

Online judge

An online judge is a platform where we can host or attend coding contests and submit our code, it compiles and evaluates the submitted code against a set of predefined test cases and returns a verdict based upon the code provided for that problem. Online judges also have ranking systems and leaderboards.

Some examples of online judges are: Codeforces, Leetcode, Hackerrank, Codechef etc.

HLD (High level design for the oj)

Tech Stack:

M: mongo db

E: express js

R: react js

N: node.js

Features:

- User/admin login and user signup
- View problems by categories (sort and filter)
- Solve problems
- Submit problems and get verdict
- See user dashboard and profile
- Contests
- Ranks

Front end:

Page1: Login/Signup

Page2: landing page

Page3: problem list, normally or filter by category or sort

Page4: problem solve

Page5: submission page

Page6: leaderboard

Page7: contest

Page8: user dashboard / profile

Database:

Table 1: users

- U_id
- Rating
- Rank
- Name
- Email
- Mobile
- Password
- Usertype

Table 2: Problems

- P_id
- Title
- Statement
- Input
- output
- Tags
- Category
- Const
- U_id
- T_id

Table 3: testcases

- T_id
- P_id
- U_id
- Input (array object)
- Output (array object)

Table 4: submission

- S_id
- U_id
- P_id
- T_id
- Verdict
- Code
- Language
- Submitted_at

Backend:

Restful Apis

Rest is an architectural style built for simplicity and restful Apis are representational state transfer Api. A set of rules by which software applications communicate with each other over internet.

It allows applications to access and manipulate resources on a server like http or https methods like get post put and delete

Get: retrieves data from resource

Put: creates a new resource

Post: deletes a resource

Delete: updates an existing resource

Authentication & User Management

- POST /api/auth/login - User login
- POST /api/auth/logout - User logout
- POST /api/auth/register - User registration
- GET /api/auth/profile - Get current user profile
- PUT /api/auth/profile - Update user profile
- POST /api/auth/refresh - Refresh authentication token

User Operations

- GET /api/users - Get list of users (with pagination)
- PUT /api/users/{id} - Update user information
- DELETE /api/users/{id} - Delete user account

Problem Management

- GET /api/problems - Get list of problems (with filters, pagination)
- GET /api/problems/{id} - Get specific problem details

- POST /api/problems - Create new problem (admin only)
- PUT /api/problems/{id} - Update problem (admin only)
- DELETE /api/problems/{id} - Delete problem (admin only)
- GET /api/problems/{id}/testcases - Get test cases for a problem

Submission System

- POST /api/submissions - Submit solution to a problem
- GET /api/submissions - Get list of submissions (filtered by user/problem)
- GET /api/submissions/{id} - Get specific submission details
- GET /api/submissions/{id}/status - Get submission status and verdict
- GET /api/submissions/{id}/code - Get submitted code

Contest Management

- GET /api/contests - Get list of contests
- GET /api/contests/{id} - Get contest details
- POST /api/contests - Create new contest (admin only)
- PUT /api/contests/{id} - Update contest (admin only)
- DELETE /api/contests/{id} - Delete contest (admin only)
- POST /api/contests/{id}/register - Register for contest
- GET /api/contests/{id}/problems - Get contest problems
- GET /api/contests/{id}/leaderboard - Get contest standings

Leaderboard & Statistics

- GET /api/leaderboard - Get global user rankings
- GET /api/users/{id}/statistics - Get user statistics
- GET /api/problems/{id}/statistics - Get problem statistics
- GET /api/contests/{id}/standings - Get contest standings

Judge System

- POST /api/judge/run - Execute code with custom input

- GET /api/judge/languages - Get supported programming languages

Admin Operations

- GET /api/admin/users - Get all users (admin view)
- GET /api/admin/submissions - Get all submissions (admin view)

File Operations

- POST /api/files/upload - Upload files (test cases, problem statements)
- GET /api/files/{id} - Download file
- DELETE /api/files/{id} - Delete file

Notifications

- GET /api/notifications - Get user notifications
- PUT /api/notifications/{id}/read - Mark notification as read
- DELETE /api/notifications/{id} - Delete notification

Docker

Docker is an open-source containerization platform which allows developers to deploy their code on cloud without worrying about the dependencies as the containerization in docker containerizes all the features and dependencies that are required for the code or application to work on any computer or platform without worrying about dependencies. The dependencies and code are encapsulated in a container.