A Comprehensive Cybersecurity Learning Ecosystem with Integrated CTF Methodologies

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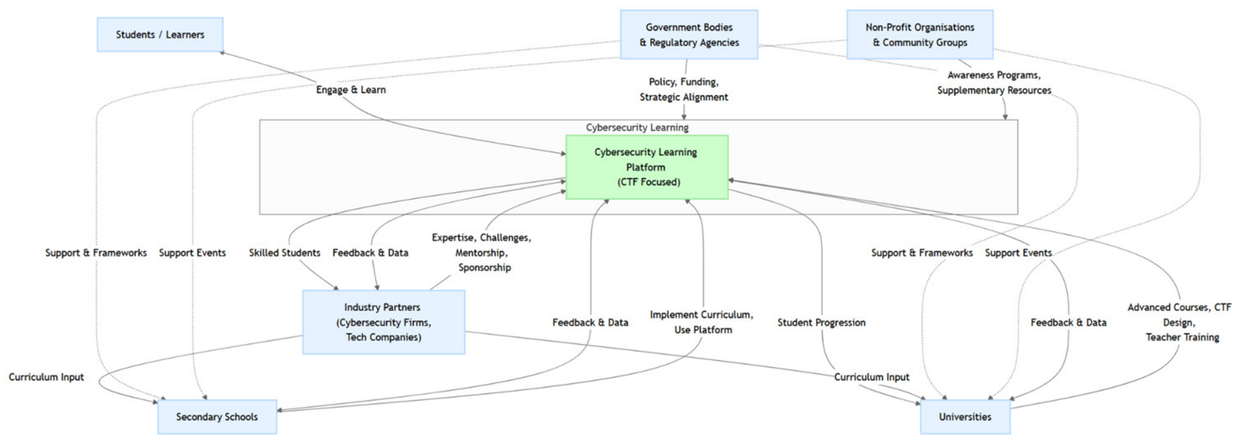
1. Introduction

There is a serious shortage of skilled cybersecurity workers in Hong Kong. In secondary schools, the main focus of education is on theory which fails to encourage early student interest in this field. Students **lack opportunities** to learn and practice practical skills in a secure environment.

This project bridges this gap by developing a complete **cybersecurity learning environment** that fits secondary education system in Hong Kong. The platform offers an interactive, fun and useful way for students to learn important skills and become the next cybersecurity experts.



2. Aim & Objectives

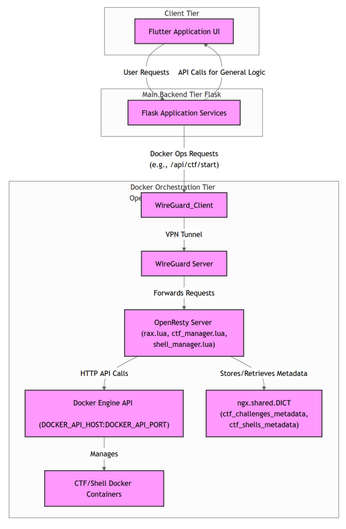
Objective: To create a complete cybersecurity learning environment based on **Capture the Flag (CTF)** approaches, and to help secondary school students in Hong Kong improve their cybersecurity knowledge.

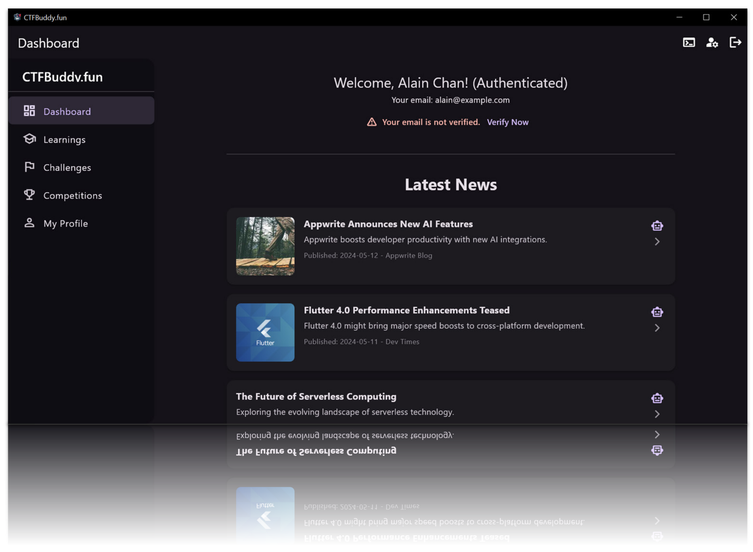
- **Develop** a platform that includes a Learning Management Systems (LMS), a CTF Engine.
- **Create** a curriculum that is progressive and allows students to move to higher levels of education.
- **Use** a CTF Engine that displays scores in real time and gives access to secure, isolated Docker containers for practical training.
- **Add** points, badges and leaderboards to encourage students to take part in learning.
- **Design** a model that ensures the company can survive and grow with the help of stakeholders.

3. System Architecture & Methodology

The platform uses a modern and modular architecture that ensures growth and security. The team adopted an Agile approach to facilitate its development and improvement.

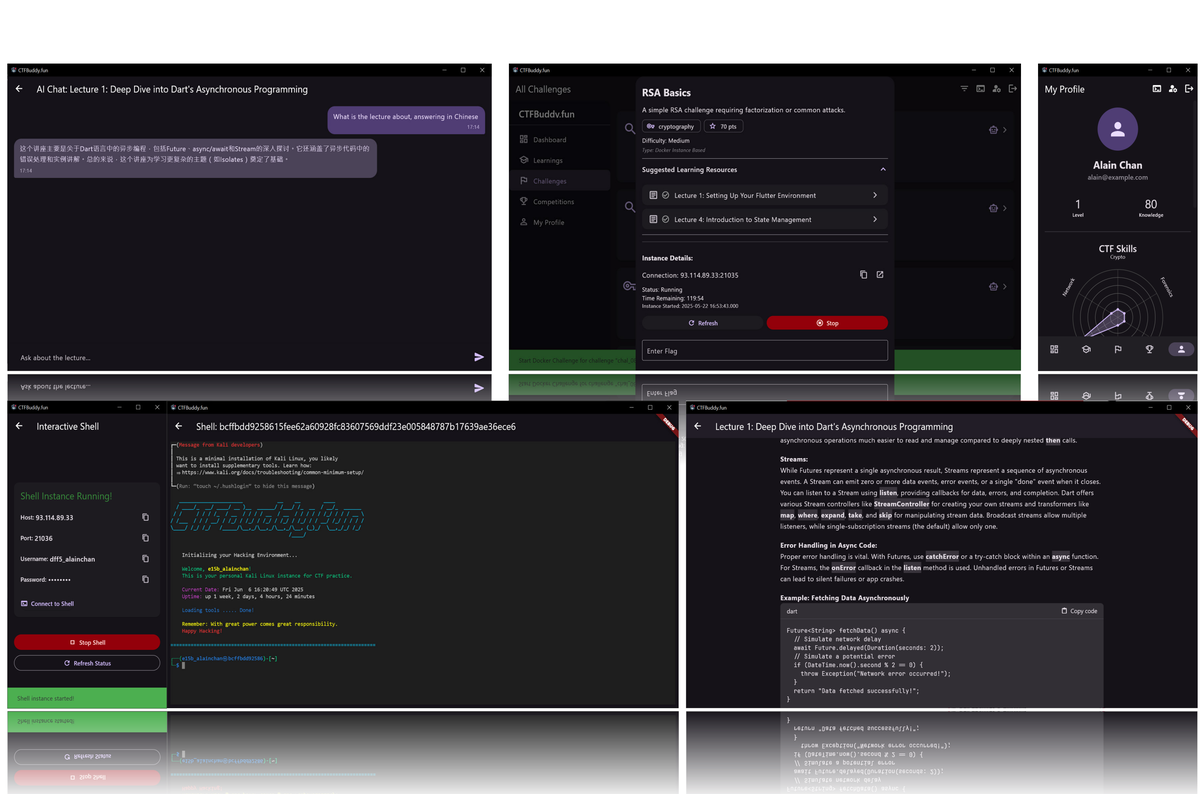
- **Flutter** is used to create a web application that works on any platform and deliver a smooth and enjoyable experience to user.
- **Microservices** developed with Flask (Python) are responsible for the main logic of the application in the backend.
- **OpenResty** server ensures that Docker services are securely and efficiently accessed by using API Gateway & CTF Orchestration.
- **Appwrite**, a Backend-as-a-Service, offers a scalable NoSQL database for all the data in the application.
- **Docker** containers, CTF challenges can be run safely, separately and consistently.





4. Key Features & Findings

The project produced a prototype platform with important features that provide an effective learning experience.



5. Summary & Future Plans

A prototype for a cybersecurity learning platform has been developed to help train new cybersecurity experts in Hong Kong. It uses a well-structured program and hands-on tasks. AI will be used to customize learning paths, It also provides teachers with resources to create their own lessons.