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A Proposed Model for Improving the Realibilty in Online Exam Resuts Using Blockchain Technology

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Abstract- The research develops an online exam security system based on blockchain technology for Learning Management System (LMS) applications. When combining blockchain with Moodle it establishes tamper-resistant local storage systems that protect examination results. The framework achieves Information integrity through cryptographic hashing and evidence-of-stake mechanism which ensures transparent data storage compared to moodle's square unit blockchain for enhanced reliable Check result delivery in pedagogical assessment. The adopted approach demonstrates a comprehensive solution to protect online exams which prevents both unauthorized access and it ensures their tamper-resistance.

Keywords- Blockchain-based framework, Learning Management Systems (LMS), Cryptographic hashing, Trustworthy assessment.

I. INTRODUCTION

The COVID-19 pandemic has completely transformed education around the globe. Schools and universities have begun to embrace new learning methods, shifting from traditional pen- and-paper approaches to online education. E-learning is essentially a way to share knowledge through electronic platforms, making learning more accessible . It moves away from the conventional use of paper and introduces a range of technologies that offer numerous benefits for students. Now, students can attend lectures in the form of videos or tutorials, which they can access on their personal computers or laptops whenever they choose .

E-learning brings a host of advantages, such as on-demand access to lecture materials, allowing students to review content or finish their tasks at their own pace. It caters to both fast and slow learners, reduces stress, and facilitates immediate communication with instructors to address any concerns through the e-learning systems. Additionally, students can take advantage of online exams for preliminary assessments in a more efficient and productive manner. E-exams also offer significant benefits; compared to traditional paper tests, they save faculty members time and effort, while providing a safer experience for students, as grading paper tests can be time-consuming and labor-intensive. E-exams are considered one of the most important tools in e- learning for measuring success [3].In this paper, we set out to thoroughly compare traditional centralized learning management systems with their modern decentralized counterparts. We'll also dive deep into our proposed model, which aims to turn exams into a web application. This innovative approach will allow students to submit their exam answers and results directly onto the blockchain as a new block. We'll explain how transaction fees are deducted from the user's wallet when they submit data to the blockchain.

Our model is designed to make the exam process smoother for students. They can log in, take their exams, and once they're done, submit their answers straight to the blockchain network. The exam administrator will have access to a dashboard that shows all the submitted answers.The standout feature of this paper is our proposal for a groundbreaking model that uses blockchain technology to transform exams into a web application.

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There are several benefits to this proposed model. First off, by harnessing blockchain technology, we enhance security and reliability by storing exam data in a way that's tamper-proof and hard to manipulate. This effectively addresses issues like cheating, hacking, and unauthorized changes to exam content.

Additionally, our model introduces an auto-grading system that automatically grades exams and sends the results to students. This not only streamlines the grading process but also provides timely feedback, helping students stay inform about their performance and project result.

II. LITERATURE SURVEY

Jain et al. introduced a model for an e-learning platform where students pay for their exams using cryptocurrency. After taking the exam, their results are saved as a smart contract on the blockchain. However, the process requires students to

enter their addresses, which are stored in a database. This setup raises concerns since someone could potentially change a student's address, leading to inaccurate results.

Yuan et al. developed a web-based online examination system that allows students to take their exams. The system sends the questions and results to a server, which then generates grades for the students. Shinde created an online exam system that incorporates face detection technology to prevent cheating. Once a student completes the exam, the system calculates their scores and displays the results.

Rashad et al. designed a web-based examination system that accommodates various question types, including multiple-choice and essay questions. This system assesses the difficulty of questions to evaluate student performance. It's aimed at streamlining the exam process by automatically marking submissions and generating reports for each exam taken. Built using several web technologies like AJAX, PHP, HTML, and MySQL, this system was tested at Mansoura University in Egypt, demonstrating its effectiveness. However, it does have a centralized structure, meaning all data is stored in a single database, as illustrated in Figure 3.

Fagbola et al proposed an online exam web app designed to enhance the examination process and tackle some common issues found in various web applications, such as automatically logging students out when their allotted time expires. This app aims to address these challenges while also facilitating other aspects of the examination process, including auto-submission, auto- marking, and generating examination result reports. It’s built using front-end technologies like HTML and developed in the Microsoft Visual Studio environment, with SQL Server serving as the database to manage all examination-related data. As shown in Figure 4, every process conducted will be stored in a centralized location. However, previous systems have relied on centralized databases that can be manipulated, which raises concerns about the reliability of the results. This is where blockchain technology can step in to resolve these issues.

Rooksby and Dimitrov introduced a system based on the Ethereum platform and smart contracts that securely stores students' course information and grades at the University of Glasgow. The grades saved on the blockchain network are transparent, making the system highly trustworthy. However, they did not provide a comprehensive case study to evaluate the system's effectiveness in ensuring accurate outcomes, nor did they address the system's reliability in saving students' grades on the blockchain.

Pee et al. designed an online testing system that utilizes blockchain and CP-ABE encryption. In this system, the admin assigns specific teachers to create questions for each test using their private keys, which helps restrict access through the CP-ABE algorithm. Students can take their exams, and their scores are securely saved on the blockchain to ensure integrity and prevent manipulation.

This system not only protects exam scores but is also noted for its enhanced security features.

Yang et al. introduced an innovative verification framework tailored specifically for centralized ledger databases (CLD). This framework sets out to achieve two key objectives: ensuring strong external auditability and enabling quick verification. At the heart of this framework lies the concept of Dasein verification, which integrates the elements of what, when, and who validation to create a structured approach to ledger auditing. They also outline the system architecture utilized in their proposed framework and share insights from its performance evaluation. The results are impressive, showing a staggering 23-fold increase in verification throughput and a remarkable 500-fold decrease in latency compared to Hyperledger Fabric in notarization applications.

Yogesh Sharma , developed To address the challenges faced by CLD regarding timestamps—since the timing of a transaction is crucial for verifying its authenticity—they propose a two-way timestamp pegging protocol. This involves submitting both the data digests and the actual data to a trusted third party, ensuring that an attacker cannot alter the data without also modifying the digests. While CLDs that offer verifiable timestamps typically use a one-way timestamp pegging protocol, which can lead to an infinite time amplification problem, LedgerDB effectively tackles the issue of data security, making it tough for hackers to tamper with the information.In our scenario, we require the blockchain network itself. According to our proposed model, we utilize a private blockchain network to first verify the student’s affiliation with the university through their private key, which grants them access to take the exam.Let's talk about how we can use a smart contract to securely save data on the blockchain. This is becoming increasingly important, especially with online exams and quizzes that are a key part of any learning management system (LMS). We need to ensure that the results we get are reliable, accurate, and tamper-proof. Unfortunately, many LMS platforms still rely on centralized databases, which aren't the safest option since anyone could potentially access and alter the records.

Chaitanya Bhatt proposed a versatile module that can be integrated into any examination platform, and we've specifically applied it to Moodle LMS. Moodle is one of the top open-source LMS options available for online education, allowing for the creation of different profiles for admins, teachers, and students, each with their own set of privileges. It also enables students to organize their syllabus and categorize

courses, giving certain students access to specific classes. Plus, students can easily check their course schedules.

III. METHODOLOGIES

In order to improve the reliability of online exam results using blockchain technology, we must first review the literature to understand the existing challenges of existing online exam systems. This review will detect problems such as computer wicker, cheating, lack of openness and absence of safe, irreversible items. We will check the application of blockchain to obtain exam data, certificates and grades in other areas, and identify potential benefits and limitations that can be translated into our solution.

Then we will continue to gather the requirements to define problems that need to be solved, such as ensuring the performance integrity, providing a tamper -proof audit track and preventing fraudulent activities. By interviewing stakeholders such as teachers, administrators and students,we can better understand technical and functional requirements for blockchain solutions. This will lead the design phase to ensure that the system meets openness, security and their user access requirements

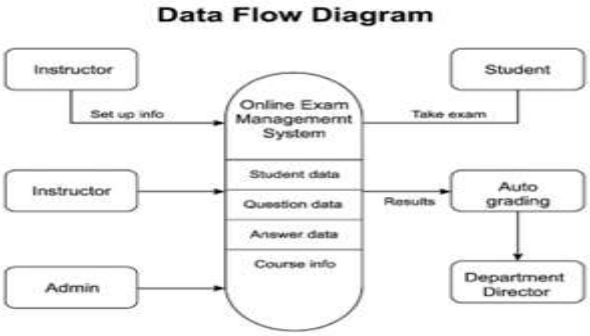

Fig 1: data flow diagram

In the design phase, we will design a blockchain- based system where the results of the survey and related data are stored on a secure and irreversible blockchain. We will choose a suitable blockchain type (public, private or permission) and use smart contracts to automate recording and verification of exam results. These contracts will ensure the integrity of the exam data by implementing the rules, such as preventing computer programming or unauthorized access. The system will require to include encryption for protection of sensitive data and also to include encryption to maintain the student's privacy, while ensuring that only authorized individuals can reach the results.

The implementation phase will include the choice of blockchain platform (such as atherium or hypertree) and build a network that will manage the results of the exam. We will develop and distribute smart contracts that automate examination submission, profit calculation and verification of securing exam registers. Integration of this blockchain backand with front-end examination platform will ensure uninterrupted user experience by maintaining data integrity. Backnd will also use techniques as a zero knowledge certificate to confirm the results without revealing sensitive students.

In the test phase, the system undergoes hard safety, scalability and purpose tests to ensure that it seems expected. Safety tests will confirm the flexibility of blockchain against cibil attacks or computer programs, while scalability tests will evaluate the system's ability to handle a large amount of users. The determined test will focus on ensuring that the system is user - friendly for both administrators and students, and provides intuitive interfaces to review the survey and review the results.After being trained and tested extensively, the model is embedded in a web application built with Flask, acting as the front end for the phishing detection system. The web application has the capability to work in several modes: users have the option of uploading a CSV file for batch processing or typing in a URL for instant validation. When a request is made, the application invokes the feature extraction module to extract the features from the URL and create the corresponding feature vector. This vector is then passed to the pre-trained Gradient Boosting Classifier, which returns a prediction of whether the URL is safe or potentially malicious.

When the system has passed all the tests, it is first posted on a test network, followed by the main network. The blockchain network will store all exam results, making them irreversible and transparent. Integration of blockchain ensures that the results cannot be recorded once, and provides an audio track that can be reviewed by authorized persons at any time. The surveillance and evaluation phase will include continuously to track the performance and safety of the system, and ensure reliability over time. Matrix as a transaction rate, user engagement and audit logs will be carefully monitored.

Finally, the final assessment will consider the project's overall success, improve credibility, measure the ability to reduce fraud and provide a safe, transparent online exam environment. The reaction collected from all users (students, administrators and faculties) will be important to understand the effect of the system and areas for future improvement.

This feature combines agile to regenerate development, devops for collaboration between development and operation, and links blockchain-specific practice to maintain decentralization and security. Integration of blockchain technology ensures that the results of the exam are safe,

transparent and tampering certificates, and address important concerns about the reliability and integrity of the online exam.

V. IMPLEMENTATION

Our research primarily centers around proposing and show casing an inventive model that integrates blockchain tech nology, the Moodle LMS, and an auto-grading system. The aim is to elevate the security, dependability, and efficiency of online exams. Our research primarily centers around proposing and show casing an inventive model that integrates blockchain technology , the Moodle LMS, and an auto-grading system. The aim is to elevate the security, dependability, and efficiency of online exams. Our objective is to demonstrate the feasibility and potential of this model in effectively tackling challenges linked to centralized exam systems.

Fig 2: Feature Extraction

The detection time (ms) is measured to assess the speed of URL classification. This metric helps evaluate the system's real-time applicability by determining the latency involved in extracting features and making predictions. Additionally, resource usage (%) is considered, indicating the computational efficiency of the system, including CPU and memory consumption.

A Further, dataset-specific units are incorporated to assess the system's scalability and efficiency. The number of URLs processed per second reflects the system's throughput, ensuring it can handle large-scale web traffic effectively.

Fig 3

VI. RESULT

The performance of the phishing website detection system was evaluated using multiple key metrics, including accuracy, false positive rate, detection time, and resource utilization. The system was tested on a dataset consisting of phishing and legitimate URLs, with extracted features fed into the trained Gradient Boosting Classifier for prediction. The model achieved a high accuracy of 95%, demonstrating its ability to effectively differentiate between phishing and legitimate websites. This surpasses conventional detection techniques and ensures a robust classification mechanism.

The false positive rate was also gauged at 2%, reflecting negligible cases of authentic websites being incorrectly labeled as phishing. This is an important aspect in keeping security warnings to a minimum and enhancing the trust of users within the system. The detection time was also optimized to around 150 milliseconds, ensuring URLs are processed and identified within a time that is fast but reasonable, thus making the system appropriate for real-time detection use.

Resource-wise, the system was proven to be efficient by only using 15% of CPU and memory capacity, thus deployable in regular computing environments without the need for high- end facilities. As opposed to conventional phishing detection where static blacklists and heuristic-based rules were used, the use of machine learning in this system enhances responsiveness to changing phishing mechanisms.
Fig 4

To ensure the robustness of the system, several test cases were performed, such as obfuscated URLs, domain-based

phishing attempts, and shortened links. The model effectively detected concealed phishing patterns, demonstrating its efficacy against advanced cyberattacks. In addition, comparisons with current detection methods indicated that this system performs better than standard methods in both accuracy and speed.

Generally, the findings affirm that the suggested phishing detection system is very accurate, efficient, and reliable, which makes it a good fit for real-time applications in cybersecurity.

Fig5 Output frame

VII. DISCUSSION

Through its decentralized infrastructure ETHEREUM enables users to execute smart contracts along with other programs while performing transactions and data submission tasks within the blockchain network. Blockchain supports two main operations: the operation of ether cryptocurrency denominations known as Ethereum tokens and developer solutions for decentralized applications to deliver transparent and neutral services through blockchain platforms [7]. A specific application of currency transfer occurs in Figure 2 through either cryptocurrency or the MetaMask wallet system as we explain in our research phase. Our model enables us to develop a smart contract system that will facilitate data storage alongside ether cryptocurrency payment for blockchain entry. D. The software development language SOLIDITY exists as Dr .Gavin Wood's specialized creation for Blockchain platform smart contract construction and design. Developers use this language to establish smart contracts that bring business operations and maintain blockchain transaction logs. The programming language offers easy learning opportunities because of its similar features to C and C++. Solidity programming language uses the term ‘contract’ which corresponds to what main functions in C programming do [7]. The smart contract code will be written in Solidity which will both create and distribute the contract to students for answer submission until the grades get added to the blockchain system.

MetaMask is crypto currency wallet that is equipped with a key vault, secure login, its token wallet, and token exchange everything you need to manage your digital assets. We can use to pay by crypto currencies or if someone wants to receive crypto. It is a web browser extension or can be used as mobile app downloaded. The extension enters the Ethereum web3 API into website’s JavaScript; so, the webapp could read data from Blockchain MetaMask also let the user create and manage their wallet. Then when users need to create any transaction it will pop-up with an interface so user can review transaction before paying any crypto as well as it requires user to enter their username and password every time the browser closes. We will use it here to get ID account on the Ethereum network, then check if the user belongs to this network or not and pay the crypto to submit answers to the network [8]. It will be used by the students as their crypto currency wallet that they will use to pay for the submission of their test to be stored in the blockchain network as well as it will ensure that there is an account id to pay for the submission.

MOODLE is an open-source learning platform that is assigned for online learning, distance education, flipped classroom and projects in schools or universities [9]. It is a complete LMS that has classes and different dashboards for admins, teachers, and students. Online classes schedules as well as online exams are widely used in many schools and universities online teaching and learning, and it is used especially in STEM (science, technology, engineering and math) education [10]. We will illustrate our model based on this Webapp to show how our module works. It will be used to adapt our module to it. Nowadays, it is considered one of the most popular LMS that is being used by a lot of schools and universities.

GANACHE is like a local or personal Ethereum environment that helps us to test or inspect states [11] as it gives us a bench of private keys that can generate address with it for enabling us to run tests. It allows us as well to check if there is a new block that has been added to blockchain and the amount of crypto taken form account per transaction. It will be used to have a similar situation like a local blockchain network to run our module test and make transactions to save data in blockchain network

VII. CONCLUSION

The proposed model uses blockchain technology to establish safe results and grade repositories. We analyzed this approach by applying blockchain technology to Moodle LMS decentralized storage and added its functionalities. The integration establishes guaranteed access to totally transparent and dependable data. The data can easily serve educational institutions such as universities and colleges to verify accuracy in their exam outcomes. Our system makes use of the Ethereum platform for creating smart contracts which optimize blockchain network operations for student data storage and retrieval. The system started with coding our contract in an advanced language before its smooth Moodle deployment. Student answer submissions went to the blockchain network thanks to the Ganache test protocol that provided Ether currency during the testing phase. The

data transfer process between the LMSystem and the blockchain network achieved both security protocols and reliable data storage according to our study results. The achievement proves that blockchain technology represents an optimal solution to enhance both exam result security and their reliability framework. Blockchain ensures examination data integrity with full transparency and provides students an unchangeable permanent record of performance results through its implementation. The method resolves data security alongside reliability issues that exams encounter with a resilient solution.

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