EMPLOYEE BACKGROUND VERIFICATION USING BLOCKCHAIN TECHNOLOGY

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Abstract

In an employee hiring process verifying the employee educational and work experience in the related domain is a crucial aspect and which ensuring that organizations make well-informed decisions when onboarding new members. The proliferation of the internet educational opportunities, enabling individuals to consistently enhance their skill sets with cutting-edge technologies and actively pursue employment opportunities that align with their updated profile. But some people manipulate their information and come up with fake profiles and certifications. Traditional verification processes are often time-consuming, raising concerns about the authenticity of provided information. To address these challenges, this project adapts the blockchain based technology to improve the transparency of the background verification process. While existing works primarily focus on protecting information integrity, this project introduces a novel approach to tackle the issue of verification process. In this proposed approach the educational, experience and the relevant curriculum of an individual will be hashed and store in the Ethereum blockchain. During the hiring process the applicant's detail can be verified by comparing the hash value in the blocks. However, the existing applicant skillsets also should be updated in the blockchain when they come up with the new skills. To address this issue, an examination-based endorsement approach has proposed. The individual will require to take a preliminary exam in the relevant subject when they are requesting for the skill upgradation in the system profile. The profile will be updated in the block when the individual qualified in the examination. This approach helps to ensures the reliability of the applicant's details and improve the transparency in the hiring process.

Keywords: Employee Background Verification, Hash, Cryptography, Blockchain Technology, Smart Hiring, Information Security.

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1. INTRODUCTION

Employee Background Verification (EBV) holds significant importance in the hiring process, ensuring that organizations make well-informed decisions when bringing new members on board. Historically, this procedure has faced challenges, including time-consuming steps, susceptibility to fraud, and worries about data security and privacy. Some of the

cultures are following phone call-based background verification in their practice.

For example, if a candidate leaving a company for switching the job and taking the profile to the new company. The new employer will check the references given in the resume and make a call or mail communication with the previous employer regarding the attendance of and skillsets of an employee. But in this process, there is no transparency on verifying the educational, experience, skillset and attitude which are all the important assets of an employee.

Conventional approaches are vulnerable to the submission of inaccurate or deceptive information, jeopardizing the reliability of background checks. Conventional employee background verification processes are known for their time-consuming nature and the potential for concerns regarding the accuracy of provided information. Moreover, certain individuals may lack a comprehensive work history or formal education, while others consistently upgrade their skills, posing difficulties in verifying their background using existing records. The integration of blockchain technology enhances the security, accuracy, and transparency of the background verification process, addressing these challenges effectively.

Background Verification is the process of collecting and verifying information such as criminal records, financial history, and employment records of an individual usually an employee. This procedure is a crucial component of HR activities, recognizing human capital as the most significant investment for any company. In the current business landscape, finding the right talent for the right job at the right time poses a substantial challenge for HR teams.

In traditional verification process some private companies are undertaking the verification process of government administration also. The result of the verification process will contain the criminal offence history, performances and the attendance of the previous employment, credits and the accommodation. Employers use these details to ensure the fitness of an employee for the particular role in the hiring process.

Based on the available data, it is clear that individuals with doubtable backgrounds often opt to place organizations that do not conduct the employee verifications. Consequently, when these organizations implement background verification processes, they uncover numerous inconsistencies, leading to a significant ratio of employee resignation. The employee or a candidate should be leaving the organization when the employer discloses the fake information via the background verification process.

This situation serves as compelling evidence of how background verification serves as a protection against right employees and those who have mis portrayed facts on their resumes or their applications. Current trends highlight the growing reliance of companies and organizations on pre-employment background verification of factual information. Employers are increasingly aware of the potential inaccuracies and subjective evaluations provided by personal references. Those with questionable backgrounds are particularly susceptible to harm as they neglect to verify background information crucial for assessing the suitability of applicants for the job.

In the contemporary business landscape, it is notable that most companies undertake some form of pre-employment background investigation. However, the consistency of these verifications varies, with only a fraction conducting them uniformly. The background verification process before hiring is considered essential for addressing challenges such as high turnover rates, workplace theft, offence, unqualified and incompetent staff, fraud, violence, dishonesty by employees, and low employee morale. A thorough verification of job applicants not only saves time and money but also helps organizations avoid legal complications, identify falsified applications, and promote a protected work environment.

Employee verification is still in its very early stages in India region, and many organizations share their employee's information with third parties for the employee data verification. However, for some organizations, particularly those willing to share information, the process can be lengthy. Databases are manually managed, and the verification procedure involves sifting through old data that is stored physically.

The purpose of the project is to implement a secure and efficient employee background verification (EBV) system using blockchain technology. The project aims to address the challenges and limitations of traditional background verification processes, such as time-consuming procedures, concerns about data authenticity, and difficulty in verifying evolving skill sets.

The project introduces a novel approach to background verification by incorporating a skill update mechanism. This mechanism involves conducting exams, validation by authorities, endorsements, and skill batch-based verification to accommodate individuals with dynamic work histories and continuous skill enhancements.

In summary, this work aims to enhance the security, accuracy, transparency, and trust in the background verification of the hiring process. Blockchain ensures the immutability of records, reducing the risk of tampering and fraudulent activities. The decentralized nature of blockchain provides a secure and transparent ledger for trustable background verification data. Ultimately, the goal is to revolutionize the way of organizations conduct background verifications, fostering trust and transparency in the hiring process.

1.1 Research motivation

The deep motivation of the proposed study is to contributing to provide technical solution to the real-world issues in the hiring process by using the growing technologies. To narrow our focus, here is a list of the research inquiries to be addressed in this study:

1. What are the reliability and security issues that are existing in the hiring process?
2. What are the primary consensus mechanisms utilized for background verification on blockchain platforms?
3. What factors drive the choice of blockchain systems for background verification?
4. In what ways do smart contracts contribute to enhancing the security of background verification processes on blockchain?

5. How to verify the qualification of the candidate while they update their profiles with new skillsets?

1.2 Scope of the study

Every day, companies hire people without thoroughly checking their backgrounds, which can lead to hiring individuals with, fake educational certifications, qualifications, fake experience and who having criminal histories or other serious issues. This can result in costly lawsuits due to negligent hiring. The main objective of the study is to develop the end-to-end secured system for employee background verification process. This study ensures the following real time needs

1. It enables a way to easy background verification process and the data can be accessed from anywhere via distributed systems
2. The immutable nature of the block chain hash data ensures the reliability of the employee data
3. It helps to analyse the suitability of the employee for the organization work force
4. The exam-based endorsement qualifies the profile of the employees without any false information and certifications.

2. LITERATURE SURVEY

The background verification process is conducted in several ways with different methodologies in each organization. It includes a phone call verification, in person verification, document verification. This literature review is aims to research a existing works that are conducted in the background verification theme and its impact in the background verification process.

Prabhu et. al (2023) a suggested initiative, a blockchain network is established to facilitate efficient information sharing and verification between educational institutions and employers. Each academic certificate is uniquely identified through the assignment of a QR code. The SHA256 algorithm is employed to compute the encrypted hash data of the QR code, and this data is subsequently saved in a block within a distributed node. Upon certificate submission by the employee, the employer converts the hash value of the employee certificate and compares it with the encrypted hash value stored in the block. If the both of the values match, the employer recognizes the certificate as valid; otherwise, it is rejected as invalid.

Rashmi and colleagues (2023) propose that the utilization of blockchain technology provides an avenue to enhance data privacy within the realm of human resource management. This technology offers a secure and decentralized platform for storing and exchanging employee data, ensuring protected access to sensitive information such as personal identification and employment history. By preventing unauthorized access, it serves as a safeguard for privacy. Additionally, blockchain can be employed to oversee and verify the accuracy of employee data, reducing the potential for errors or fraudulent activities. It is essential to acknowledge, however, that the effectiveness of blockchain in bolstering security and privacy relies on proper implementation and continuous maintenance to uphold data protection.

Karan et al. (2023) pointed out that individuals often provide inaccurate information on their resumes, which is why international organizations invest heavily in verifying the biographical information provided by applicants. This allows you to verify process details for applicants at specific points in the hiring process by cross-referencing document hashes with hashes stored on the blockchain.

Govind War and colleagues (2023) emphasized that scrutinizing the qualifications and experience of potential candidates before making hiring decisions is an essential yet intricate responsibility for every company. To gain insights into the current landscape of information technology in human resource management and investigate how Blockchain can contribute to intelligent, cost-effective, efficient, transparent, and secure workforce management, the researchers conducted a thorough literature review. The escalating number of applicants, especially in larger firms, has rendered the verification of candidate qualifications and experience a time-consuming process, resulting in frequent oversights. The issue of candidates providing inaccurate information poses a growing concern for HR departments. While traditional skill verification systems serve a purpose, they still exhibit limitations in effectively addressing this challenge.

Govad and colleagues (2022) introduced a novel approach where cluster heads transmit the collected information to the Base Station (BS). Following this, the BS records all crucial parameters on a distributed blockchain, and significant data is transmitted to the cloud for storage. This Blockchain-based system efficiently eliminates the revoked certificates of all malicious nodes, thereby ensuring data integrity. The effectiveness of the proposed scheme is assessed through metrics such as detection accuracy, certification delay, computational overhead, and communication overhead. Simulated results, accompanied by comparative analysis and security validation, validate the superior performance of the proposed solution when compared to existing approaches.

Jain and colleagues (2022) presented two methodologies for storing data on the blockchain: the first involves hashing the document, and the second entails saving the document in JSON format as private data. User data privacy is safeguarded through the use of hashing, preventing any exposure of data in the event of security breaches. In the latter method, the document is stored as private data, providing users with the additional capability to control and restrict access rights for others, thereby ensuring the privacy of user data.

Praveen et. al (2021) discussed major domestic companies go to great lengths to verify the background of job applicants. However, background checks conducted by these companies are not only costly, but also time-consuming and inefficient. During the recruitment process, the authenticity of the candidate can be verified by comparing the hash value of the submitted document with the hash value stored in the blockchain.

Rachael Njeri Ndung'u (2022) proposed a review on the use of Blockchain as a solution to address issues related to information security and data privacy. The

article explores the evolution of technology, particularly the advent of device-mesh technology, wherein smart devices are interconnected, leading to heightened data sharing through online marketplaces and web applications. The central focus revolves around emphasizing the crucial need for safeguarding data, especially for organizations dealing with sensitive information. The study assesses Blockchain technology as a potential means to enhance data privacy. While acknowledging Blockchain's potential in securing and protecting data, the article highlights the existence of challenges and limitations in the realm of data privacy. The author advocates for further research to ensure comprehensive protection of data privacy.

Haiping Yu (2022) proposed an application of blockchain technology in the data processing security system of financial enterprises. This study explores the convergence of data confidentiality within financial enterprise databases and the integration of blockchain technology. It establishes several models, encompassing the execution structure model for the data confidentiality system in financial enterprise databases, the task scheduling operation structure model, and the blockchain domain authentication model. Through a comparative analysis, which takes into account factors such as time and space consumption along with data security, the research aims to assess the effectiveness of blockchain technology in fortifying data security systems. In the article, the introduction of the "R factor" emerges as a pivotal reliability parameter. This factor gauges the degree of conformity among various curves within the assumed model structure. Its significance lies in evaluating the reliability of the proposed models with respect to their structural conformity. The R factor is noted for its sensitivity to the position of surface atoms, distinguishing it from unstructured quantities like electron-atom scattering fields and electron decay, which are emphasized as key attributes of this reliability parameter.

Jimenez-Gomez et. al (2020) proposed Risks of Bl Risks of Blockchain for D Ain for Data Protection: A European Tion: A European Approach. This article delves into the difficulties arising from using blockchain technology in the context of safeguarding data. To understand its pros and cons, especially regarding privacy, we need to closely examine the characteristics of blockchain. Despite being a disruptive technology, blockchain can be adapted and configured in various ways based on specific needs. The study investigates the reach of the General Data Protection Regulation (GDPR) to determine if it applies to blockchain technologies. Several aspects are discussed, including the challenge of identifiers in a blockchain, assigning responsibilities to participants, and the potential conflicts with the rights of individuals, particularly the right to have data erased. The article not only highlights these challenges but also suggests ways to strike a balance between data protection and blockchain technologies. One notable recommendation is extending the privacy by design principle to applications using blockchain. The article underscores the need to ensure that technological progress doesn't compromise individuals' rights. However, it acknowledges that certain technical solutions may involve significant trade-offs, as seen in the case of anonymity in cryptocurrencies. Overall, the literature review navigates the evolving landscape of

data protection and blockchain, shedding light on crucial issues and proposing potential strategies to address them.

Mathur et. al (2023) proposed an approach named GANACHE: A Robust Framework for Efficient and Secure Storage of Data on Private Ethereum Blockchains. This work explores that the Ethereum is a popular blockchain platform, enables the execution of smart contracts and the storage of data on the blockchain. However, Ethereum's inherently public nature may not be suitable for scenarios that demand secure storage and access to sensitive or private data. This paper presents GANACHE, a proficient private Ethereum blockchain tool crafted to address the challenges of confidentiality and security linked with data storage. GANACHE employs various cryptographic techniques, such as encryption and zero-knowledge proofs, to ensure the privacy of stored data while retaining the benefits provided by blockchain technology.

Several studies have examined the and tried to provide a various solution to tackle the constraints in the background verification process. However, the studies are focusing on storing the records in the distributed blocks and accessing the data via DApp. Moving forward it is essential to develop a system which integrate the background verification and the proper updating of the employee details with blockchain based security to avoid the fraud activities and data inconsistency.

PROPOSED SYSTEM

In current research area, many studies focus on checking past employee information against current data. However, in today's world with a wealth of online academic resources, people are always updating their skills and knowledge. If a candidate doesn't keep their skills updated in our system, the system will suggest that their profile doesn't match the current details. As more companies gather user profiles through online forms or resumes, our project is creating a system where employers can ask users to update their skills through an exam-based endorsement process. This ensures that users keep their skills current in the system. Additionally, our system includes a verification process using candidate documents. The employee skill and other necessary information will be stored in the hashed blocks and it will be compared wit the given data while background verification process. Each process such as storing data, examination-based endorsement and the verification process will be happen in the end-to-end blockchain transaction.

3. METHODOLOGY

The suggested system uses blockchain based storage and employee verification to verify whether the given details are matching with the existing profile or not. However, if the candidate upgraded their skill set that ca be updated with the existing profile based on the examination-based endorsement. The proposed system integrates blockchain-based storage and employee verification to validate information against existing profiles, allowing candidates to update their skills through examination-based endorsement. Implemented using Ganache blockchain and MetaMask, the project employs hashing, specifically SHA-256, for cryptographic security. Structured into three phases—Employee Data Verification,

Employee Data Upgradation, and Employee Document Verification—the system ensures data accuracy, privacy, and security throughout the employee verification and document validation processes.

This project developed using the ganache blockchain and the MetaMask is used for the interface mechanism. The primary cryptographic technique employed in the MetaMask and Ganache blockchain is hashing, typically using the SHA-256 (Secure Hash Algorithm 256-bit). Data Hashing is an unidirectional process which transforms the given input data, such as register or login information, into a consistent-length of characters. The resulting hash is distinctive to the input data, and any minor alteration in the input results in a substantially different hash.

This project consists of three important phases

 i.   Employee data verification
 ii.   Employee data upgradation
 iii.   Document verification

Methodology 01: Employee Data Verification

Employee data verification stands for verifying the existing registered data with the candidate given data. When it's comes to candidate profile some of the information such as candidate personal profile, experience and education details are the high impact factors regarding the job. The candidate might not have that skillset but there is a chance of modifying their profile based on the job description provided by the employer. In order to find that fraudulent activity the employee verification module is implemented. High-

impact elements including personal profiles, work history, and educational background are carefully scrutinized throughout the data verification process. Verifying identity and confirming contact details are essential for personal profiles. Details about experience, such as employment history and compliance with duties with industry norms, are examined closely. Verifying academic qualifications and making sure that educational timetables are accurate are two aspects of education details. The significance of ongoing education is emphasized by the verification of certifications and professional development activities. Through practical validation, skills and competences are evaluated and verified as proficient in necessary domains. The candidate's credibility and professional status are further established by their professional affiliations and memberships, which include leadership positions and industry organizations. The correctness and dependability of the employee data in the system are guaranteed by this extensive inspection.
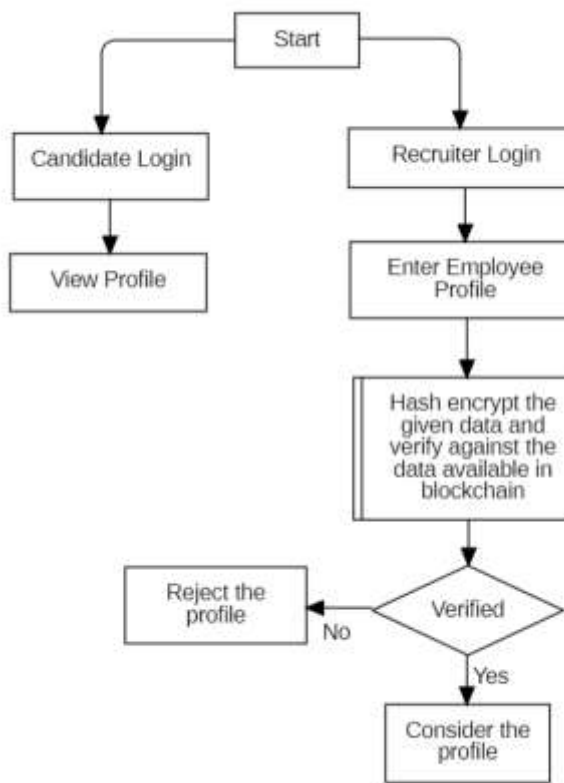
Fig 1. Employee Data Verification

The Figure 1 describes about the process of employee data verification process. Once the candidate logged in, they can check their current profile data with the system. Once the employee logged in, they can enter the employee details for verification. The profile of an employee will be fetched from the blockchain based on the unique key that is common for candidate and the recruiter. The data given by the recruiter will be encoded using the Secure Hash Algorithm (SHA-256) and comparison will be performed against the employee data available in the blockchain. If the hash values are matched the profile will be considered as verified otherwise the recruiter will be reject the profile. The candidate then connects the system for the profile upgradation if required. The process of profile upgradation is discussed in the next section.

Methodology 02: Employee Data Upgradation

Once the candidate wishes to upgrade their profile, they can contact the admin for the skill/ profile upgradation. The process of upgrading the profile of a candidate is described in the figure 2.
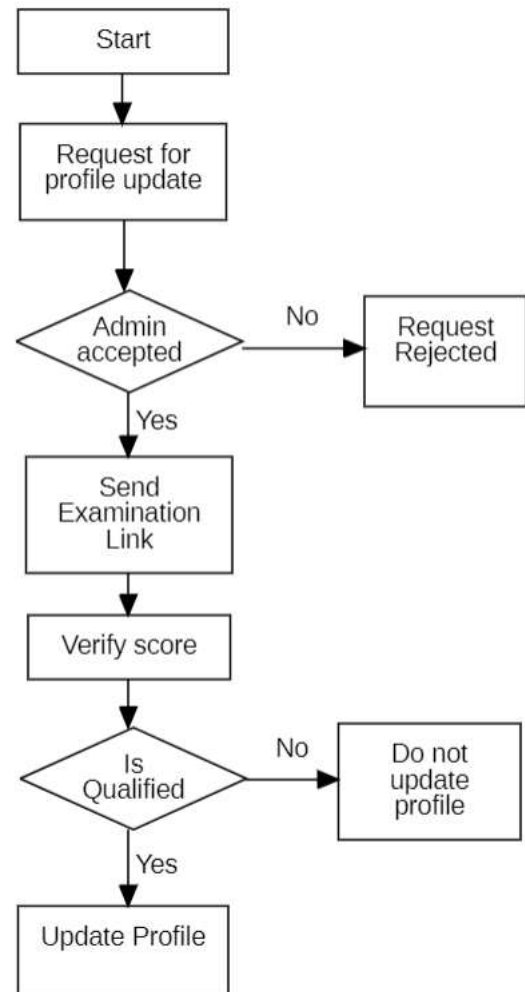

Fig 2. Employee data upgradation

The candidate will be contact the admin in order to update their profile. The profile updating cannot be done without any verification process. Hence, this project introduces the examination-based endorsement for the profile upgradation. Once the admin received request, admin will send the examination link to candidate

mail. Once candidate completed the examination., the score will be validated. If the user reached qualified range, then the admin will update the profile in the blockchain., otherwise the admin will not be updating the profile. Verifying the competence of abilities professed by the applicant is accomplished by means of hands-on evaluations, interviews, or recommendations. This rigorous verification procedure guarantees that the applicant really holds the skills required for the position, which helps to produce an accurate and detailed evaluation of their skill set. Verifying a candidate's competence with particular tools, programming languages, or software is essential for jobs requiring technical expertise. By confirming that they have the necessary technical knowledge pertinent to the position, this verification procedure helps to improve the accuracy of their skill set.

Methodology 03: Employee Document Verification

Now a days most of the companies are getting the candidate profiles in the form of PDF or web forms. In this project we also covered the document verification using the blockchain.
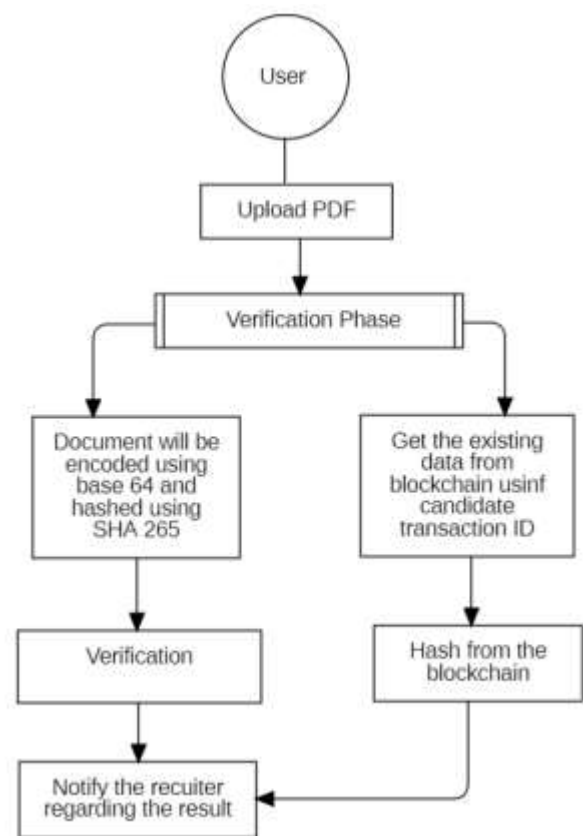

Fig 3. Employee document verification

The figure 3 describes about the document verification using the blockchain. Once the file received from the recruiter it will be hashed using the SHA 256 algorithm and compared with the existing data. The process of hash encoding is given as follows.

i.   Initialise the constant hash value (Initialization vector)
ii. Append a padding to the message
iii. Divide the padded contents into 512 bits
iv. Create a message schedule array (M[0], M[1], ..., M[63]) from each 512-bit block.
v.   Initialize eight working variables (a-h) with the hash values from the previous hash computation or the initialization vector.

vi. Perform a series of bitwise operations, logical functions, and additions on the working variables based on the current block of the message and constants derived from the SHA-256 specification.

vii. The final hash value is the concatenation of the updated working variables (a-h).

viii. The output of a hash value 256-bit, which represented as a 64-character in the hexadecimal format.

The document verification includes the employee's attendance verification also. The information supplied is more credible when the tasks and responsibilities expressed by the candidate are in line with industry norms and their skill set is consistent. By confirming that the candidate's work experiences align with accepted industry standards, this verification procedure increases the credibility of the stated credentials and proficiencies. Verifying the veracity of a candidate's work experience entails comparing their job history with information from prior employers or pertinent databases. The methodical procedure guarantees that the applicant's professed experience corresponds with verified and documented data, so strengthening the validity and precision of their employment record.

4. RESULTS AND DISCUSSIONS

The proposed system has been implemented in a controlled setting, utilizing a web-based application designed to function as the front-end interface. This application facilitates user interaction in a user-friendly manner. The system developed in the windows environment with 8GB RAM specification. Sublime text editor used for code and the ganache and MetaMask used to implement the blockchain

Discussion: Tools Used

The proposed system is developed as a web application. Ganache server is used to deploy the smart contacts. Bootstrap and jQuery are used for the front-end development. Truffle is employed to build and migrate the solidity into the solidity into the smart contracts to communicate with ganache. The system uses Python language as a backend to provide the connection and data sharing mechanism in between the system and the ganache. Ganache serves as the source of the necessary coins for transactions in this model. In ganache a solitary block within the blockchain has the capacity to hold up to 1 Mega Byte of information. It offers temporary coins because every transaction within a blockchain model incurs a cost. Solidity is a kind of programming language used to develop the smart contracts. Truffle is widely recognized as a development framework tailored for Ethereum, which is a decentralized platform designed to execute smart contracts. Truffle offers a comprehensive suite of tools and libraries specifically crafted to facilitate the processes of constructing, testing, and deploying smart contracts on the Ethereum platform.

Discussion: Functionalities

The system has developed as a user-friendly web application with the mandatory functionalities such as authentication, validations and dynamic data updating mechanisms. The application includes three modules which are the

admin, recruiter and the employee module. Each user can access the system only after the blockchain based authentication. The employee allowed to view there existing information and requesting for the skill upgradation. Various the recruiter can be verifying the employee details through the document and direct information as well. The admin can add and manage the users as well conduct the exam-based endorsement activities.

Result

The propose system has evaluated against various test data and profiles. The main aim of the evaluation was to gauge the system's performance concerning the employee background verification system requirements outlined in the study. Additionally, it sought to pinpoint any considerations relevant to its real-world application.

The experimentation involved several steps, including verifying said transactions, conducting multiple transactions, mining them into the blockchain, reflecting the alterations made in the public ledger to all network nodes, and assessing the system's usability. The authorized users only can be accessing the verification pages otherwise their login will be denied. The proper validations have been done in the front-end in order to ensure the format of data do avoid complexities. The system properly store/ retrieve the data into the blocks based on the token., and if the token not matched it throws error to the user. The blocks, the encoded data and the transactions are verified in the ganache.

The proposed system has compared against the existing systems which are serving the background verification. The comparison of the existing systems are discussed in the table 1.

System	Function	Drawback	Comparison
Tradition background verification system	A lot of background check services use manual procedures that include paper documentation, emails, and phone conversations. This can be error-prone and time-consuming.	A few background check providers keep verified information in centralized databases. These databases could be subject to manipulation or attack, though. The lack of openness in traditional background verification procedures might make it challenging for people to confirm the integrity of their own information.	The suggested solution provides a safer and more effective substitute for conventional background check services. It addresses some of the drawbacks of conventional techniques by utilizing blockchain technology and cryptographic hashing to assure tamper-proof records and greater transparency.

Online background verification systems	Online databases and public record access enable background check systems to automate the process of information verification.	These platforms are convenient, but they might not have the security that blockchain technology offers and might rely too heavily on certain verification techniques. Users of background check websites could be worried about the security and privacy of their personal data.	When it comes to security and reliability, the suggested system outperforms several online background check services. It improves security and privacy protection by using blockchain for data integrity and cryptographic hashing for document verification.
Government Background verification process	Government organizations keep databases with specific background data, like job histories and criminal records.	Government agencies are bound by stringent requirements to guarantee the privacy and accuracy of their data when conducting background checks. There could be restrictions on who can access government databases, and the verification procedure can take a while.	Although official background check systems give accurate information, blockchain-based alternatives may offer greater accessibility and openness. The proposed system offers a decentralized approach that allows individuals to verify their own information securely and efficiently.

Table. 1. Comparison of proposed system with existing systems

5. CONCLUSION

Background verification has become an indispensable aspect of the hiring process, particularly in the current decade. The expansion of the internet has concurrently increased the availability of tools and opportunities for fraudulent activities, including the fabrication of certifications and experiences. By integrating the background verification process with blockchain technology, employee details can be securely stored in immutable hash blocks and accessed on an as-needed basis. The blockchain-integrated examination system ensures the accuracy of employee skill qualifications.

The proposed work promises more efficiency, requires less manpower and

eliminates the need for 3rd party verification. It aims to improve oversight of employee certificate providing institutions, enhancing the credits within the system blockchain network. Not only does the envisioned system ensure fast record verification, but it also shows that it is a cost-effective solution for employers. All in all, it promises an efficient and secure document verification solution.

In the future, this work can expand by integrating the real-time Blockchain-AI (Artificial Intelligence) based automation into background verification processes, enabling automated document analysis, fraud activities detection, personalized applicant recommendation, optimization of verification processes, and ethical considerations.

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