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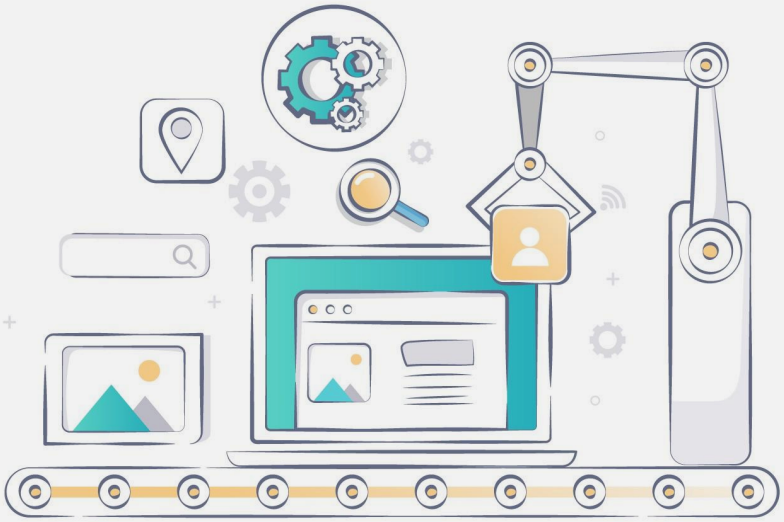

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High-Level Design
Online Judge

The main aim is to provide an overview of the system architecture. The task is to build an Online Judge using Django from scratch. The final product will allow users to submit their code in multiple programming languages, execute them and generate a verdict in real-time. The system will be constructed with a focus on ensuring robust security and scalability.

Main Components

1) **Frontend:** HTML, CSS, Javascript and Python Templates
2) **Backend:** Django framework to handle the logic
3) **Database:** Postgresql of django
4) **Other components**: Custom compiler, Docker for isolation and AWS EC2 instance to host the app

Key Functionality

1. **User Authentication and Authorization:**
    a) User registration and login page for authentication
    b) Permissions assigned based on role (e.g., Students, Admin and Employee)
2. **Database Design:**
    a. User_id to identify which user is currently active
    b. Customized Home Page based on gender and role
    c. Problem Table:
        i. Problem Id
        ii. Problem name
        iii. Problem description
        iv. Difficulty level → Easy, Medium, Hard
        v. Input and Output (base case)

d. Testcase Table:
    i. Problem Id → to which this testcases corresponds to
        1. **Use foreign key to connect the problems and test case**
    ii. Test cases → array of actual Output corresponding to each Input
        1. Test case number
        2. Input and Output → pre-defined

e. Attempt Table:
    i. Attempt number
    ii. Problem Id
    iii. User Id
    iv. Language used
    v. Date and Time of submission
    vi. Code
    vii. Final Verdict
        1. Returns "**Accepted**" if the output from user's code matches with the pre-defined output array
        2. Make changes in the attempts database
        3. Supports TLE and Runtime ERROR

f. View common stats in profile section

g. Custom Input feature

h. Can copy submitted codes in past submissions

3. WebServer Design:

a. UI Screens Involved:
    i. Login Page
    ii. Registration Screen
    iii. Home Page (before & after)
    iv. Dashboard with list of problems & difficulty
    v. Profile
    vi. Problem Screen → Shows problem statement with Input and Output (Base Case) with difficulty of problem
    vii. Create Testcase
    viii. Create Question

b. Editor to write code along with submit, run button and Custom Input option.
    i. After clicking the submit button, feed the Input to the user's code and compare the output received with the pre-defined Output in the solution table. Generate the verdict and update the attempts table.
    ii. Run Button - Compile code and check for any error or not
    iii. Custom Input - to test code on input and code provided by user
c. Syntax highlighting and line numbers feature for code-editor
d. Shortcut keys support - Tab, Shift + Tab and Enter key in code-editor
e. Code-editor supports both HTML & Markdown language.

4. Security:

a. Custom made Compiler using python subprocess
b. Docker and Docker-Compose to maintain 2 containers → one for postgresql database and other for whole django application

5. Deployment on AWS

a. Using EC2 instance provided by AWS to deploy our whole file and host our website on internet to be accessed globally.
b. Using Git Student's Developer's Pack to have domain name and SSL certificate to by-pass chrome security layer.