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Interactive Coding Platform for Students

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Abstract: ***Programming has become one of the most demanded skill of a working professional in almost every industry. Even though we have a lot of platform to work on and learn from, we are not properly trained in this domain . This has increased the need for a platform that is targeted only for the colleges students to develop a coding culture among them , right from the start. The project that we aim to develop solves this particular issue and will also enhance the skills of the students by continuous feedback learning. The end-product will be a web application which the teachers can use to set problems and give assignments while the students will use the application to solve the assignments. The application will be developed using: VueJS in the front-end, the database will be MongoDB and the back-end will be composed of ExpressJS and NodeJS entities. Thus, MEVN is the technology stack on which the web application will be built because most of the operations in the project will be I/0 based and NodeJS is the perfect tool to handle asynchronous calls. The data will be transferred in the form of a JSON contract for easy interpretation. The web application will be composed of REST api endpoints for performing various operations. The application will be built on MicroServices Architecture to support modularity, scalability and ease of use. Some of the features provided by the application are performance comparison of the students, customizable test environment, compilation and execution of the code, cloud storage for sensitive data and support for many languages. Thus, this web application will solve the critical need for skills that are to be possessed by the individuals graduating out of the college as demanded by the IT industry.***

Keywords: Programming, Micro services, MEVN stack, REST

I.INTRODUCTION

Getting started in learning a programming language isn't as daunting as it sounds, nor is it ever too late to learn. Programming involves activities such as analysis, developing, understanding, generating algorithms, verification of requirements of algorithms including their correctness and resources consumption, and implementation (commonly referred to as coding) of algorithms in a target programming language. Many people will say yes, it is hard to learn code. And it's a sad fact that lot of these people give up and fail. But what these people don't realize is that there is no such person as an 'instant coder'. It takes a lot of time and practice to get good at coding.

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As the market place as a whole shifts towards more digital leaning commerce, learning code, even at a basic level, is becoming more important. Not only for young workers to stay competitive, but for older employees in varying industries to stay sharp and able to manage a younger workforce. Technology is everywhere in the today's society. There will always be a need for developers, because our need for apps and software is steadily growing. Regardless of what background you have, the ability to contribute to software means that you are always employable, always able to create and advance technology and always able to be on the cutting edge of innovation. The pace to solve and code a program will considerably increase only upon continuous practice and here is a platform for it. Whether it is for personal growth and development, career advancement, career change, or just a desire to improve digital literacy, knowledge of how software works and the ability to contribute to developing new software means that there is no limit to the impact that you can have. This also brings in uniformity in which students learn to code in a single platform instead of using different other platforms.

II.LITERATURE REVIEW

A. Existing Systems

The following are the observations based on our review of the existing systems.

a. Hacker Rank:

Hacker Rank is a coding platform that enables programmers from all over the world to solve coding challenges. Hacker Rank supports a variety of programing languages (including Java, C++, PHP) and span over a variety of computer science domains. When a programmer submits a solution to a programming challenge, the submission is scored based on the accuracy of the output. Programmers are then ranked globally on the Hacker Rank leaderboard. In addition to individual programming challenges, Hacker Rank also hosts contests (often referred to by Hacker Rank as "Code Sprints") where programmers compete on a specific set of programming challenges during a short period of time and are then ranked at the conclusion of the event. Hacker Rank also allows companies to recruit programmers based on their performance. Hacker Rank is seen as a market leader in the growing gamification trend within competitive computer programmingand the consumer-side of their website is free for coders to use.

b. Code Chef:

It is a global competitive programming platform which supports over 50 programming languages and has a large community of programmers that helps students and other computer professionals test and improve their coding skills.

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Its objective is to provide a platform for practice, competition and improvement for both students and professional software developers. Code chef conducts regular practice contests for ACM-ICPC and also conducts monthly contests to give away prizes. Apart from this,

it aims to reach out to students while they are young and inculcate a culture of programming in India

c. E-Box:

E-Box is a Technology Enabled Active Learning and Assessment platform for technology and engineering domains. Apart from the basic LMS components like quizzes, assignments, lesson components, resource components etc. It has numerous activity components pertaining to technology and engineering concepts that could be used for design and analysis oriented learning. These components are also used for assessing the design and analysis skills of candidates apart from the regular knowledge level testing.

TABLE 1. FURTHER OBSERVATIONS

Observation	Inference
Quality Of Questions	Codechef is the best.
User Interface	HackerRank is the best .
Quality Of editorials	Codechef is the best.
QA and Discussion forums	Codechef and HackerRank are similar.
Prizes and rewards	HackerRank is the best..
Number Of contest	Hackerrank hosts more , but codechef contests are of three types and more interesting.
Participation	Codechef attracts more international participation especially in the long challenge

TABLE 2. COMPARISON TABLE

HackerRank	CodeChef	HackerEarth
Beginners and people interested to start programming use this system.	Experts in programming would prefer using this system.	People with intermediate skill set use this system.
The difficulty level of the problem given in this system increases gradually.	The given problems are complex.	Difficulty level of the problems given are unexpected.
HackerRank provides various learning categories like machine learning ,functional programing and so on.	Lot of complex problem solving competitions are held and the winners are awarded regularly.	Has several intermediate level of analytical problem solving contests and easily attracts recruiters.
The drawback of this system is that it has editorial section to view several solved solution to a problem and thus test cases can be solved easily.	Codechef has no options to view the test cases like that of HackerRank and has a good standard of questions to solve.	HackerEarth neither has an option to view the solved solutions or the test cases. The problems are presented in such a way that a user can easily understand the question of given problem.
Large Community of People and Students use this system.	Has huge number of International active users.	Employees and Staffs use this system for easy and frequent upgradation.

III.PROPOSED SYSTEM

A. System Description

Coding platform is a technology that focuses on competitive programming challenges among the students in college. The programming challenges can be solved in a variety of programming languages like C, C++, Python, Java. On the student's side, when a student submits a solution to a programming challenge, their submission is scored on the accuracy of their output. Students are then ranked on the leaderboard and earn badges based on their accomplishments to drive competition among students. The most important part of this system is that it shows the students their strengths and weakness based on their performance, which helps them develop accordingly. Faculties can update problems with test cases anytime and assign tasks to students and also conduct semester practical examinations in this platform. During placement, we can request recruiters to conduct coding rounds in this platform which might impress the recruiters.

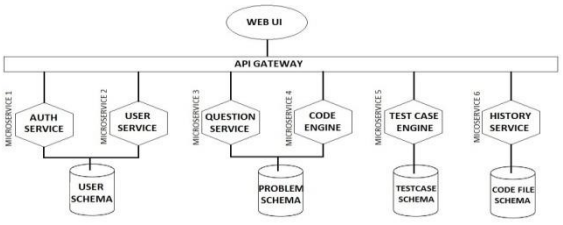

Fig. 1 Module Diagram

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Features

- Modularity
- Open Source
- Scalability
- Extensibility
- Configurable Trainee and Trainer Feedback mechanism.
- Modular and Easy to use.
- Complete decoupling of the Front End and the Back End.
- Scalability is simple.
- Data Visualization
- History is stored and student activities will be monitored and guided.
- Security is high with the front end as they are developed with Vue Js scripts.
- MicroService Architecture is being used to implement the system due to which any single bug won't affect the system process as a whole.

B. Micro services

Micro services is way of architecting the software process functionalities to several micro process which all in the whole combined can together constitute a working software product setup. The *microservice* architecture enables the continuous delivery and deployment of large, complex applications.

1) VueJS App:

The Front End of the Application is developed using the VueJS Framework. The Front end is thus completely decoupled from the other services (Back End). The framework uses Virtual DOM and provide reactive components which are rendered independently. This enhances the performance of the Application and also allows the developers to not render UI Elements from the back end.

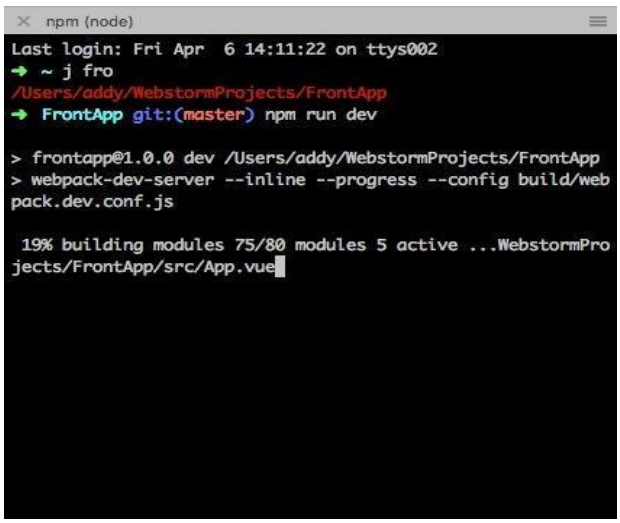

Fig. 2 VueJS App Server

2) Authentication Service:

This service is used to authenticate the students and teachers. PassportJS is used to implement and handle the authentication of the Users. Passwords are stored as hash in the Database for security purposes.The OTP is stored with the credentials along with a timestamp to check for expiry. Some of its functions are: to check if the user has entered the correct credentials, to convert the user password to an encrypted hash and to orchestrate the OTP flow.

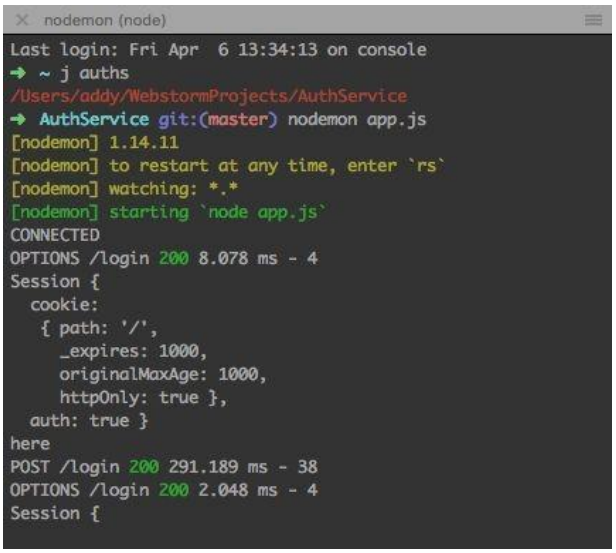

Fig. 3 Authentication Service

3) Question Service:

This service holds all the subjects, its corresponding sub-topics and its questions. It also holds specific information for each of the questions such as Difficulty level, Maximum points, Sample input, Sample output , Constraints, Explanation, Problem Description.

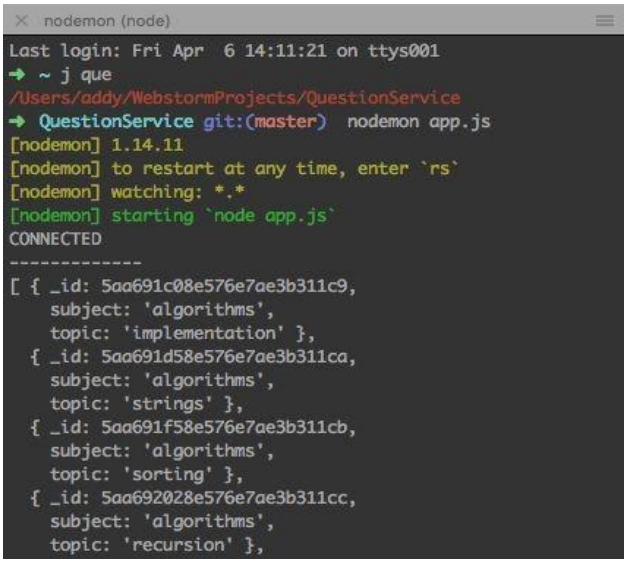

Fig. 4 Question Service

4) Code Engine:

Code Engine is the Micro Service which acts as the core of the entire application. It communicates with all the other services and orchestrates the data flow. Code Engine is used to compile and execute the user code in the server and to give back the result. Some of the functions of this service are : compilation and execution of the code, comparing the user output with the actual output, fetching test cases associated with the problem from the test case engine.

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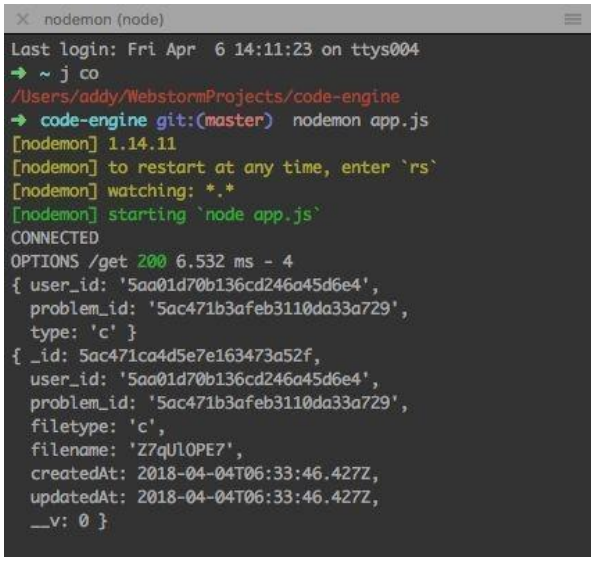

Fig. 5 Code Engine

5) Test Case Engine:

This service is used to store and fetch the test cases corresponding to the desired problem. The code engine interacts with the service to fetch the test cases and compare it with the produced output from the user .The test cases are stored in a specialised form so as to enable the Code Engine to fetch the test cases.

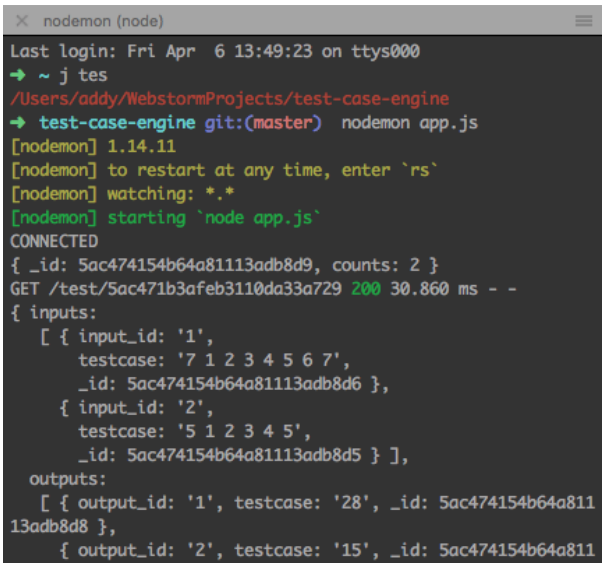

Fig. 6 Test Case Engine

6) User Service:

User Service holds all the user related information. User service is used to obtain and create all user related information. Also it has specific database which has separate collections for User credentials, User information and User points. A series of GET / POST / DELETE / PUT requests are used to Fetch , Create , Delete and Update the user information stored in the database. Some of the functions of the User Service are : to store all user related information , to Create / Delete / Update users by exposing endpoints for sending requests. Maintain timestamps of creation and updation.

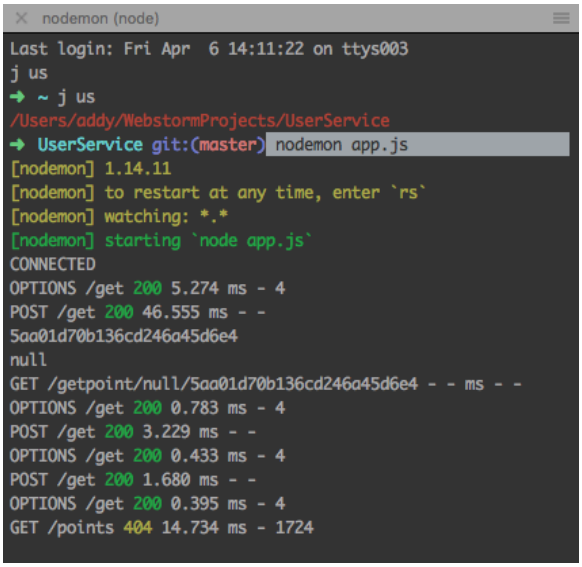

Fig. 7 User Service

7) History Service:

This service is used to analyse the student's activities. This information is used by the teachers to track the students' performance and activities. Only the teachers are allowed to view the activities of the students.

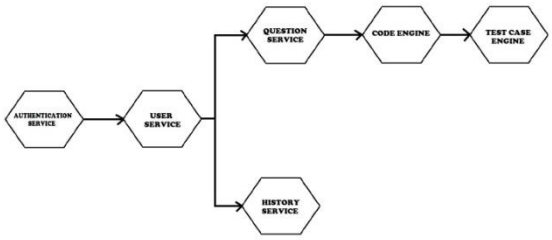

Fig. 8 Microservices Communication

C. Database Design

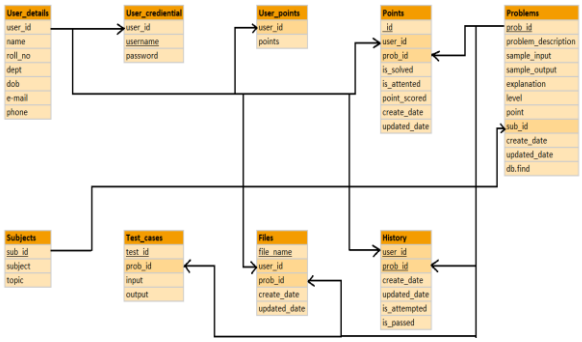

Fig. 9 Database Design diagram

For Design purpose, the Main database is split into the following:

User DB

- User Credentials
- User Information
- User Score

Test Case DB

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- Test Cases

Problems DB

- Subjects
- Problems

History DB

- History

Code DB

- Code Files

IV. SIGNIFIGANCE

This project upon successful implementation would certainly help increase the growth of students to a step higher towards their career. Placement tests can be conducted on this platform for all recruitments. Coding culture will be a habit and integral part of the college. This will bring a good set of competitive and talented resources for the companies to look on and also hire students from our college. Students will inculcate the habit of coding which would bring tremendous change in their approach of programming and ability of problem solving.This platform make each and every student work on a single platform to code and learn instead of using other platforms which are unpredictable in different aspects.

V.CONCLUSION

A Coding Platform for students may sound as simple as any online IDE's having the same functionalities. But this project, upon implementation and regular maintenance, would have a significant and drastic change towards their career preparation .This would rapidly increase the number of placements happening and would enhance the pool of skilled resources in the college. A panel of staffs could be given the responsibility of managing this project and the project can be extended to be developed as a full scale product. Hence, technical placement training by outside vendors can be completely eliminated in a step by step manner. This would probably urge all the students as well as the staffs to set their skill range as high as possible. This will help the students take a better step in their careers. Student can eliminate the fear to code as they would start cultivating the habit of coding right from the beginning. Integrating the features in one single platform brings in an uniformity in which students learn rather than using multiple IDEs to code and learn.

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