Journal of Artificial Intelligence and Emerging Technologies
Volume 3, Issue 3, pp 25-31, March 2026
ISSN (online): 30491967
DOI: https://doi.org/10.47001/JAIET/2026.303005
Available Online at https://www.jaiet.com

Blockchain Based Identity Generator and Authenticator

[1]S Jubeda Banu, [2]P Kalpana, [3]K Akhida, [4]P Thaslim, [5]P Ismail, [6]K Nandini

[1,2,3,4,5,6]Department of Computer Science Engineering (Cyber Security), GATES Institute of Technology, Gooty, Andhra Pradesh, India
E-mail: [1]jubedashaik123@gmail.com, [2]kalpanapapasani680@gmail.com, [3]akhidakolimi@gmail.com, [4]patanthaslim25@gmail.com, [5]iismail23653@gmail.com, [6]nandinikalavallinandini@gmail.com

Abstract: The rapid growth of digital services has increased the need for secure and reliable identity management systems. Traditional identity systems are centralized and vulnerable to data breaches, identity theft, and unauthorized access. Blockchain technology provides a decentralized and secure approach to address these challenges by ensuring transparency, immutability, and trust. This paper proposes a blockchain-based identity generator and authenticator that allows users to create and manage their digital identities securely. Each identity is stored on a blockchain network, making it tamper-proof and verifiable without relying on a central authority. The system uses cryptographic techniques to generate unique identities and authenticate users during access requests. By maintaining a distributed ledger of identity records, the proposed system improves data integrity, enhances privacy protection, and reduces the risk of identity fraud. Additionally, it enables secure verification between users and service providers while maintaining control over personal data. This approach provides a reliable and efficient solution for modern identity management systems and can be applied in areas such as e-governance, banking, healthcare, and online services.

Keywords: Blockchain, Cryptography, Identity Management, Authentication, Security, Digital Identity.

I. INTRODUCTION

Blockchain technology has emerged as one of the most promising innovations for secure data management and digital transactions. With the rapid growth of digital services, the need for reliable and secure identity management systems has increased significantly. Traditional identity management systems rely on centralized databases where user information is stored and managed by a single authority. These centralized systems are vulnerable to data breaches, identity theft, and unauthorized access, which can compromise user privacy and system security.

Blockchain provides a decentralized and tamper-proof platform that enhances transparency, security, and trust among users. By using cryptographic techniques and distributed ledger technology, blockchain ensures that once data is recorded, it cannot be altered without the consensus of the network participants. This feature makes blockchain highly suitable for identity management systems where data integrity and authenticity are critical.

The proposed blockchain-based identity generator and authenticator aims to provide a secure method for generating and verifying digital identities. In this system, each user is assigned a unique digital identity that is securely stored in the blockchain network. The identity information is protected using cryptographic hashing techniques, ensuring that sensitive data remains secure and cannot be manipulated by unauthorized users.

During authentication, the system verifies the user identity through secure verification methods such as biometric authentication or credential validation. Since the identity data is stored on a decentralized blockchain network, it eliminates the dependency on centralized authorities and reduces the risk of data tampering. The system provides a transparent and reliable approach for identity verification across various digital platforms.

This approach can be applied in multiple sectors such as online services, financial institutions, healthcare systems, and government services where secure identity verification is essential. By integrating blockchain technology with authentication mechanisms, the proposed system enhances security, improves trust, and provides a robust solution for modern digital identity management.

II. LITERATURE REVIEW

Advances in technology using blockchain have gained a lot of popularity in recent years.

Zhang.L and Ge.Y [1] introduced an identity authentication system in their paper which focuses on the security and control of the diverse association networks. Their system uses blockchain technology and domestic commercial cryptography.

Journal of Artificial Intelligence and Emerging Technologies
Volume 3, Issue 3, pp 25-31, March 2026
ISSN (online): 30491967
DOI: https://doi.org/10.47001/JAIET/2026.303005
Available Online at https://www.jaiet.com

It substitutes the traditional cryptogrammic algorithms with SM2, SM4, SM9 and ZUC for heterogenous alliance networks in the identity authentication process.

Ganta.S, Rebekka.B, Gunavathi.N, and Malarkodi.B [2] in their paper explaines how they developed a private blockchain network with a unique network ID 1114. Counterfeit goods have a significant impact on the product manufacturing industry that affects both sales and profits. The paper also discusses about how the application works for various use cases.

The research done by Kirupanithi. D.N and Dr. Antonidoss. A, [3] discusses about the sharing of the user data on permissioned blockchain using an identity-based encryption for maintaining access control and data security. This paper gives a detailed survey of the features of the self sovereign identity and its consequence over the rules and regulations of identity which are being explored.

Security issues involved with the Car sharing systems that have evolved to resolve numerous urban problems by issuing people with shared vehicles has been the topic under discussion in the work by Kim.M, Lee.J, P.Kisung, P.Yohan, P.Kil.Houm and P.Youngho [4]. Here blockchain technology has been used to deliver a decentralized car sharing service and ensure data integrity and anonymous authentication. The BAN logic analysis showed that the suggested protocol ensures guarantee mutual authentication among the user, station, and owner. Furthermore, the AVISPA simulation confirmed that the protocol is safe from replay and man-in the-middle attacks. An analysis of the computational and communication costs of the system has also been presented in the paper.

Most of the work done in the past few years is compromising the feature of decentralization. In the system proposed by Choudhri's, Das. K.M and Parasher. S, [5] the authors have developed a compatible blockchain solution for Identity Management. Motive of the research work stated is to study the compatibility of blockchain solutions for Identity and Access Management and the same has been illustrated by creating a PoC.

Another area of focus for blockchain application is in the field of smart contracts, which is an agreement between two or more parties, executed by the computer code. Liu.J and Liu.Z [6] in their paper has presented a survey on this aspect.A comprehensive and detailed survey about the research results associated to security verification of blockchain smart contracts from major scientific databases in recent years has been presented and an analysis based on the security promise and the reliability verification has been done by the authors.

M. C. Jayaprasanna, V.A.Soundharya, M.Suhana and S.Sujatha [7] have in their work presented a blockchain based management system to verify the authenticity of real products all through the supply chain, a functional block chain technology which helps in preventing the product counterfeiting. The developed Blockchain Based Management system uses a barcode reader for identification of artificial products.

Another such work which enables end users to SelfVerify authenticity of products has been presented by Rana.A and Ciarduli.A [8]. A basic identification system that uses the public-key cryptography is combined with a 2D barcode and an online product id verification system which can be implemented on a smartphone app has been proposed by the authors. S. Aggarwal, N.Kumar and P.Gope [9], in their paper has discussed an efficient Blockchain based authentication scheme for Energy-Trading in V2G Networks.

Khawla Bouafia and Mahammad Gulalov, [10] in their paper suggest a comprehensive overview and method for authentication and authorization using blockchain technology by developing a decentralized application(dApp) for enhanced security. The paper discusses about the blockchain solutions for authentication and authorization compared to the traditional authentication system which is highly vulnerable to many attacks like phishing, brute force and social engineering. The authors also discusses about the various methodologies on how to develop a blockchain with various tools like Javascript, Ganache and metamask.

The papers by Y.Eazawa ,Takita.M , Shiraishi.Y , Kakei.S , Hirotoma.M, Fukuta.Y, Mohri.M and Morii.M [11] and by A. Jamal, R. A. A. Helmi, A. S. N. Syahirah and M. -A. Fatima [12] focuses on the designing and implementation of an authorization system using Blockchain technology in order to leverage the inherent properties of decentralization and security to overcome the challenges faced by the traditional system. Alexandru Cristian Careja, Nicolae Tapus [13] in their paper discusses about the importance of digital identity in modern day digital environment unlike traditional system which is vulnerable to so many data breaches. The authors suggest blockchain as a solution for decentralized digital identity system to overcome these challenges. The paper addresses various blockchain based identity management like smart contracts and verifiable certificates for enhanced security.

Journal of Artificial Intelligence and Emerging Technologies
Volume 3, Issue 3, pp 25-31, March 2026
ISSN (online): 30491967
DOI: https://doi.org/10.47001/JAIET/2026.303005
Available Online at https://www.jaiet.com

The paper by Xingxiong Zhu [14], D.Maldona-Ruiz, J.Torres, N.El Madhoun and M.Badra [15], and Umren O, Singh R, Awan S, Pervez Z, Dahal K , [16] addresses about the various challenges in traditional credit reporting systems like relying on the third party agencies to gather, store and report credit related data and issues which leads to security breaching and data tampering. The authors propose decentralization using blockchain technology for identification and authorization which increases enhanced security and privacy.

In most of the works an integration of the system with AI is proposed for development of a more secure and accurate system with improved decision making.

III. PROPOSED SYSTEM

The proposed system introduces a blockchain-based identity generator and authentication mechanism to provide secure and decentralized identity management. Traditional identity systems rely on centralized databases, which are vulnerable to hacking, data breaches, and unauthorized access. To overcome these limitations, the proposed system uses blockchain technology to store and verify user identities securely.

In this system, a user first registers by providing personal details and biometric information such as facial data. After registration, the system generates a unique digital identity for the user. This identity is encrypted and stored in the blockchain network. Since blockchain is decentralized and immutable, the stored identity data cannot be altered or deleted by unauthorized users.

During authentication, the user attempts to log in using facial recognition or identity credentials. The system captures the user's face and compares it with the stored data in the blockchain. If the identity matches, the system grants access; otherwise, the request is rejected. This process ensures that only authorized users can access the system.

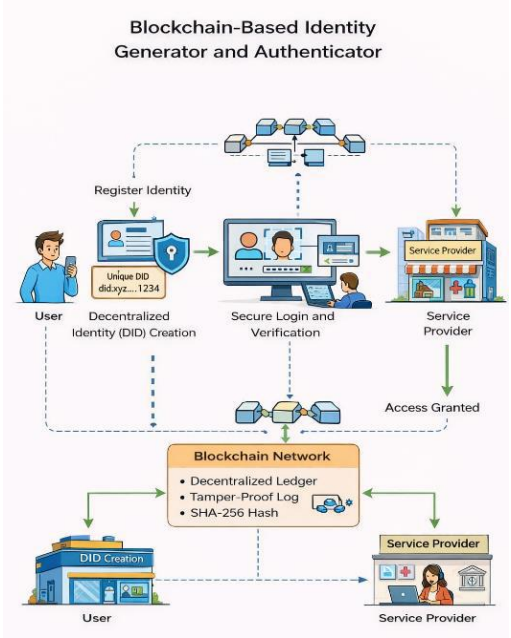
The proposed blockchain-based identity management system improves security, transparency, and reliability. It eliminates the need for centralized authorities and provides a tamper-proof method for generating and verifying digital identities.

IV. METHODS AND MATERIALS

The aim of this work is to develop a secure identity management system using blockchain technology to ensure reliable authentication and data integrity. Traditional identity systems rely on centralized databases which are vulnerable to data breaches, unauthorized access, and identity theft. To overcome these limitations, the proposed system uses blockchain to create a decentralized platform where user identities can be securely generated, stored, and verified.

The system consists of several main operations including Identity Registration, Identity Generation, Authentication, Verification, and Identity Management. During the registration process, the user provides basic details and biometric information such as facial data. The system generates a unique digital identity for the user using cryptographic techniques. This identity is then stored in the blockchain network as a secure and immutable record.

Blockchain acts as a distributed ledger that records identity transactions in blocks. Each block contains encrypted identity data, timestamps, and cryptographic hashes linking it to previous blocks. This structure ensures that once data is added to the blockchain, it cannot be altered or deleted without network consensus, thereby maintaining the integrity and security of identity records.



For authentication, the system captures the user's face using a camera and compares it with the stored facial data associated with the blockchain identity. If the captured data matches the stored identity within a defined threshold, access is granted. Otherwise, the authentication request is rejected. This process

Journal of Artificial Intelligence and Emerging Technologies
Volume 3, Issue 3, pp 25-31, March 2026
ISSN (online): 30491967
DOI: https://doi.org/10.47001/JAIET/2026.303005
Available Online at https://www.jaiet.com

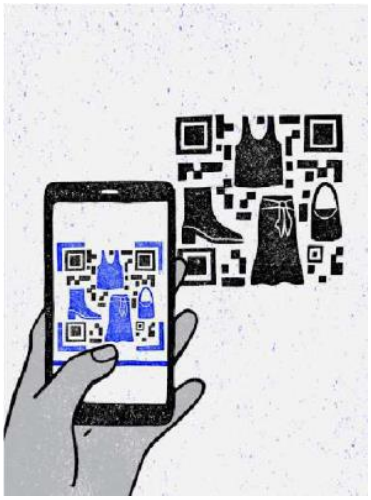
ensures that only authorized users can access the system.

The proposed approach improves privacy, transparency, and security in identity management. By eliminating dependence on centralized authorities and enabling tamper-proof storage of identity data, the blockchain-based identity generator and authenticator provides a reliable solution for modern digital identity systems.

When the user decides to drop the product, he/she can deposit it in the recycling unit authorized by the specific brand. A small cash back can be offered as per company policies. Once the product gets back to the factory, the manufacturer can assess the performance of the product, recycle, or refurbish the product with the same ID.

User Authentication

After each user is assigned with a QR Code, along with User Interface that is provided to each customer. By using the UI each customer can scan the QR on the user and authenticate the user. The QR code on the user contains the entire details of the user like, user name, mobile number etc. shows the authentication procedure using QR code, which contains the details of the product.



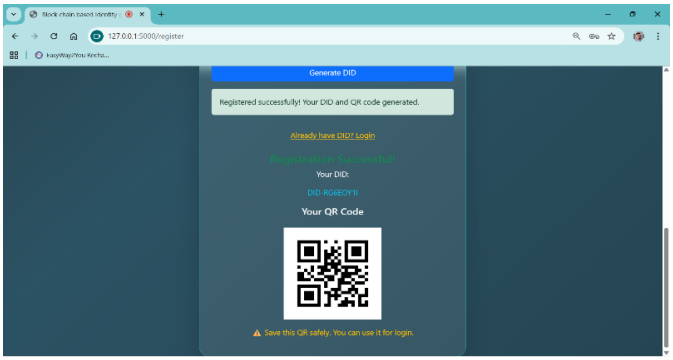
Authentication of user using QR code

The proposed system allows users to authenticate their identity using a secure blockchain-based mechanism. During registration, the user provides personal details and biometric information such as facial data. The system then generates a unique digital identity for the user and stores it securely in the blockchain ledger. This identity acts as a decentralized identifier that cannot be modified or duplicated by unauthorized entities.

During the authentication process, the user attempts to log in by providing their credentials and biometric verification. The system captures the user's face through the camera and compares it with the stored facial data linked to the user's digital identity. If the facial features match within the predefined threshold, the system verifies the identity and grants access. Otherwise, access will be denied. Since identity records are stored on the blockchain, they remain immutable and secure from tampering or unauthorized modification.

V. RESULT AND ANALYSIS

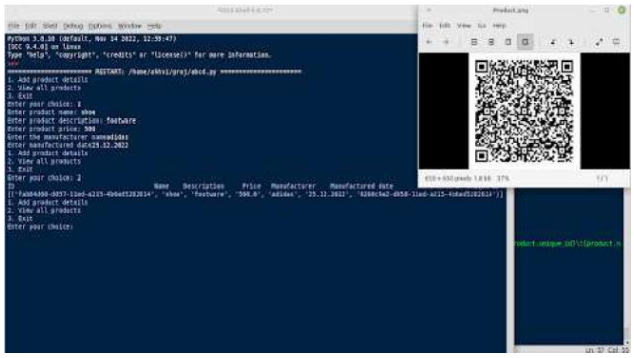
The implemented system successfully demonstrates the secure generation and verification of digital identities using blockchain technology. The developed modules provide an interface for user registration, identity generation, and authentication. User details and identity data are securely stored in a blockchain structure where each block contains a unique hash and reference to the previous block.



In the first stage, a genesis block is created to initialize the blockchain network. This block serves as the foundation for storing identity records. In the second stage, user registration details such as username, biometric data, and unique identifiers are added to a new block. Each block is linked with cryptographic hashes, ensuring the integrity and security of the data.

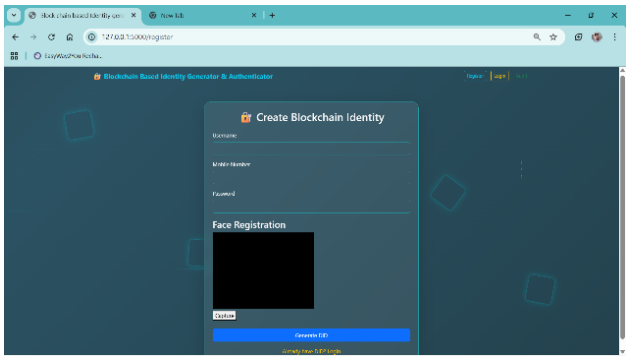
During authentication, the system verifies the captured facial data with the stored identity information. If the verification is successful, the system grants access to the user. The results demonstrate that the blockchain-based identity management system provides enhanced security, transparency, and reliability compared to traditional centralized authentication systems.

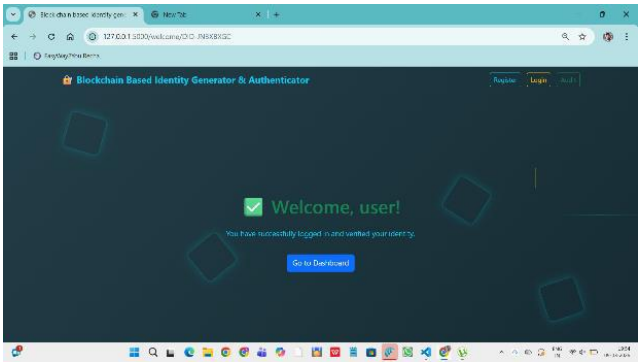
Journal of Artificial Intelligence and Emerging Technologies
Volume 3, Issue 3, pp 25-31, March 2026
ISSN (online): 30491967
DOI: https://doi.org/10.47001/JAIET/2026.303005
Available Online at https://www.jaiet.com



Terminal view of the system

The interface was handled in terminal to avoid connection overhead when linked with an interface. It can be viewed in a web interface or in an app as per the user requirement. Fig 7 shows the interfaces designed using PHP.



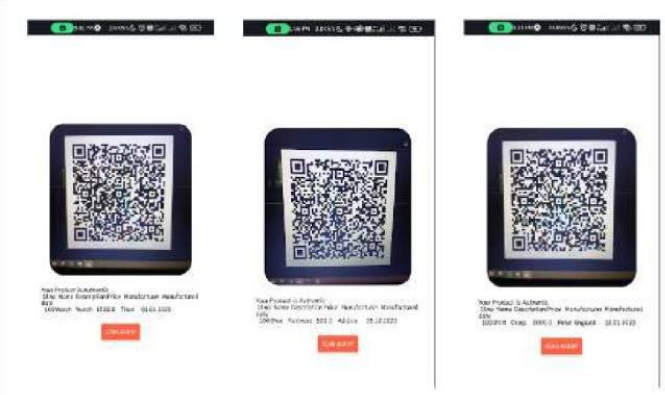


Web interface

The data entry page has columns to enter the serial number assigned, the product name, its description, manufacturer details and date of manufacturing. In the product viewing page, the same details entered before can be retrieved. Along with that, the unique ID generated is also obtained. This ID is the one which is affixed in each and every different piece of the same commodity. It can be affixed in the form of text, bar codes, QR codes, etc.

For convenience of the customer, currently, QR code is used as the medium. The QR is stamped and the user can scan it to verify the product's authenticity. Once it is verified, the user can view the information entered before, but this privilege is solely controlled by the manufacturer's policy. Fig 8 is the implementation of the user interface for scanning the QR code on the product. This UI will provide the users to check the authenticity of the product. The details contained in the QR code like Product Serial Number, Name, Description, Manufacturer, Price and manufactured date. Also, it shows a message that "Your Product is Authentic" when an authentic product is scanned.

In case, if the product is a pirated product the scan prompt will not give any message. The given interface is made from Expo Go, a run-time environment which is available in Google Play Store.



User interface for scanning QR code

VI. CONCLUSION

The blockchain-based identity generator and authenticator provides a secure and decentralized method for managing digital identities. Unlike traditional centralized systems, blockchain stores identity data in a distributed and tamper-proof ledger, which improves security and prevents data breaches or identity theft.

The system generates unique digital identities and authenticates users using cryptographic hashes, ensuring that only authorized users can access the system. This approach increases privacy, transparency, and trust between users and service providers.

Additionally, the system reduces dependence on centralized authorities and minimizes the risk of identity

Journal of Artificial Intelligence and Emerging Technologies
Volume 3, Issue 3, pp 25-31, March 2026
ISSN (online): 30491967
DOI: https://doi.org/10.47001/JAIET/2026.303005
Available Online at https://www.jaiet.com

manipulation. In the future, the system can be enhanced by integrating advanced biometric technologies and smart contracts to improve scalability and efficiency.

Overall, this solution offers a reliable and efficient method for digital identity management and can be widely used in e-governance, banking, healthcare, and other online services for secure identity verification.

REFERENCES

[1] L and Ge.Y., "Identity Authentication Based on Domestic Commercial Cryptography with Blockchain in the Heterogeneous Alliance Network," 2021 IEEE International Conference on Consumer Electronics and Computer Engineering (ICCECE), 2021, pp. 191-195, doi: 10.1109/ICCECE51280.2021.9342494.

[2] Ganta.S, Rebekka.B, Gunavathi.N, and Malarkodi.B "Unique Identity Management Scheme for Distributed NFV Market Place using Ethereum," 2019 TEQIP III Sponsored International Conference on Microwave Integrated Circuits, Photonics and Wireless Networks (IMICPW), 2019, pp. 454-457, doi: 10.1109/IMICPW.2019.8933182.

[3] Kirupanithi.D.N and Dr. Antonidoss. A "Self-Sovereign Identity creation on Blockchain using Identity based Encryption," 2021 5th International Conference on Intelligent Computing and Control Systems (ICICCS), 2021, pp. 299-304, doi: 10.1109/ICICCS51141.2021.9432099.

[4] Kim.M, Lee.J, P.Kisung, P.Yohan, P.Kil.Houm Zhang and P.Youngho, "Design of Secure Decentralized Car-Sharing System Using Blockchain," in IEEE Access, vol. 9, pp. 54796-54810, 2021, doi: 10.1109/ACCESS.2021.3071499.

[5] Choudhari.S, Das.K.M and Parasher.S "Interoperable Blockchain Solution For Digital Identity Management," 2021 6th International Conference for Convergence in Technology (I2CT), 2021, pp. 1-6, doi: 10.1109/I2CT51068.2021.9418220.

[6] Liu.J and Liu.Z "A Survey on Security Verification of Blockchain Smart Contracts," in IEEE Access, vol. 7, pp. 77894-77904, 2019, doi: 10.1109/ACCESS.2019.2921624.

[7] M. C. Jayaprasanna, V.A.Soundharya, M.Suhana and S.Sujatha, "A Block Chain based Management System for Detecting Counterfeit Product in Supply Chain," 2021 Third International Conference on Intelligent Communication Technologies and Virtual Mobile Networks (ICICV), 2021, pp. 253-257, doi: 10.1109/ICICV50876.2021.9388568.

[8] Rana.A and Ciarduli.A , "Enabling consumers to self-verify authenticity of products," The 9th International Conference for Internet Technology and Secured Transactions (ICITST-2014), 2014, pp. 254-255, doi: 10.1109/ICITST.2014.7038816.

[9] S. Aggarwal, N.Kumar and P.Gope, "An Efficient Blockchain-Based Authentication Scheme for Energy-Trading in V2G Networks," in IEEE Transactions on Industrial Informatics, vol. 17, no. 10, pp. 6971-6980, Oct. 2021, doi: 10.1109/TII.2020.303094.

[10] Khawla Bouafia and Mahammad Gulalov, "Blockchain Solutions for Authorization and Authentication," Procedia Computer Science, Volume 237, 2024, pp. 115-122, ISSN 1877-0509,doi:10.1016.2024.05.86.

[11] Y.Eazawa ,Takita.M , Shiraishi.Y , Kakei.S , Hirotoma.M, Fukuta.Y, Mohri.M and Morii.M "Designing Authentication and Authorization System with Blockchain, " 2019 14th Asia Joint Conference on Information Security (AsiaJCIS), Kobe,Japan,2019, pp.111118,doi:10.1109/AsiaJCIS.2019.00006.

[12] A.Jamal, R. A. A. Helmi, A. S. N. Syahirah and M. -A. Fatima, "Blockchain-Based Identity Verification System," 2019 IEEE 9th International Conference on System Engineering and Technology (ICSET), Shah Alam, Malaysia, 2019,pp.253257,doi:10.1109/ICSEngT.2019.8906403.

[13] Alexandru-Cristian Careja, Nicolae Tapus , "Digital Identity Using Blockchain Technology," Procedia Computer Science ,Volume 221, 2023, pp. 1074-1082, ISSN 1877-0509, doi:10.1016.2023.08.090.

[14] Xingxiong Zhu, "Blockchain-Based Identity Authentication and Intelligent Credit Reporting," 2020 J.Phys.: Conf.Ser. 1437 012086,doi:10.1088/1742-6596/1437/1/012086

[15] D.Maldona-Ruiz, J.Torres, N.El Madhoun and M.Badra, "An Innovative and Decentralized Identity Framework Based on Blockchain Technology," 2021 11th IFIP International Conference on New Technologies, Mobility and Security (NTMS), Paris, France, 2021, pp.1-8,doi:10.1109/NTMS49979.2021.9432656.

[16] Umren O, Singh R, Awan S, Pervez Z, Dahal K , "Blockchain-Based Secure Authentication with Improved Perfomance for Fog Computing," Sensors.2022;22(22):8969, doi:10.3390/s22228969.

Journal of Artificial Intelligence and Emerging Technologies
Volume 3, Issue 3, pp 25-31, March 2026
ISSN (online): 30491967
DOI: https://doi.org/10.47001/JAIET/2026.303005
Available Online at https://www.jaiet.com

Citation of this Article:

S Jubeda Banu, P Kalpana, K Akhida, P Thaslim, P Ismail, & K Nandini. (2026). Blockchain Based Identity Generator and Authenticator. *Journal of Artificial Intelligence and Emerging Technologies (JAIET).* 3(3), 25-31. Article DOI: https://doi.org/10.47001/JAIET/2026.303005

***** End of the Article *****