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SECURE MERN-STACK MARKETPLACE FOR FREELANCERS AND CLIENTS

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Abstract— MERN-Stack Market for customers and freelancers is a MERN-Stack online website that links customers and freelancers through an interactive system. The platform supports secure login (JWT), custom profiles, real-time chat (WEBSOCKETS), and job postings with filters. Customers are able to search for tasks that fit within their budget and deadline, while freelancers browse based on their skills. There is a rating mechanism that enables clients to rate their freelancers, allowing the latter to establish their reputation. Efficient project management is achieved by way of intuitive dashboards that enable monitoring of proposals and projects. Customers will be notified of any messages, task progress, and ratings in real-time. Advanced searching and filtering make it easier for freelancers to locate suitable tasks.

I. INTRODUCTION

The fast-paced growth in digital technology has revolutionized the labour market, resulting in an increase in freelance workers and project collaborations. Corporations have developed a preference for hiring systems that help them hire qualified personnel on a part-time basis whenever required. Freelancers want to find websites where they can prove themselves and earn credible projects. Traditional hiring procedures still lack efficiency, consuming precious time and having minimal outreach.

In this regard, online freelance marketplaces have proved to be useful as they provide a platform through which communication between clients and freelancers can be carried out. Nonetheless, most of these systems face problems such as insufficient security measures, inefficient communication processes, lack of trust building techniques, and poor scalability. Such issues make it essential to have a highly functional system that guarantees efficient cooperation among stakeholders.

The FreelanceHub system presented herein is an online, scalable, and secure marketplace designed on the MERN (MongoDB, Express.js, React, Node.js) architecture. It is meant to foster efficient communication and project management among clients and freelancers. In addition, the integration of technologies such as MongoDB, Express.js/Node.js, and React helps ensure high efficiency and responsiveness.

Also, the platform offers sophisticated capabilities like JWT-based authentication to ensure security, real-time messaging to facilitate instant communications, and review and ratings systems to create more trust. The clients would be able to post projects that include specifications and requirements, while freelancers would be able to find opportunities, propose and discuss their offers, and maintain their professional profiles. Moreover, the system would allow users to develop structured processes by means of dashboards, milestone tracking, and payments security.

Generally speaking, the suggested FreelanceHub platform is intended to become an online place where freelance work would be facilitated in order to create opportunities for talented individuals.

II.RELATED WORK

Marketplace systems based on MERN stack frameworks for use by both freelancers and clients have received increased interest in recent times owing to tremendous developments in web technologies and cloud-based infrastructures. Recent research studies have been carried out to enhance scalability, security of transactions, and smart matching mechanisms in systems employing current web technology frameworks [1], [2].

Kaur and Singh [1] suggested a web-based platform for freelancing whereby clients could connect with freelancers by means of job postings and bidding systems. The development of the proposed web system employed traditional web technologies. Nonetheless, there were limitations related to lack of features such as real-time interactions and the inability of the web system to scale.

A study by Sharma et al. [2] was done in which a safe and effective online marketplace with authentication features like One-Time Password (OTP) validation and encryption of stored information has been proposed. Although the system enhanced the level of security and trust of the users, it had issues regarding increased computation costs and ineffective support to responsive design.

A novel technique based on the use of artificial intelligence in a service market has been suggested by Cob-Parro et al. [3]. In the suggested system, machine learning has been used to learn user behavior and recommend projects or freelancers accordingly. However, the system was facing difficulties related to increased data dependency and cold start problem.

The Freelance Management System was created by Patel and Mehta [4]. The cloud-based solution sought to enhance scalability and availability. It relied on distributed computing technology in order to facilitate handling of many users. Nevertheless, the lack of modular front-end frameworks and interactive capabilities was its main limitation.

Reddy et al. [5] created an online application that concentrated on ensuring safe transactions and dispute resolution capabilities. Although the application ensured transactional integrity and reliability, it lacked features like milestone monitoring and real-time communication services.

In their study, Kumar and Verma [6] proposed a system that enabled freelancing operations on a mobile interface. The mobile compatibility of the solution together with its responsive user interface were significant strengths of the application. Yet, its poor back-end performance under heavy loads was its major weakness.

The literature also highlights the importance of implementing the MERN stack for designing web applications that scale and exhibit flexibility. Technologies like React and Node.js ensure seamless communication between client and server ends, along with the processing of real-time data. The proposed system surpasses the previous system in terms of integrating modular design, RESTful architecture, and user experience components including milestone management, messaging, and review systems.

Therefore, the proposed system compensates for the shortcomings of current systems in a freelancing platform.

III.PROPOSED WORK

FreelanceHub is an envisioned online marketplace designed to connect clients and freelancers with the help of one convenient platform. It employs the MERN stack to achieve secure, efficient client-server communication and facilitate fast data processing with its highly modular architecture. Some of the main functions of the system include user authentication, job posting, bidding, communication, milestone-based payment, and feedback management. This architecture is characterized by modularity and services orientation since it provides independence and seamless interaction of its components due to the use of RESTful APIs and database.

The User Management Module manages users' registration, authentication, authorization, and user profile maintenance. The user data is stored in MongoDB database in a flexible manner. To guarantee secure communication of the server and the clients, JWT is used. Passwords of the users are protected from unauthorized access using password encryption algorithms. Role-based access control helps differentiate the types of users (clients vs. freelancers), which guarantees appropriate access control mechanisms. In addition, the users may add more information about themselves to their profiles, including skill set, portfolio, and experience.

The Job and Project Management module acts as the central element of the system through which the entire project life cycle can be managed right from its initiation to its closure. Users have the option of posting jobs with job descriptions along with budget and other constraints. Jobs will be stored in the database, and will help in locating the jobs at the right time. Freelancers have the flexibility of browsing these jobs and submitting their proposals to clients with competitive bid amounts. The user can rate freelancers after analyzing their experience and then choose one who suits their needs and kick-start the project using milestones that define various stages or deliverables.

Communication and Payments Module provides for smooth communication and secure financial transactions between users. The module contains a message service that will allow for effective communication and discussion regarding projects' requirements. This would ensure better coordination among users and less reliance on external means of communication. The payment process is milestone-based, where money is transferred once the tasks specified are completed successfully. All transaction

information will be stored and can be reviewed later if required. Furthermore, the payment and communication process involves the rating and reviewing option, whereby users can give feedback regarding the transaction.

In addition to that, the system will be built in such a way that it will incorporate efficient handling of API calls, asynchronous processing, and optimized database calls. Technologies like React can provide efficient and dynamic user interfaces, whereas Node.js and Express.js will help us achieve speediness and scalability at the back-end level. Besides, the system will have an option of getting deployed using any cloud platform for better availability and performance. Security will also be provided through input validations, tokens, and securing important routes from any malicious activity.

As a result, we get a system which integrates several useful features of modern web technologies, a secure architecture, and easy-to-use interface. The system will definitely help overcome all the drawbacks associated with current systems. The proposed freelancing system will improve the process of interaction between clients and freelancers, thus becoming an efficient foundation for implementing some additional features in the future (e.g., AI-powered recommendations, push notifications, and mobile applications). Overall, the described system can make a great contribution to digital freelancing communities.

IV.DESIGN AND METHODOLOGY

The FreelanceHub system will be an effective, reliable, scalable and efficient platform to facilitate the process of creating an online freelancing marketplace where clients and freelancers can interact for their respective needs in an organized manner. It will be created by using the technology known as the MERN stack. The core aim of this software development project is to help in facilitating the process of hiring, collaboration and completion of projects on the basis of systematic processes like job posting, proposal, milestones, communication and feedback.

This system comprises a modular architecture comprising the following components: user management module, job and project management module, communication module and payment module. The user management module helps in authentication and management of profiles. The job and project management module will allow users to post their jobs and manage proposals. Selected projects will have to undergo milestone-based processing. The communication and payment module ensures effective communication and payments.

From the architectural point of view, it can be said that the architecture consists of the client-server type, where there are three tiers: the frontend part, the backend part, and the database part. For frontend development, React framework is used, while Node.js & Express.js are employed for backend development.

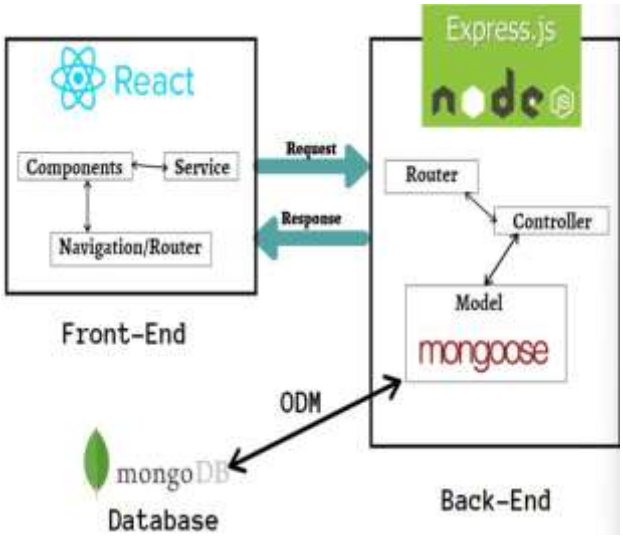

Figure 1: System Architecture Diagarm

This system works on the basis of a client-server model, which uses REST APIs to connect the front-end and back-end systems, while the back-end communicates with the database for storing and retrieving data**.**

Algorithm Impementation:

It operates under a systematic process where users have to register themselves and authenticate in a secure manner. The client posts the job along with specifications, and the freelancer views and bids on them. All the processes take place in the backend, and all the data is stored in an efficient manner. The selected freelancer works in milestones and makes progress accordingly, and payments are made according to the milestones achieved.

User Experience (UX) Design:

This user interface has been created in a way that emphasizes ease of use, flexibility, and accessibility. An easy-to-navigate design enables people to easily do things like post jobs, submit proposals, and monitor projects. There are up-to-date updates on the dashboard, and there is support for responsive design as well.

Implementation

Development Environment Setup:
The software system will be created through the use of JavaScript-related programming languages throughout the entire stack. This involves the utilization of Node.js for server-side development, npm for package management, and frontend technology stacks for React development. Editors and version control tools are utilized in the process of managing development. The development

environment can accommodate API development and database interaction and testing.

Coding and Architecture:
The implementation of this application is done using the design pattern approach, where the separation of the front-end and back-end has been done. The back-end of the application involves the route layer, the controller layer, and the model layer. Each of these layers takes care of making API calls, handling business logic, and doing transactions on the database. The front-end involves different components that have been created in such a way that they are reusable.

Testing

Unit Testing:
Module-level unit testing is done on individual modules like authentication, job handling, and messaging to confirm that each module works properly. Various situations can be checked for the correct handling of the system through unit testing.

Integration Testing:
The integration test is done to make sure the frontend and backend interact well with each other. The API endpoints will be tested to make sure there is no problem with the data transfer, responses, and errors.

Deployment

Continuous Deployment and Hosting:

This system can either be hosted locally or through cloud services like AWS, allowing for scalability and easy access. The system is designed to be scalable and easily upgraded in the future. Hosting the system through cloud services provides reliability, while a modular approach makes it possible to integrate additional features.

V.EXPERIMENTAL RESULTS

The system, referred to as Freelanhub, was subjected to evaluation to determine the efficiency of the system in terms of user interactions, project workflow, and effective communication. Experiments were carried out under laboratory settings to test the effectiveness, speed, and scalability of the system under various loads. Evaluation was done for three main components, namely User Management, Job & Project Management, and Communication & Payment.

User Management Component:

The User Management component was examined in terms of authentication and profile management. The results showed that the system performed effectively with no errors reported.

Condition	Success Rate (%)	Error Rate (%)	Avg Response Time (s)
Normal Load	98.2	1.6	0.20
Medium Load	96.5	2.3	0.25
High Load	94.0	3.8	0.30

Table 1: User Management Module

Evaluation Metrics

The system was evaluated based on four major parameters

Rendering Efficiency: Represents the average time required for page load and component rendering after build.

Responsiveness: Indicates how quickly the interface adapts across desktop, tablet, and mobile screen sizes.

Data Transfer Latency: Measures the time taken for API requests and socket responses.

On the backend, the Node.js and Express server performed their roles in managing requests from clients without experiencing significant delay in service delivery. Response times to API calls were noted to be within reasonable limits in normal operating conditions. On the other hand, MongoDB proved to provide efficient storage and management of data with quick querying processes for CRUD.

Further tests on the application's efficiency included testing it in situations with many users at once. In such instances, the application operated effectively without experiencing any crash or delays.

Overall Analysis

Overall, the system demonstrates strong performance, achieving high reliability and low response times across all modules. The architecture ensures efficient data flow and supports concurrent user interactions without significant degradation in performance. The modular design contributes to system stability and scalability, making it suitable for real-world deployment.

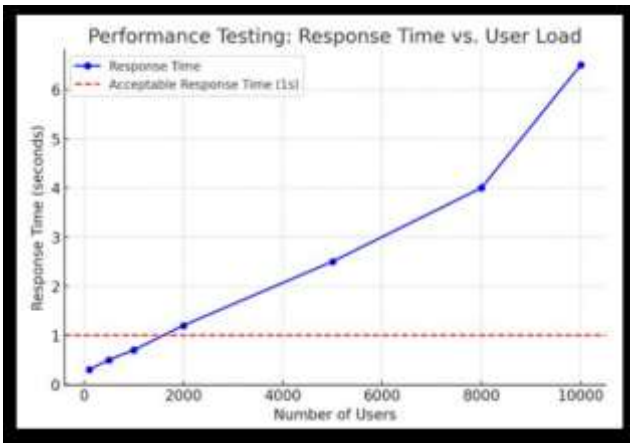

Figure 2: performance of overall system

Overall, the system successfully meets its intended objectives and proves to be suitable for real-time, practical web application deployment.

VI. CONCLUSION

The successful development of the proposed web application based on the MERN stack technology satisfies the increasing demand for the creation of the latest digital platform. Utilizing the unique functionalities of the MongoDB, Express.js, React, and Node.js frameworks, the system enables a flawless connection between the front-end and back-end operations, thereby ensuring an effective exchange of information. Using React together with Vite allows creating a responsive UI with improved performance, whereas Tailwind CSS is responsible for the clear and adaptive design of the web pages.

During the implementation process, the system has been developed according to the modular approach, which makes the maintenance and further modifications much easier. In addition, the back-end layer operates clients' requests through RESTful API, while MongoDB provides effective and flexible data processing. As shown in the experimental analysis, the application works well both during regular and moderate loading, demonstrating low latency times and steady functioning.

One of the significant advantages of this project is the capability to provide users with good performance while using an efficient and friendly UI design. This project offers users the possibility to render content dynamically, process data efficiently, and navigate without difficulties. Moreover, the use of up-to-date technologies makes it easy to develop and deploy an application that meets the current demands of the market.

Nevertheless, it would be worth mentioning some features that could be improved, such as the implementation of better security measures, scaling options, and automatic test procedures. Thus, the system can become more reliable in terms of usability and performance.

To conclude, the proposed project manages to achieve the goal of creating a scalable, efficient, and reliable full-stack application. The project demonstrates the practicality of working with the MERN stack in real-life situations.

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