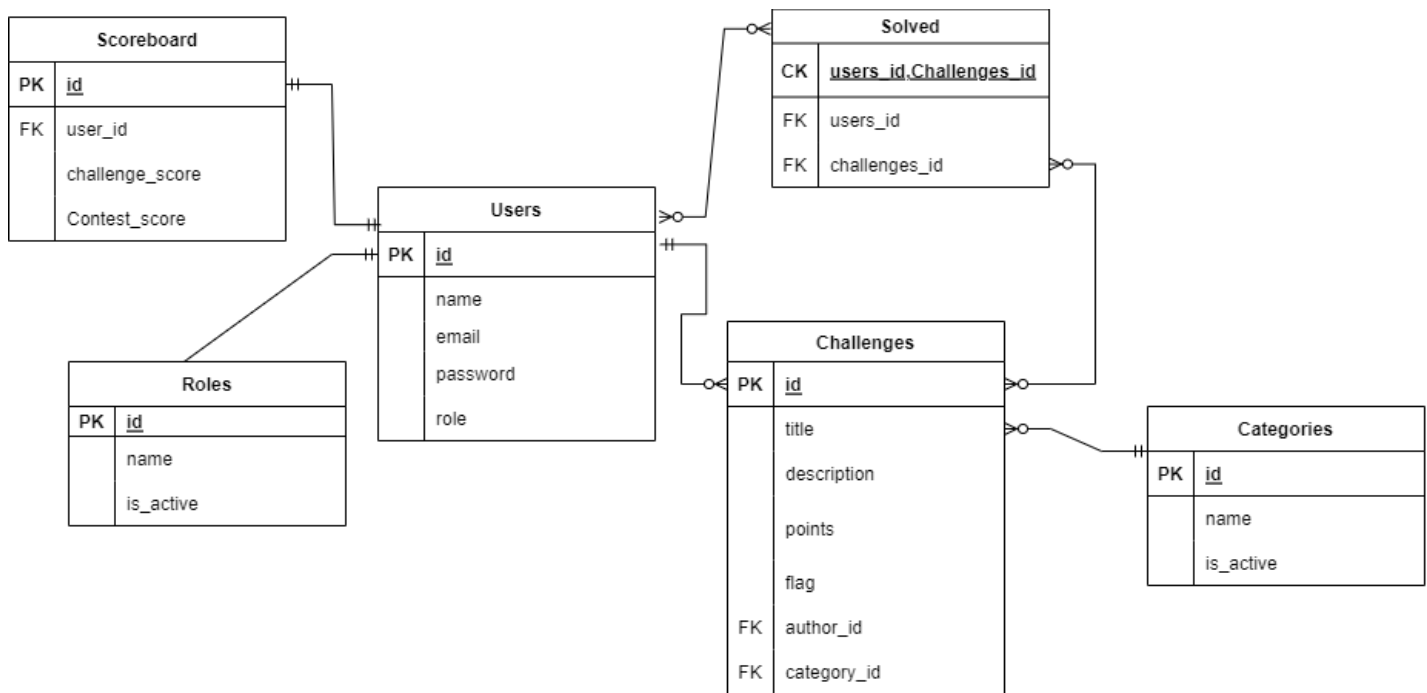


Figure 3.4: Entity Relationship Diagram of illus1onCTF

CHAPTER 4: SYSTEM TESTING

4.1 Feature Testing

Feature testing is considered to add and modify the feature system of the new features. New functionality of the system will arrive here with the uppermost system. And the main. Those are designed to make the web application more efficient, useful, reliable, effective, and secure.

4.1.1 Features to be tested

Table-4.1: Features priority table

Features	Priority	Description
Login	4	The user must be authenticated with valid credentials.
Registration	4	Users need to register to access all features.
Authorization	5	Our web app should authorize users according to their role. And respond according to that.
Log out	2	Users can Logout from our web app.
Update Credential	3	User can update their credentials by changing their name, email, or password.
Filter	1	Users can find specific challenges by filtering.
Solve CTF	1	Checking if the user can solve CTF with a valid flag
Manage CTF	1	Only the Author and admin can CRUD CTF.
Category Management	3	Only the Admin can manage the category.
Score Board	2	Scoreboard should show according to the user's Score.
Role Management	4	User roles can be changed by admin or specific score.
Contest Management	3	User can host a contest if he gets permission from the admin.
Response Time	4	Response time should be as minimum as possible.
Moderator Management	2	Can add moderators in the Contest.

Author Management	2	Admin can update user roles and remove their roles.
Publish Challenge	2	Author can request to publish challenges.
Participant Generation	1	Contest manager can generate private users for specific Contests.

4.2 Test Strategies

4.2.1 Test approach

I used two different kinds of testing to make sure that my system was good. I focused on functional testing and structural testing mainly.

- Black Box Testing, which is also called "functional testing," is a type of testing that doesn't look at how a system or component works on the inside. Instead, it only looks at the outputs that come from certain inputs and execution conditions.
- White-box testing, which is also called structural testing and glass-box testing, is a type of testing that looks at how a system or component works on the inside.

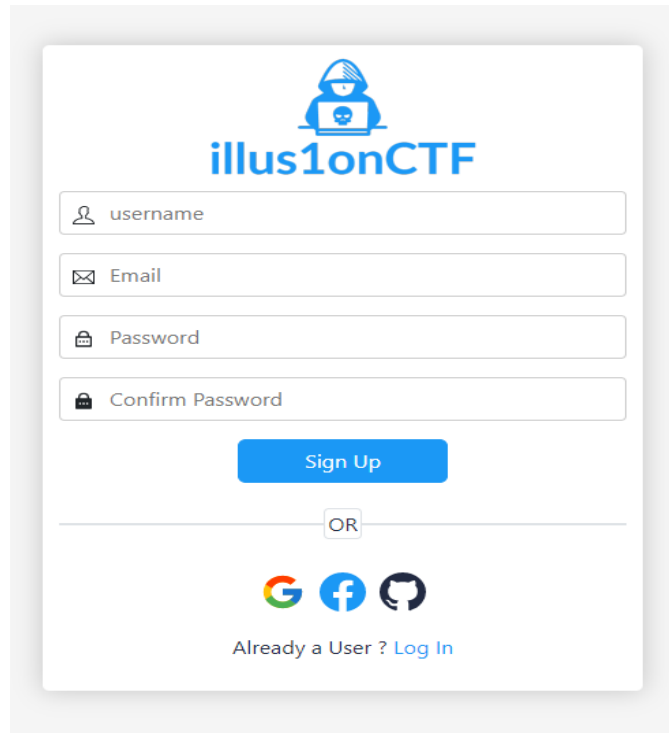
4.2.2 Testing Schedule

Test Phase	Time
Planning	1 W
Unit Testing	During development time
Component Testing	During development time
UI Testing	1W
Usability Testing	3 Days
Responsive Testing	3 Days
Database Testing	1w
Performance Testing	1w

Compatibility Testing	1w
Accessibility testing	1w
Stress Testing	1w
Security Testing	2w

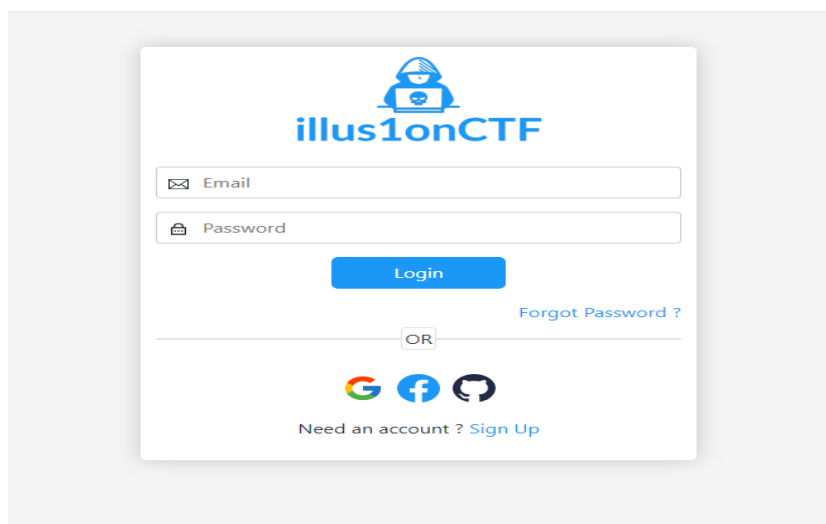
CHAPTER 5: USER MANUAL

5.1 Registration:




The registration form for illus1onCTF features a blue logo at the top with a hacker icon. Below the logo are four input fields: 'username' (with a person icon), 'Email' (with an envelope icon), 'Password' (with a lock icon), and 'Confirm Password' (with a lock icon). A blue 'Sign Up' button is positioned below the fields. A horizontal line with 'OR' in the center separates the registration section from the login section. Below the line are three social media icons: Google, Facebook, and GitHub. At the bottom, the text 'Already a User ? Log In' is displayed with 'Log In' as a blue link.

Log In :



The login form for illus1onCTF features the same blue logo at the top. Below the logo are two input fields: 'Email' (with an envelope icon) and 'Password' (with a lock icon). A blue 'Login' button is positioned below the fields. To the right of the button is a blue link 'Forgot Password ?'. A horizontal line with 'OR' in the center separates the login section from the registration section. Below the line are three social media icons: Google, Facebook, and GitHub. At the bottom, the text 'Need an account ? Sign Up' is displayed with 'Sign Up' as a blue link.




Forgot Password :



Email


[Reset](#)


OR

Need an account ? [Sign Up](#)

User Dashboard :



[Dashboard](#) [Challenges](#) [Contest](#) [LeaderBoard](#) 

Challenges Rank
Solved : 17 / 1700
Rank : 1707

Contest Rank
Participated : 10 Contest
Rank : 13

Contribution Point
Score : 1700
Rank : 3

Progress Overview

Binary Exploitation	70/100
Cryptography	70/100
Forensics	70/100
General Skills	70/100
Reverse Engineering	70/100
Web Exploitation	70/100
Total Solved	70/100

→ Pay Attention


Before Contest
illus1onCTF Round #832 (Div. 2)
25:50:54
[Register](#)
*has extra registration

→ Find user

[Search](#)

Challenge Page :

illu1onCTF

Dashboard
Challenges
Contest
LeaderBoard


Filters

☐ Hide Solved
☐ Show Bookmarked Solved

Create a Challenge

Want to contribute on illu1onCTF?
Please send us a message and we will get in touch with you.

[Make a Request](#)

Category Filter

All Categories (45)
Web Exploitation (45)
Binary exploitation (45)
Web Exploitation (45)
Web Exploitation (45)
Web Exploitation (45)

Filter By Point

Sed temporibus quasi... | 793 points

Nostrum iste asperiores voluptas tempore est eveni...

Solves 568 568

Consequuntur nemo iu... | 617 points

At quos hic rerum qui esse nulla quod repellendus....

Solves 961 961

Odit praesentium ill... | 208 points

Rerum ipsum autem veritatis. Libero qui corrupti v...

Solves 939 939

Cupiditate sequi imp... | 257 points

Recusandae ut aperiam vitae autem qui soluta. Quia...

Solves 356 356

Sed qui ad quidem se... | 152 points

Ipsa placeat ea ut vel. Qui in illum et qui nihil ...

Solves 344 344

Nulla quidem consequ... | 370 points

Ut accusamus dolore est. Voluptate laboriosam saep...

Solves 300 300

Quis unde quis verit... | 49 points

Explicabo et earum beatae atque rerum. Ut quaerat ...

Solves 69 69

Magnam est fugiat in... | 294 points

Quo quaerat voluptatem officia qui voluptatum reru...

Solves 588 588

Quisquam distinctio ... | 756 points

Laboriosam voluptatem non unde. Earum consectetur ...

Solves 124 124

Blanditiis aut maxim... | 807 points

Nostrum et molestias saepe fugit. Rerum quo unde m...

Solves 676 676

Aut labore numquam q... | 69 points

Quam unde modi voluptatem et laborum unde voluptat...

Solves 954 954

Nostrum possimus min... | 255 points

Est ea et eius fugit consectetur. Esse et aut plac...

Solves 616 616

Quo qui nulla sit ut... | 428 points

Nemo aliquam quo voluptatum ipsa dignissimos dolor...

Solves 175 175

Suscipit mollitia ma... | 263 points

Nisi nisi eos ullam magnam deleniti molestiae in v...

Solves 185 185

Quasi expedita dolor... | 523 points

Ab minus quas quae. Debitis nihil nesciunt odit ve...

Solves 496 496

Quod ullam voluptas ... | 619 points

Ipsa quod vitae adipisci sequi mollitia sequi cons...

Solves 364 364

Eos officiis vel mod... | 951 points

Harum qui exercitationem in occaecati et similique...

Solves 116 116

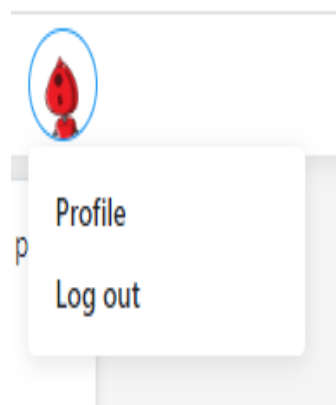
Odio perferendis aut... | 202 points

Laborum est aut iure nisi quibusdam. Suscipit repe...

Solves 860 860

1 2 3 > 18 / page

Log Out :



The image shows a user profile icon (a red flame) with a dropdown menu. The menu contains two options: 'Profile' and 'Log out'.

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Filtering options :

Filters

☐ Hide Solved

☐ Show Bookmarked Solved

Create a Challenge

Want to contribute on illus1onCTF?
Please send us a message and we will
get in touch with you.

Make a Request

Category Filter

All Categories (45)
Web Exploitation (45)
Binary exploitation (45)
Web Exploitation (45)
Web Exploitation (45)
Web Exploitation (45)

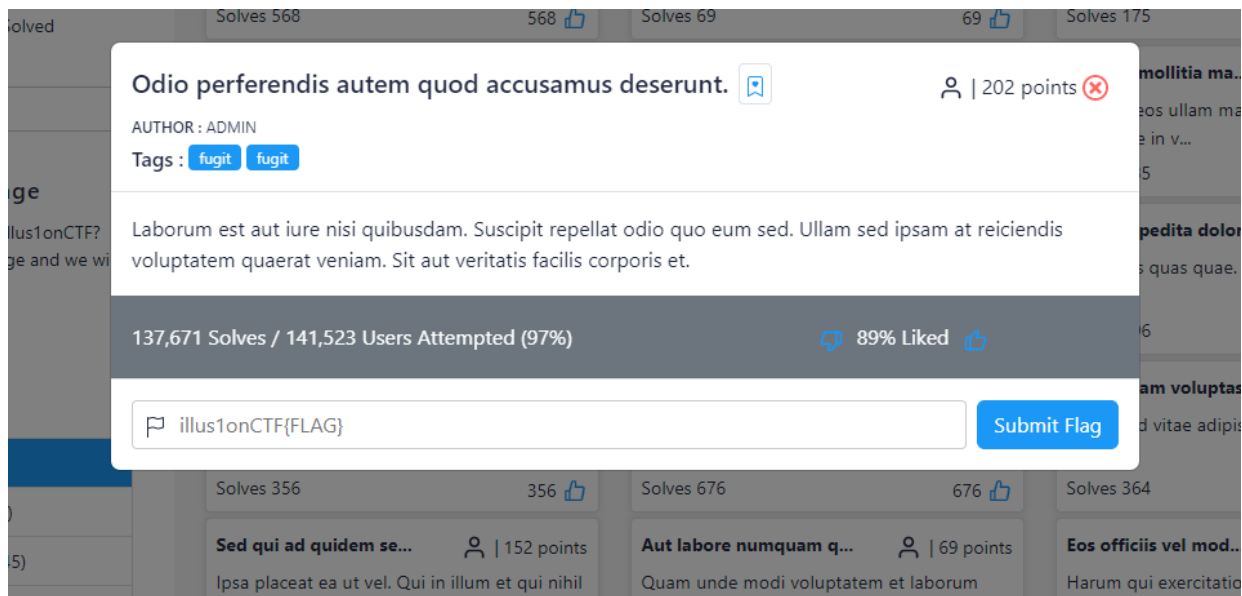
Filter By Point

Min

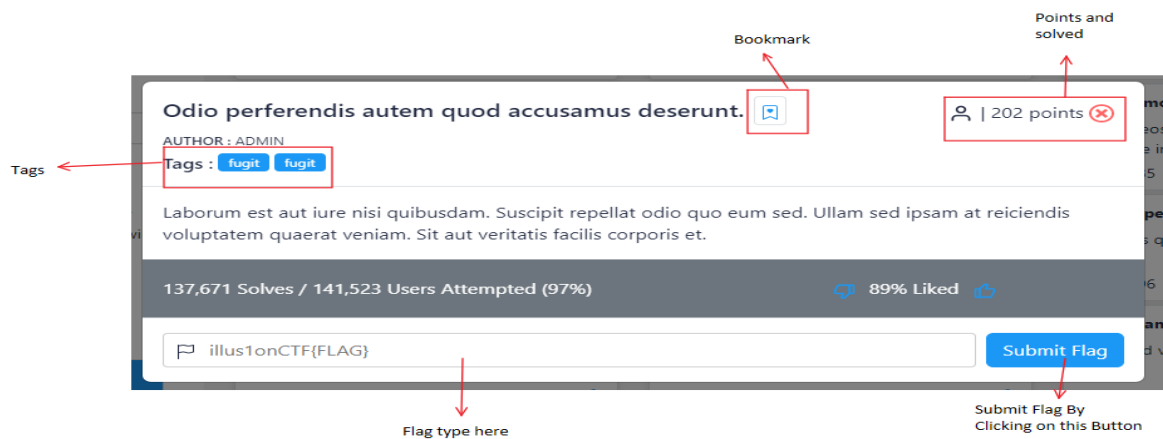
To

Max

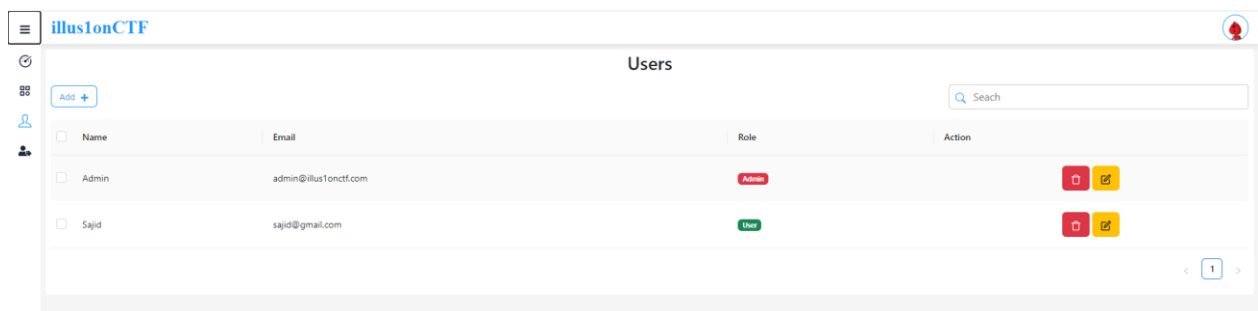
Challenge View:



Challenge View Manual:



Admin panel:



CHAPTER 6: CONCLUSION

6.1 Project Summary

We live in a time where almost everything is connected with technology. Where cyberattacks are increasing day by day. In this cyber world, making our data secure is one of the greatest challenges. Hackers are always thinking of new and creative ways to get into data, so it's the job of information security analysts to find risks before hackers do. If they want to keep up with the constantly changing environment in which cyber-attacks happen, they will need constant training (especially in secure coding). But, how can people train themselves? They had to know first how to exploit. If they know how to exploit then they can make it more secure. but attacking other servers or applications is illegal. People need a legal way to learn to hack, a place where they can attack without thinking of the law. "illus1onCTF" is providing that feature. "illus1onCTF" is providing a platform where there will be many challenges to practice, which will help users to train. There will be many contests on a weekly or monthly basis, which will provide a competitive environment, people will compete within themselves and that will encourage them to practice and learn more on a daily basis.

6.2 Tool and platform

Hardware specification:

Processor	1.6 GHz or faster processor
Ram	1.5 GB
Disk Space	4GB of available hard disk

Software specification:

OS	Windows 10
Frontend	HTML, CSS, JS
Library	Axios, Redux
Frameworks	React, Bootstrap5, Laravel
Backend	Php (Laravel), REST API, Passport(Auth)
Text editor	VS Code
Database	MySQL
Clients	Google Chrome, Firefox, Brave, Chromium
Web server	Apache
Drawing tools	Draw.io, OneNote, Photoshop

6.3 Limitations

- SMS alert facility is not available.
- As it was created with React that's why the website is not SEO friendly.
- Registration Email verification is not available.
- Chatting and connection are not available right now.
- Contest manager and Author roles are not available right now.
- Hosting contest is in progress.

6.4 Future Scope

There are many things that can be simplified and made user-friendly. We can increase some of the codings to enhance functionality. We are mainly focused on the hosting contest, but this is still in progress. We wanna make our website simple so that we can get many contributors, who can help us create as many challenges as possible. The more users can train the more they will learn. That's why there will be a facility for becoming an Author after getting a specific

score. It now lacks the ability to back up the database. The next development will be to enable the backup capability to be bundled, allowing users to perform activities based on previous data. As technology emerges, it is possible to upgrade the system and can be adaptable to the desired environment.

Plagiarism Report



Project Report Library

to me, Rajib ▾

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 - c. All pages have to be arranged according to the table of contents
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