

Online Judge

An online judge refers to a website that has a library of coding problems, with test cases and expected outputs for each problem (preferably hidden from the user), where the user has the option of writing code for a particular problem and submitting it. Upon submission, the output of the user code will be compared to the expected output and a verdict will be displayed to the user.

Expected Features:

1. Users should be able to login by providing username/email and correct password.
2. Users should be able to submit their code through either file upload or writing in an in-built text editor.
3. Problem Library should display a list of problems.
4. Users should receive a verdict for each of their submissions.

High Level Design:

1. Database Schema:
 - a. Problem Library JSON structure:
 - i. Problem Title : string
 - ii. Problem Statement : string
 - b. Test Cases JSON structure:
 - i. Input : string
 - ii. Output : string
 - iii. Problem link : link to problem JSON document
 - c. Submissions JSON structure:

- i. Verdict : string
 - ii. Submission Time : DateTime
 - iii. Problem link : link to problem JSON document
- d. User Authentication JSON stricture:
 - i. User ID : string
 - ii. Password : string
 - iii. Email : string
 - iv. Username : string

2. Front End Structure:

- a. Home Screen :
 - i. Login/SignUp screen
 - ii. Problem Library
- b. Problem Screen:
 - i. Text editor section
 - ii. Language select section
 - iii. File upload section
 - iv. Submission log section.
- c. Submissions Screen:
 - i. Past Submissions section (with verdicts)
 - ii. Links to past submission code.

3. Security Flaws and solutions:

- a. Flaw: Large number of users submitting simultaneously.

Possible Solution: Implementing a submission queue, which might increase waiting time for users but will prevent server from crashing due to too many requests.

- b. Flaw: User submitting a solution that takes very long to finish running.

Possible Solution: Implementing a Time Limit

Exceeded verdict, which prevents user code from running longer than a fixed duration the length of which would depend on the problem setter.

- c. Flaw: User submitting a very large solution file, causing slowdowns.

Possible Solution: Implementing a size limit for user submissions, which prevents users from submitting files larger than a specified memory size.

- d. Flaw: User submitting a solution that uses too much memory upon running.

Possible Solution: Implementing a Memory Limit Exceeded verdict, which prevents user code from using more server resources than necessary.