Project Report: CTFx – An Online Platform for CTF Practice

Website Link:

https://ctfx-ctepfchdg3ajc6fj.canadacentral-01.azurewebsites.net/

1. Project Overview

CTFx is an interactive online platform designed to help users practice Capture-the-Flag (CTF) challenges. Users can register accounts, solve challenges, create and upload their challenges for others to solve, and track their progress on the leaderboard. The platform gamifies cybersecurity learning, promoting an engaging environment to enhance users' skills in cybersecurity, problem-solving, and cryptography.

2. Technologies Used

- **Node.js:** Backend runtime for javascript
- **Express.js:** Used as the web application framework to create the routes and API for the platform.
- **MongoDB:** The NoSQL database for managing user information, challenges, and leader-board data.
- **Bulma.CSS** – CSS framework used for styling and front-end design.

3. Purpose and Goals

The primary goal of CTFx is to provide an engaging platform where users can practice CTF challenges at their own pace. By allowing users to solve challenges, earn points, and contribute their challenges to the community, CTFx fosters collaborative learning while encouraging users to advance their cybersecurity skills.

4. Features and Functionality

- **User Registration and Authentication:** Users can create an account, log in, and manage their profiles.
- **Challenges:** Users can solve pre-defined challenges to gain points, covering a variety of topics such as cryptography, web vulnerabilities, reverse engineering, and more.

- **Create Challenges:** Users can submit their own challenges for others to solve, encouraging community participation and content generation.
- **Points System:** Each user has points associated with their account, which increase as they solve challenges.
- **Leaderboard:** A global leaderboard tracks the top-performing users based on points, encouraging competition.

5. Development Process

1. Planning and Design:
- Core functionality: user registration, challenge-solving, and leaderboard features.
- Sketched the basic architecture using Node.js(Express) for backend and MongoDB as the database

2. Implementation:
- Setup the users API (registration and authentication)
- Setup the "ctfx" API which included fetching challenges, adding new challenges, serving a particular challenge and tallying points for the users
- Setup the leader-board page and the profile page for the individual user
- Styled the website using CSS-component framework Bulma.CSS

3. Deployment:
- Setup a local git repository for the project
- Created a new Azure App Service Web Application using the Azure Portal
- Deployed the app from the local repository to the Azure remote repository

6. Future Enhancements

- **Challenge Categories:** Adding more diverse challenge categories to cover topics like network security, binary exploitation, and OSINT and implement a tagging system for challenges.
- **Team-Based Challenges:** Enabling team creation and participation in challenges for collaborative problem-solving.
- **Timed CTF Events**: Hosting timed competitions where users compete in real-time for a limited duration, with points awarded to the fastest solvers.
- **Hint System**: Introducing a hint system for beginners, with points deducted for using hints.
- **User Profile Customization**: Allowing users to personalize their profiles with avatars, achievements, and challenge completion badges.