

Blockchain-Based Assignment Management System

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Abstract—Today's modern education system uses Learning Management System (LMS) portals for the scoring and grading of student performances, to maintain student records, and teachers are instructed to accept assignments through online submissions of .pdf, .doc, .ppt, etc. There is a risk of data tampering in the traditional portals; we will apply the Blockchain model instead of this traditional model to avoid data tampering and also provide a decentralized mechanism for overall fairness. Blockchain technology is a better and also recommended model because of the following features: consensus mechanism, decentralized system, cryptographic encryption, smart contracts, Ethereum blockchain. The proposed system ensures data integrity and tamper-proof assignment submission and grading, which will be helpful for both students and also educators.

Keywords—Education technology, learning management system, decentralized applications, blockchain.

I. INTRODUCTION

THE motive of this work is to provide a safe, trustworthy, and dependable mechanism for handling student submissions and ensuring fair evaluation is driving the use of blockchain [1] to address the assignment submission issue. Traditional assignment submission procedures frequently lack transparency, making it challenging to monitor the sincerity and integrity of contributions. Concerns regarding plagiarism, disagreements over grades, and general fairness in the evaluation process may result from this. The implementation of a blockchain-based solution can lessen these difficulties. The inherent properties of blockchain - immutability, transparency, and cryptographic security - offer the perfect platform for building a setting where all participants may have faith in the reliability of the assignment submission process. With the use of this technology, safe timestamping and tamper-proof record-keeping can be done, which addresses difficulties with data security, authentication, and trust.

There are specific potential constraints that must be considered in this project. Specialized technical expertise to design and operate a blockchain-based system is needed, which might increase development time and expenses. There are several scalability concerns when dealing with a large number of transactions, which may result in submission verification delays during peak hours. Users may also be unfamiliar with blockchain technology and may find it challenging to navigate the portal, resulting in slow development. Blockchain systems use consensus methods [2], indicating that decisions may be taken beyond from the institution's direct authority.

Several outcomes come from the installation of this blockchain assignment management system, bringing about a

rapid change in the traditional assignment submission method. The blockchain technology enhances honesty and trust among students and teachers, ensuring that assignments are submitted and evaluated fairly. It cryptographically connects each assignment submission to a specific student identification and time stamps it in this system to reduce the risk of fraudulent submissions and plagiarism [3]. Smart contracts simplify the verification process, confirming validity and allocating grades effectively. In terms of user convenience, it ensures that students and teachers benefit from a simplified submission procedure; allowing teachers to focus on evaluation and feedback rather than trading trust [4].

The paper is structured as follows. Section II discusses the modules developed as part of the system at a very high level. Architecture of the reliable blockchain based assignment management system is discussed in Section III along with the technologies used. Working of the implemented application in hardware and software environments is discussed in Section IV. Similar work in literature of blockchain based assignment management systems is discussed in Section V. Finally, the paper concludes and points to future work planned in Section VI.

II. MODULES

A. Admin

Register: Admin register is the process of creating administrative accounts, granting control and privileges for managing a system or application.

Login: Admin login is the act of entering credentials to access an administrative account, enabling control and management of a system or application.

Check all the Assignment: Admin check all assignments involve reviewing and verifying completed tasks and ensuring they meet requirements and quality standards in an administrative role.

View all the Grades: View all the grades means accessing and examining the performance scores or evaluations for multiple individuals or items, typically within an educational or assessment context.

Logout: Admin logout is the action of signing out from an administrative account, terminating the active session for security and access control.

B. Faculty

Register: A faculty register is a record of academic staff, documenting their personal and professional information, qualifications, and employment history within an educational

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institution.

Login: Faculty login is an online access system where teaching staff can securely enter educational platforms, manage courses, and access resources.

Add Assignment: Faculty add assignment refers to the process by which faculty inputs and uploads assessment tasks for students in an educational system.

View Submission: Faculty view submission involves instructors accessing and reviewing assignments, projects, or assessments submitted by students in an educational platform or system.

Post Grades/Add Grades: "Faculty post grades" or "add grades" is the action of inputting and recording students' performance assessments in an educational system for evaluation and reporting.

Logout: Faculty logout refers to the action of ending an academic staff member's secure session in an online system to protect privacy and data security.

C. Student

Register: A student register is a record-keeping document containing essential information about enrolled students, facilitating administrative and academic management.

Login: Student login is a secure digital gateway allowing students to access educational platforms and resources by verifying their credentials.

View Assignment: "Student view assignment" refers to a feature in educational software allowing students to access, review, and complete assignments and related materials.

View Grades: "Student view grades" enables students to check their academic performance, including scores, marks, and feedback, on assignments, exams, or coursework.

Logout: "Student logout" refers to the process of ending an active session in an educational system, securing a student's account by signing out.

application development platform, like Ganache, expedites the application development and deployment.

A. HTML and CSS

HTML (Hyper Text Markup Language) [5] is used for presenting the content. Cascading Style Sheets (CSS) [6] provides better visual experience by organizing the content. Browsers such as Internet Explorer render the content by interpreting HTML and applying styles specified using CSS.

B. Solidity

Solidity [7] is an advanced programming language which will be used by this application to execute the Smart contracts on Ethereum [8] blockchain network for the blockchain assignment management system. It supports static typing along with other features of objected oriented programming languages.

C. Python

Python [9] is a versatile and high-level programming language commonly employed for various purposes. Its primary usage often lies in backend applications. Notably, the key frameworks utilized for backend Python development include Django, Pyramid, Flask, and FastAPI. Web3.py is a Python library for interacting with Ethereum blockchain.

D. Ganache

Ganache [10] serves as a platform for the development of DApps [11] using Ethereum blockchain [11]. It provides easy to use development and deployment environment.

IV. EXPERIMENTS AND RESULTS

A. Hardware Environment

The application was developed on the below platform:

- Operating System: Windows
- Processor: i5
- Ram: 4GB
- Hard Disk: 1 TB

B. Software Environment

Ganache allows developers to run a local Ethereum blockchain on their own machine, which is isolated from the main Ethereum network. This is useful for testing and debugging smart contracts without spending real Ether or interacting with the live blockchain. Ganache comes with a set of pre-funded accounts, which means developers do not need to acquire real Ether to test their smart contracts. These accounts have virtual Ether that can be used for transactions. It provides a controlled and predictable environment for testing and development, making it easier to simulate various scenarios and interactions that might occur on the actual Ethereum network.

C. Results

The different use cases for the 3 types of users – Admin, Faculty and Student are implemented on the Blockchain. All the use cases are tested for their functionality using different accounts. The application screenshots for these use cases and

III. SOFTWARE ARCHITECTURE

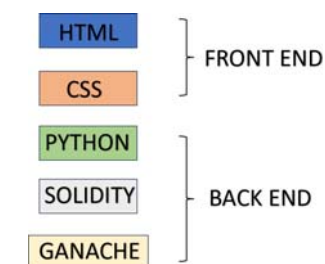


Fig. 1 Application architecture

The application follows a 2-tier architecture. The top tier is the front end and includes components that facilitate user interaction with the system. It is typically implemented using web development technologies like Hyper Text Markup Language (HTML), Cascaded Style Sheets (CSS), etc. The bottom tier is the backend and contains the application logic written using programming languages Python and Solidity. Solidity is the smart contract programming language. Smart contracts enable code execution on Blockchain. A rapid

the data stored in different accounts on the Blockchain are shown in Figs. from 2 to 24. The application inherits all the security characters of the Blockchain.

The Blockchain based Assignment Management System's home page is shown in Fig. 2.



Fig. 2 Welcome screen

1) Admin

Admin can add faculty details (Fig. 4) after successful login (Fig. 3). Admin's checking of all the assignments given by different faculty for the subjects they are handling is shown in

Fig. 5. Viewing all the grades of the students is shown in Fig. 6. Admin can view grades secured by all the students after the evaluation of the assignments.

Admin Login Screen

Username

Password

Login

Fig. 3 Login screen

Add Faculty Details

Username

Password

Department

Experience

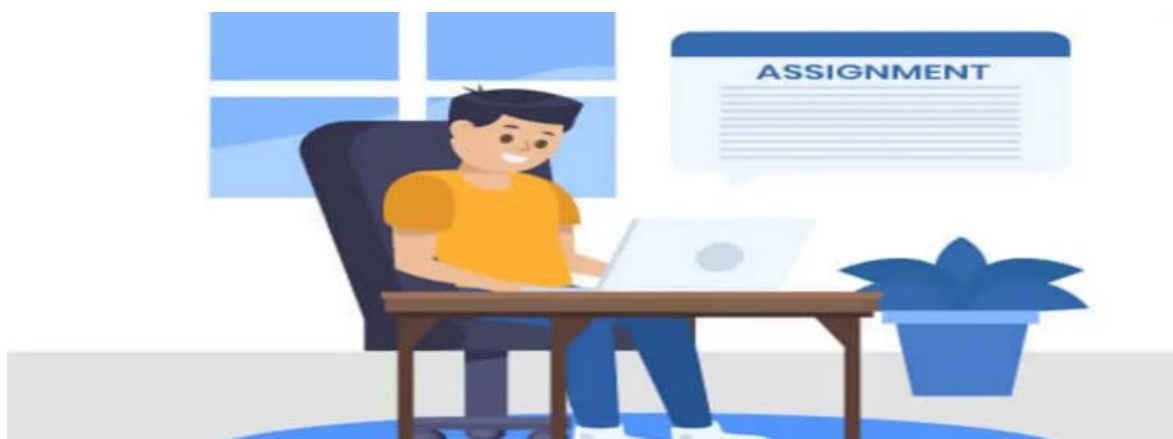
Number

Email

Address

Add Faculty

Fig. 4 Add faculty screen



Assignment Number	Assignment Name	Subject Name	Description	Total Marks	Download	Action
1001	Mid Term Assignment - 1	Computer Graphics	Due on 24th	25	Download	Click Here to submit
1002	abc	CSE	due date 27	30	Download	Click Here to submit
20	Blockchain	Blockchain Development	Do the assignment	10	Download	Click Here to submit
7	blockchain submission	bct	please complete the submission	20	Download	Click Here to submit
8	blockchain	bct	last deadline 4th	12	Download	Click Here to submit

Fig. 5 View assignments screen

Assignment Number	Student Id	Student Name	Marks
1001	1254	Yash	22
20	222010324001	harsha	9
8	222010324058	sakshari	12

Fig. 6 View grades screen

2) Faculty

Faculty login page appears as shown in Fig. 7. Faculty can add assignment details is shown in Fig. 8 after successful login. Faculty can view all the submissions uploaded by the students (Fig. 9). By clicking on add grades, faculty can add grades for

the assignments submitted after evaluation (Fig. 10).

Faculty Login Screen

Username

Password

Login

Fig. 7 Login screen

Add Assignment Details

Assignment Number

Assignment Name

Subject Name

Description

Total Marks

Upload No file chosen

Fig. 8 Add assignment screen

Assignment Number	Student Id	Submitted File	Marking
1001	1234	Download	Grading Completed
1003	1234	Download	Click Here to Grade

Fig. 9 View assignments

Add Grades

Add Marks

Fig. 10 Grade assignment screen

3) Student

Here, student can register in the portal by giving all his/her details as shown in Fig. 11. Student logs in to the portal (Fig. 12). To login student needs to enter the username and password. Student can view the assignments given by the Faculty as shown in Fig. 13.

Add Student Details

Username

Password

Department

Student Id

Number

Email

Address

Fig. 11 Student register screen

Student Login Screen

Username

Password

Login

Fig. 12 Student login screen

Assignment Number	Assignment Name	Subject Name	Description	Total Marks	Download	Action
1001	Mid Term Assignment - 1	Computer Graphics	Due Date is 25th and assignment should contain 1000 words.	25	Download	Already Submitted
1003	Mid Term Assignment - 2	Computer Graphics	Due Date is 25th and assignment should contain 1000 words.	30	Download	Click Here to submit

Fig. 13 View assignments screen

Student can upload the assignment by clicking on assignment submission provided above (Fig. 14). Student can view the grades for the submitted assignment (Fig. 15).

The application data stored in the Blockchain can be viewed using the Blockchain explorer provided by Ganache (Fig. 16).

Add Assignment

Assignment Saved Successfully

Upload No file chosen

Fig. 14 Upload assignment success

Assignment Number	Student Id	Student Name	Marks
1001	1254	Yash	22
20	222010324001	harsha	9

Fig. 15 View grades screen

The screenshot shows a blockchain explorer interface with a dark theme. At the top, there are navigation tabs for ACCOUNTS, BLOCKS, TRANSACTIONS, CONTRACTS, EVENTS, and LOGS. Below these are various network statistics like CURRENT BLOCK, GAS PRICE, GAS LIMIT, HARDFORK, NETWORK ID, RPC SERVER, and MINING STATUS. A search bar is located on the right. The main content area displays a list of accounts with columns for ADDRESS, BALANCE, TX COUNT, and INDEX. Each account entry includes a link icon for more details.

ADDRESS	BALANCE	TX COUNT	INDEX
0x1e7FD3799651f3Ab887360df2436F2c965840ed5	100.00 ETH	25	0
0x4958F9d0B39f4EfDDFA40E78Ab25F369Ac425f36	100.00 ETH	0	1
0xacc4B9DF9F083f981E461bdC3D4ed4dF9652A492	100.00 ETH	0	2
0x8E929d0EFC3A35a280513892D4Ddd37A660bc2d6	100.00 ETH	0	3
0xBf83e66d20d0894cDf64dF8c47C2f4c42E7c9802	100.00 ETH	0	4
0x962f5e46639f65620d4c10F334F6C3970B9E23F9	100.00 ETH	0	5
0x2d52F2398bd3259aA9ED553aDdb2870fB12E9D9D	100.00 ETH	0	6

Fig. 16 Blockchain explorer

V. RELATED WORK

Blockchain is a recent and progressing concept. Many systems make use of it for only a small part of their whole application.

Reference [12] extended the Ethereum platform with the assignment management functionality using Node.js for blockchain interactions, Go for Chaotic Cryptography, Python for user-interface, RSA and Secret Sharing for encryption/decryption. The proposed system, in contrast, is a web application based on Python integrated with Ethereum smart contracts using Web.py.

Reference [13] is a Blockchain based grading system where the teacher will assign tasks in form of transactions and points will be awarded to the student who completes the tasks and these transactions are stored in blocks and they will hash the block and no two blocks should have same transactions which shows the fair distribution of tasks, E-wallets are used to store the points and also they used to another blockchain to store E-wallets data. Here they introduce scorers for grading the assessment where each scorer will have access to a block and will grade accordingly no two scorers will receive the same block of data. The proposed system of this paper uses smart contracts written in Solidity for the entire application logic.

Some other blockchain based systems were available in the literature [14]-[16] but are not closely relevant to this work.

VI. CONCLUSION AND FUTURE WORK

In conclusion, this Blockchain-Based Assignment Management System represents a significant leap forward in the realm of educational technology. It responds to the evolving

demands of educational institutions by introducing a secure, transparent, and efficient platform for managing assignments and grading. The existing systems, often reliant on traditional or basic digital methods, have limitations that hinder the seamless operation of educational processes. They may lack the security and transparency offered by Blockchain, which is increasingly essential in today's digital age. The proposed system is a solution that bridges these gaps. It streamlines administrative tasks, empowers faculty members with automated grading and tracking, and offers students a user-friendly experience. By harnessing the power of Blockchain, it ensures data integrity and fosters trust among all stakeholders.

Future work is planned for reducing the amount of data pushed onto the Blockchain. It also plans to make the application cost effective by efficient use of Blockchain. Implementation of plagiarism detection mechanism in order to check the legitimacy of student's assignments is also planned.

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