ONLINE JUDGE PLATFORM

An online judge platform is a web-based system that allows users to submit code solutions to programming problems and receive automated feedback on their correctness and efficiency. It features a problem repository, user interface for problem listing and submission, a secure code execution environment supporting multiple languages, and an automated judging system that evaluates code against predefined test cases. Users receive feedback on their submissions and can track their progress via a dashboard. The platform supports user registration, problem-solving, feedback, contests, and competitions. Examples of such platforms are LeetCode, HackerRank, Codeforces, and CodeChef.

Key Components

I. User Interface :

- **User Dashboard:** Provides users with an overview of their submissions, performance, and progress.
- **Problem Listing:** Displays a list of available problems, often categorized by difficulty or topic.
- **Problem Detail Page:** Shows the full problem statement, input/output details, and any sample test cases.
- **Submission Interface:** Allows users to upload their code, typically supporting multiple programming languages.

II. Problem Repository:

- A collection of programming problems, each with a clear statement, input/output specifications, constraints, and sample test cases.

III. Code Execution Environment:

- A secure sandboxed environment where user-submitted code is executed. This ensures that code runs safely without affecting the host system.
- **Language Support:** Ability to compile and execute code in various programming languages like C++, Java, Python, etc.

IV. Judging System:

- **Automated Judging:** Evaluates submitted code against a set of predefined test cases. It checks for correctness (producing the right output) and efficiency (running within time and memory limits).
- **Feedback Mechanism:** Provides users with feedback, such as Accepted, Wrong Answer, Time Limit Exceeded, Runtime Error, or Compilation Error.

V. Scoring and Ranking:

- **Scoring:** Assigns points based on the correctness and efficiency of solutions.
- **Leaderboard:** Displays user rankings based on their scores, often encouraging competitive programming.

VI. Administrative Tools:

- Tools for problem setters to add, edit, and manage problems.
- Tools for moderators to review submissions, handle disputes, and manage user accounts.

HIGH LEVEL DESIGN

Architecture Overview:

1. **Frontend :** Django Templates
2. **Backend :** Django
3. **Database :** MySQL
4. **Code Execution:** Docker containers to securely execute user code**.**
5. **Hosting and Deployment:** AWS
6. **Version Control:** Git

Modules and Components

1) User Management :

- Registration, Login, Logout, Profile Management, Roles and Permissions

2) Problem Management :

- Create, Update, Delete Problems, Categorize Problems

3) Submission System :

- Code Submission, Real-time Code Execution, Result Verdict

4) Testing and Evaluation :

- Test Case Management, Automated Evaluation, Scoring System

5) Leaderboards and Rankings :

- Display User Rankings, Contests and problems solved

6) Code Editor :

- Integrated Web-based Code Editor, Code Templates, Run Code

7) Security :

- Sandboxing, Input ValidationAdministrative Features

8) Administrative Features :

- Admin Dashboard, Moderation Tools, Logs and Audits