RESEARCH ARTICLE OPEN ACCESS

# E-Cert: Blockchain Enabled E- Certificate Generation System

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## ABSTRACT

In an era marked by digital transformation and growing concerns regarding data integrity, conventional methods of issuing certificates for college events face increasing inadequacy. These methods often encounter challenges such as fraudulent claims, cumbersome verification procedures, and susceptibility to data manipulation. Harnessing blockchain, a decentralized and immutable ledger, presents a promising solution by providing a secure and transparent platform for certificate issuance and verification. The proposed system delves into integrating blockchain technology into the issuance of electronic certificates (e-certificates) for college events, aiming to revolutionize the traditional certification process. Following the conclusion of an event, pertinent information such as participant details, event name, and achieved accomplishments are securely recorded onto the Ethereum blockchain network in the form of a digital certificate. Each certificate is uniquely linked to the participant's identity, thereby ensuring authenticity and thwarting tampering or duplication attempts. Participants gain immediate access to their certificates, eliminating delays associated with manual processing. Additionally, academic institutions can verify the authenticity of certificates in real-time, thereby fostering trust and credibility in the credentials presented by individuals. Furthermore, the proposed system streamlines the assignment of activity points by teachers. Through seamless integration with the blockchain-based platform, teachers can efficiently allocate activity points to participants based on their contributions to college events, thereby enhancing transparency and fairness in the assessment process.

## I. INTRODUCTION

In today's global landscape, fraudulent certificates undermine academic credibility. "e-Cert" leverages blockchain, specifically Ethereum, to securely generate and verify certificates from college events. Its decentralized nature ensures tamper-proof certificates, addressing vulnerabilities to forgery. Each certificate is cryptographically secured, accessible to teachers for verification. e-Cert introduces a point system for recognizing student participation, enhancing certificate value. It streamlines authentication, fostering trust in academic credentials for seamless transitions to the workforce. Ultimately, e-Cert revolutionizes certificate verification, offering a reliable framework for academic recognition in the digital age.

## II. OBJECTIVE

The primary objective is to create a sustainable system that not only saves paper but also streamlines academic processes while addressing the prevalent issue of document forgery. By harnessing the immutability of blockchain technology, our aim is to establish a robust framework for generating digital certificates that are inherently resistant to tampering and fraud. Blockchain's attributes, including its destructibility, encryption, traceability, and data synchronicity, make it the ideal choice for ensuring the security and reliability of digital certificates.

Through the integration of blockchain functions, we seek to optimize operational efficiency at every stage of the certificate issuance and verification process. This entails leveraging blockchain's capabilities to enhance data management, authentication, and transparency, ultimately providing a seamless and trustworthy solution for managing digital certificates in today's interconnected world

## III. LITERATURE REVIEW

A research which introduces a Blockchain-based Document Management System (DMS) to tackle document security, authentication, and accessibility challenges [1]. In today's document-centric world, theft, duplication, and manipulation risks are heightened. Traditional databases are susceptible to unauthorized access and tampering, compromising data integrity. The proposed system utilizes Blockchain to ensure secure and immutable document storage, preventing duplication and unauthorized changes. Blockchain's decentralized ledger enhances security by distributing data across nodes, resistant to tampering. Key components include transaction recording, peer-to-peer network operation, ledger system, and smart contracts for automated execution. The system employs IPFS for secure storage, reducing bandwidth consumption. Though lacking content analysis, future enhancements may integrate Natural Language Processing (NLP) for security. Results show improved scalability and execution time compared to traditional methods. In conclusion, the system offers a promising solution for secure document management, leveraging Blockchain's immutable ledger and decentralized architecture for enhanced security, reliability, and accessibility.

Neethu Gopal and Vani V Prakash's Survey on Blockchain Based Digital Certificate System [2] article underscores the importance of authenticating academic records and transcripts while maintaining confidentiality. It advocates for blockchain technology to combat certificate forgery, offering enhanced security, validity, and confidentiality. While digital signatures exist for authenticity verification, they lack comprehensive security, leaving e-credentials vulnerable. The proposed blockchain-based digital certificate system ensures tamper-proof certification by leveraging blockchain's immutability. It involves creating electronic files from paper certificates, storing hash values in blockchain blocks, and enabling verification via QR codes or website queries. This system streamlines certificate issuance and verification, reducing administrative costs, preventing forgery, and providing accurate digital certificate information. It establishes an open and transparent framework for automatic certificate granting, enhancing reliability while conserving paper and reducing administrative burdens. This innovative approach not only addresses the need for secure document authentication but also offers a sustainable solution for efficient certificate management in the digital age.

A study which introduces a revolutionary system for educational institutions, leveraging blockchain technology to streamline administrative processes [3]. In today's digital era, efficient, secure, and transparent administrative procedures are crucial. The proposed decentralized solution aligns with blockchain principles of transparency, confidentiality, and immutability. It addresses challenges like paperwork management, certificate verification, and student identity integrity. By transitioning to online administration, the system reduces costs and inefficiencies. It eliminates third-party verification, ensuring security and authenticity while minimizing bureaucratic hurdles. Technical components include a decentralized web app for secure certificate storage, IPFS for data security, and Solidity smart contracts for blockchain interactions. User-friendly interfaces enhance accessibility. Future enhancements may involve cryptocurrency integration and additional features for authorities and scholarship agencies, further improving system efficiency and effectiveness. This innovative approach revolutionizes educational administration, offering a scalable and sustainable solution for managing certificates and identities.

The paper verifies participant information from an access database and generates certificates for all participants in a portable document format [4]. It's adaptable to various settings using databases for unpredictable report generation. The system allows for easy customization by enabling user input for participant information, offering a user-friendly interface and login authentication. Users define event details and select certificate templates. Implemented with client-server technology, it optimizes processing time by handling multiple certificates, enabling bulk issuance based on participant data, uploaded either via CSV files or manually. Secure authentication is ensured through session and cookie mechanisms. The system captures event specifics, enhancing certificate quality and user satisfaction. It contributes to paper reduction, cost savings, and document security. With its intuitive design and robust functionality, it offers a comprehensive solution for efficient certificate generation and verification.

Amidst the escalating challenge of certificate forgery, the investigation delves into the development of a blockchain-based digital certificate system, offering a potent remedy[5]. Certificates wield substantial influence in academic and professional arenas, yet their susceptibility to manipulation underscores the pressing need for innovative safeguards. By capitalizing on the immutable nature of blockchain technology, the system endeavours to fortify the authenticity and reliability of certificates, rendering them impervious to tampering and effortlessly verifiable. Embracing blockchain's decentralized framework, the system not only mitigates the risk of fraudulent alterations but also streamlines administrative workflows, curtailing costs and operational complexities inherent in traditional certificate management practices. Facilitating the secure input of assessment data, the system ensures the integrity of grades and student information. Certificate generation entails the creation of blocks housing student data, each fortified by unique hash values. Any endeavour to tamper with data disrupts the chain, thereby guaranteeing the system's integrity and the credibility of certificates derived from blockchain data. This innovative approach signifies a paradigm shift in certificate authentication, promising a resilient solution for both academic and professional spheres in combating fraud systems.

## IV. METHODOLOGY

In the context of our blockchain enabled certificate generation system, the methodology outlines a technology to uphold data integrity within academic systems, securely recording student participation and achievements in college events. By leveraging blockchain's immutability, event details are stored in tamper-resistant blocks, guaranteeing certificate authenticity and enabling accurate certificate issuance. The Nethereum Framework is employed for blockchain implementation, ensuring secure storage of event participation details through the SHA-256 hashing algorithm. Web applications are developed using C# and ASP.NET in Visual Studio, featuring a login system that directs users (students, teachers, or admins) to respective pathways. Students can register, view profiles, join events, and access certificates, with complaint handling available. Event coordinators can manage participant lists. Teachers verify student participation, while admins oversee broader functions like managing personnel and clubs. This delineation of roles ensures focused student engagement and organizational oversight. Activity points are allocated based on student contributions, streamlining assessment for teachers and ensuring fair evaluation. This systematic approach promotes transparency and fairness in assessing student involvement and achievements within the academic ecosystem.

### A.SOFTWARE REQUIREMENTS

1. OPERATING SYSTEM : WINDOWS 10
   Designed to operate seamlessly on Windows 10 and subsequent versions
   Ensures compatibility and optimal performance within the Windows ecosystem
2. CODING LANGUAGE : C#,ASP.NET
   C# is widely used for building a variety of software applications, including
   desktop applications and web applications
   ASP.net provides developers with a powerful set of tools and
   libraries for building dynamic, data-driven web applications and services.
3. FRONT END : HTML
4. BACK END : NETHEREUM
   Enables .NET developers to build Ethereum dApps with ease, providing tools for seamless interaction with nodes, smart contracts, and the ecosystem.
5. IDE : VISUAL STUDIO
   It provides developers with a robust set of tools and features for building a wide range of software applications across multiple platforms

### B.HARDWARE REQUIREMENTS

1. PROCESSOR : CORE i3
2. RAM : 4GB
3. ROM : 256GB

### C. ALGORITHM

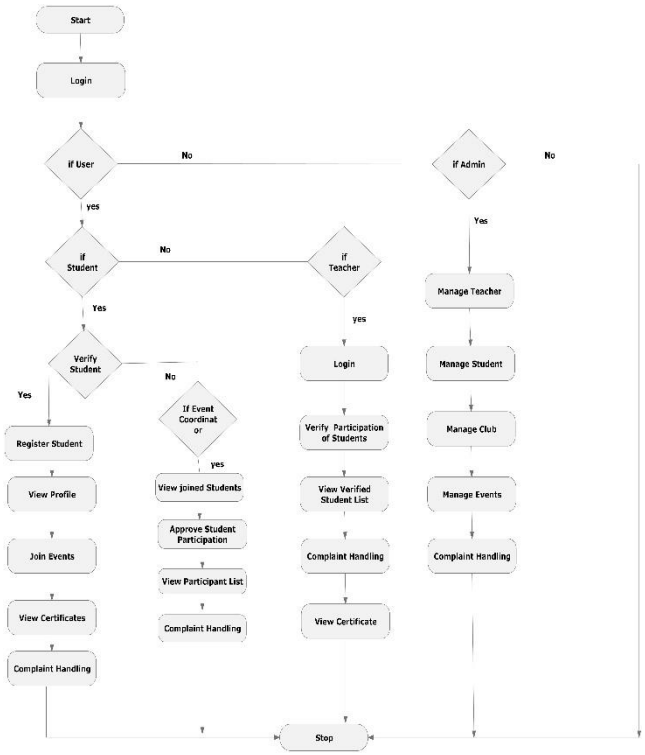
1. The default time configuration is initially set for all signals.
2. Capture the video feed of the next lane where the signal is supposed to turn green. Transmit the feed to the local system for analysis. The resulting data is used to set the timer of the green signal.
3. The current vehicle density in the monitored lane.
4. Adjust the green light timer:

If the density is low, reduce the green light timer.

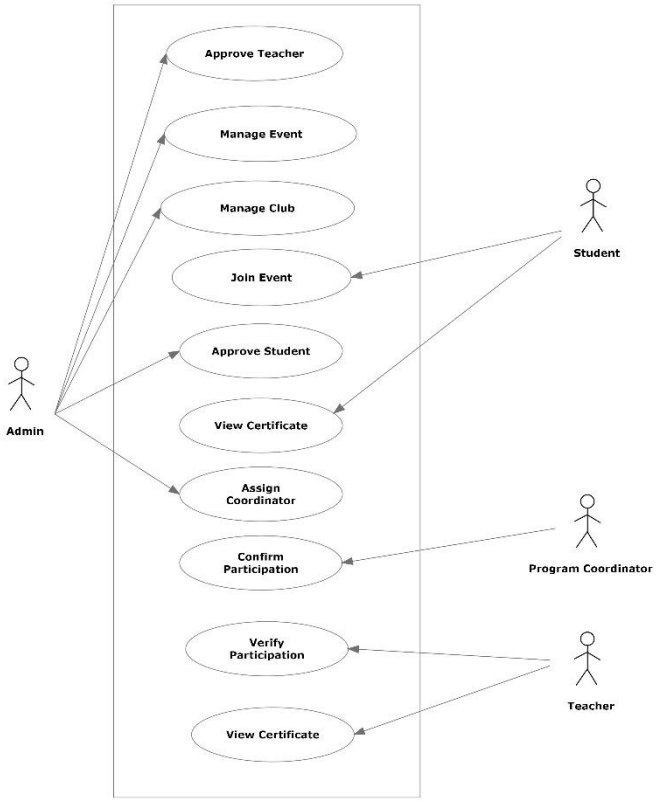
- If the density is high, maintain the usual green light timer.
- If an emergency vehicle is detected, then that particular lane will be set green.

5. Repeat the process cyclically for continuous adaptation to changing traffic conditions.

### D.PROPOSED SYSTEM ARCHITECTURE




### C. UML DIAGRAM



## V. CONCLUSION

The proposed system introduces a pioneering solution to challenges in traditional certificate generation systems for college events, utilizing blockchain technology. Through cryptographic hashes and a decentralized network, the system ensures the integrity and immutability of certificate data, establishing transparent and tamper-resistant records. By digitizing issuance and verification, operations are streamlined, reducing administrative costs and enhancing efficiency. Its blockchain-based approach eradicates paper-based systems, resulting in expedited certificate issuance. Furthermore, the system addresses the prevalent issue of certificate forgery by providing a secure platform for certificate storage. Once recorded on the blockchain, certificates become unalterable, enhancing authenticity and reliability. Additionally, the system simplifies activity point assignment by teachers, offering a transparent mechanism for recognizing student achievements. Stakeholders gain easy access to accurate digital certificate information, streamlining verification processes and eliminating doubts. In conclusion, the system sets a new standard for trust, transparency, and efficiency in certificate issuance and verification for college events. It offers a secure and reliable solution while catalyzing broader adoption of blockchain technology in academics.

## VI. ACKNOWLEDGMENTS

We would like to express our sincere gratitude to LBS Institute of Technology for Women for encouraging us to go forward and providing all the necessities for the completion of this work. We express our sincere gratitude to Prof. Sandeep Chandran and Prof. Sujakumari N R for helping us and providing their valuable insights and guiding us in the right path. Finally, we extend our thanks to all those who provided encouragement, feedback, and assistance throughout the course of this project.

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