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Business Mapping in Context of Web 3.0 using Blockchain Technology

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Abstract: ***The foundation of e-commerce is based on conducting transactions and transferring goods online without the need for physical travel. However, cyber threats can pose a risk when it comes to transferring transactional data. Our primary goal is to develop a system that can protect against such mishaps during the process of transmitting transactional data. Additionally, we aim to implement an automated system that ensures error-free transactions. To achieve these objectives, we will leverage the latest technologies such as blockchain and smart contracts. Blockchain technology provides a decentralized and immutable digital ledger that can securely store and transfer data across a network. E-commerce can use blockchain technology to process transactions safely, securely, and rapidly. By using blockchain technology, we can enable peer-to-peer transaction systems and data encryption, ensuring the safe transfer of sensitive financial information. Moreover, we can use blockchain technology to transfer transactional data securely. A smart contract is a specialized program that functions as an agreement and runs on the Ethereum blockchain. Smart contracts provide transactional security, and when combined with blockchain technology, they can transform e-commerce. By utilizing blockchain technology to ensure data security and user privacy and smart contracts to maintain the transaction protocol, our proposed system aims to offer a solution for transactional data privacy and transparency. In conclusion, our system will provide a secure and transparent platform for conducting e-commerce transactions. With the use of blockchain technology and smart contracts, we can create a system that ensures safe transfer of data and error-free transactions.***

Keywords: Transparency; Privacy; Blockchain; Securely; Quickly;

I. INTRODUCTION

The inception of Blockchain technology can be traced back to 1991 when Stuart Haber and W. Scott Stornetta were researching digital signed documents. However, it wasn't until 2008 when Bitcoin, a peer-to-peer electronic cash system, was proposed by Santoshi Nakamoto that blockchain technology gained wider recognition. As digitization is becoming more ubiquitous, people are increasingly conducting transactions, shopping online, and using smartphones from anywhere in the world. Most interactions between consumers and vendors in e-commerce occur through online media, making it crucial to have a secure and transparent means of conducting transactions. Unfortunately, online transactions are not always completely secure, as evidenced by the increasing number of recorded security breaches in which a third-party gains possession of large amounts of data. Hackers are constantly trying to exploit weaknesses in networks and gain unauthorized access to user data, leading to a decrease in users' trust in online transactions. This is where blockchain technology comes in - it is a peer-to-peer, decentralized platform where members can interact without any trusted intermediaries and any form of malicious activities. Smart contracts are programs that act as agreements between buyers and sellers, and they are written using languages such as Solidity, Rust, etc. These contracts are stored on the blockchain, and they automate the actions of parties in the agreement, thereby building trust between both parties. In the rapidly growing world of e-commerce, security is the biggest threat to both financial institutions and consumers. It is vital to have a secure and protected form of interaction between buyers and sellers. Centralized organizations often use customers' personal data for analysis, research, and profit-making, which makes data privacy and security all the more important.

II. LITRECTURE REVIEW

Author/ Year	Paper Outcomes	Limitations
Huiqing Wang, 2016	1. Real-world adoption issues are addressed. 2. The IT Maturity model has been used to assess and	1. The blockchain system is not yet at its ideal degree of maturity.

[1]	direct the growth of blockchain technology.	2. Prior to implementation, a thorough development model study.
Jennifer J. Xu, 2016 [2]	1. Discusses the capabilities and limitations of blockchain technology. 2. Presented blockchain technology by going over cutting-edge tools for spotting online scams and intrusion.	1. The vast majority of society needs to embrace technology. 2. Technology cannot by itself build businesses free from maliciousness.
Ye Guo, 2016 [3]	1. Blockchain application scenarios that involve bank systems and payment clearing systems are appropriate. 2. Apply to solve issues like a dearth of mutual trust and high transaction costs.	1. Regular efficiency and security issues have always been the catalyst for newly financed invention. 2. The possibility of incorporating blockchain technology into the financial sector in the near future.
Yuanfeng Cai, 2016 [4]	1. Blockchain has potential strengths and limitations for reputation systems, including the ability to prevent attacks such as ballot stuffing and bad mouthing, but scalability and governance issues must be carefully considered. 2. The system preventing only bad mouthing.	1. Not detect ballet staffing sybil attack. 2. Not detect constant attack and camouflage attack.
Zibin Zheng, 2017 [5]	1. A description of the architecture and terminology of blockchain technology.	1. It is not application oriented.
Jiin-Chiou, 2019[6]	1. Developed project based on Covind-19 using blockchain technology to authorized real users. 2. There main aim to identify fake certification and fake user.	1. Process is very lengthy. 2. It's not cost effective.
Maharshi Shah, 2019 [7]	1. The initiative aims to create an immutable certificate generation system as well as a validation system.	1. Not secured. 2. Data can be tempered.
Arshad Jamal, 2016 [8]	1. By participating in blockchain technology, individuals can enhance regulatory compliance and minimize fraudulent activities. 2. Consensus is required for any deletion of records in the blockchain ledger, ensuring its immutability.	1. Certain tasks or processes necessitate significant amounts of energy. 2. In the case of the Bitcoin network, the act of mining requires an estimated daily expenditure of around $15 million on energy.
Jesse Yli-Huumo, 2016 [9]	1. Linked all pertinent current trend research to Blockchain technology. 2. Make suggestions for potential research directions.	1. Conduct more study on scalability issues of Blockchain. 2. Lack concrete evaluation on effectiveness.
Gunit Malik 2019 [10]	1. Proposed solution to enhance IPFS material security by incorporating traceability, access control, and authentication features into private IPFS networks.	1. The proposed solution involves incorporating new features and technologies that demand more processing power and time to function

		properly. 2. The recommended approach does not completely limit access to hash addresses.
Pierangelo Rosati, 2018 [11]	1. A summary of potential blockchain applications in the financial services industry, as well as a discussion of pertinent scholarly literature. 2. Generate significant increases in total sector efficiency.	1. The process of integrating legacy systems with blockchain technology remains a challenging undertaking. 2. The quality of financial reporting has long been a significant concern for regulatory bodies.
Oscar Silva, 2020 [12]	1. The study specifically concentrates on Portugal, examining the various elements that pertain to the obstacles and prospects presented by the COVID-19 pandemic.	1. Require large amounts of energy. 2. Process is very lengthy.
J. Leon Zhao 2016 [13]	1. The utilization of smart contracts within enterprise blockchains has the potential to transform numerous industries by facilitating automated business transactions. 2. The fundamental nature of blockchain technology centers around its capability to enable secure transactions through distributed computing instead of relying on human oversight and regulation.	1. The creation of a new transaction record necessitates an extremely rigorous verification procedure, resulting in substantial delays and a squandering of computational resources. 2. The present methods of blockchain technology is frequently unsuitable for employment within the Internet of Things (IoT) network.
Dr. Gunjan A Rana, 2020 [14]	1. Emphasize the conditions that determine decentralized application applicability. 2. Aims to bridge the gap by helping individuals comprehend the concept and its application in various sectors in India.	1. Inability to scale, intellectual property. 2. concern, Audit/compliance concerns.
Suraj Chaubey, 2022 [15]	1. Map and visualize education certificates and store in decentralized format using IPFS networks. 2. Providing certificate by authentication of a user.	1. Some file extensions not supported. 2. lengthy process.

III. PRODUCT FUNCTION

Smart contracts are a key advantage of blockchain technology. These contracts are programs written in Solidity Language, a high-level language derived from JavaScript and strongly typed languages, and are used to maintain the integrity of the network. Our project is based on blockchain technology, which is a distributed immutable ledger consisting of a chain of blocks, each containing smart contract programs. We have used Ethereum, a peer-to-peer network, to make our project decentralized and provide equal power and rights to everyone in the network. For payment in our project, we have used the MetaMask crypto wallet, which provides faster and more secure transactions. These transactions are visible to everyone in the network, ensuring transparency and trust for all businesses and customers. Our project uses a public blockchain, allowing access to all nodes, and a decentralized application (Dapp) for both buyers and sellers. All transactions are clearly visible to all nodes in the network, and users can connect to their MetaMask wallet to make purchases using ether (ETH) currency. Transaction fees, called gas fees, are distributed to Ethereum organization and miners and the speed of transactions depends on the amount of gas fees fixed by the sender. To ensure transparency, all product images are stored on the IPFS (Interplanetary File System) and consensus is achieved through smart contracts. Figure 1 depicts the proposed working of our project. When a buyer confirms the purchase, the transaction status is set to pending until both the buyer and the business owner agree to the smart contract. Only then can the transaction be completed and the product delivered to the buyer's address. The buyer can then leave a review, which builds trust in the network. If the product is in good condition and there are no issues, the buyer leaves a positive review and the transaction is marked as completed.

The dealer receives the payment in cryptocurrency and the block in the blockchain is updated. If the product is in bad condition and the buyer leaves a negative review, the payment status remains pending, and the product is returned to the dealer or business owner while the payment is transferred back to the buyer.

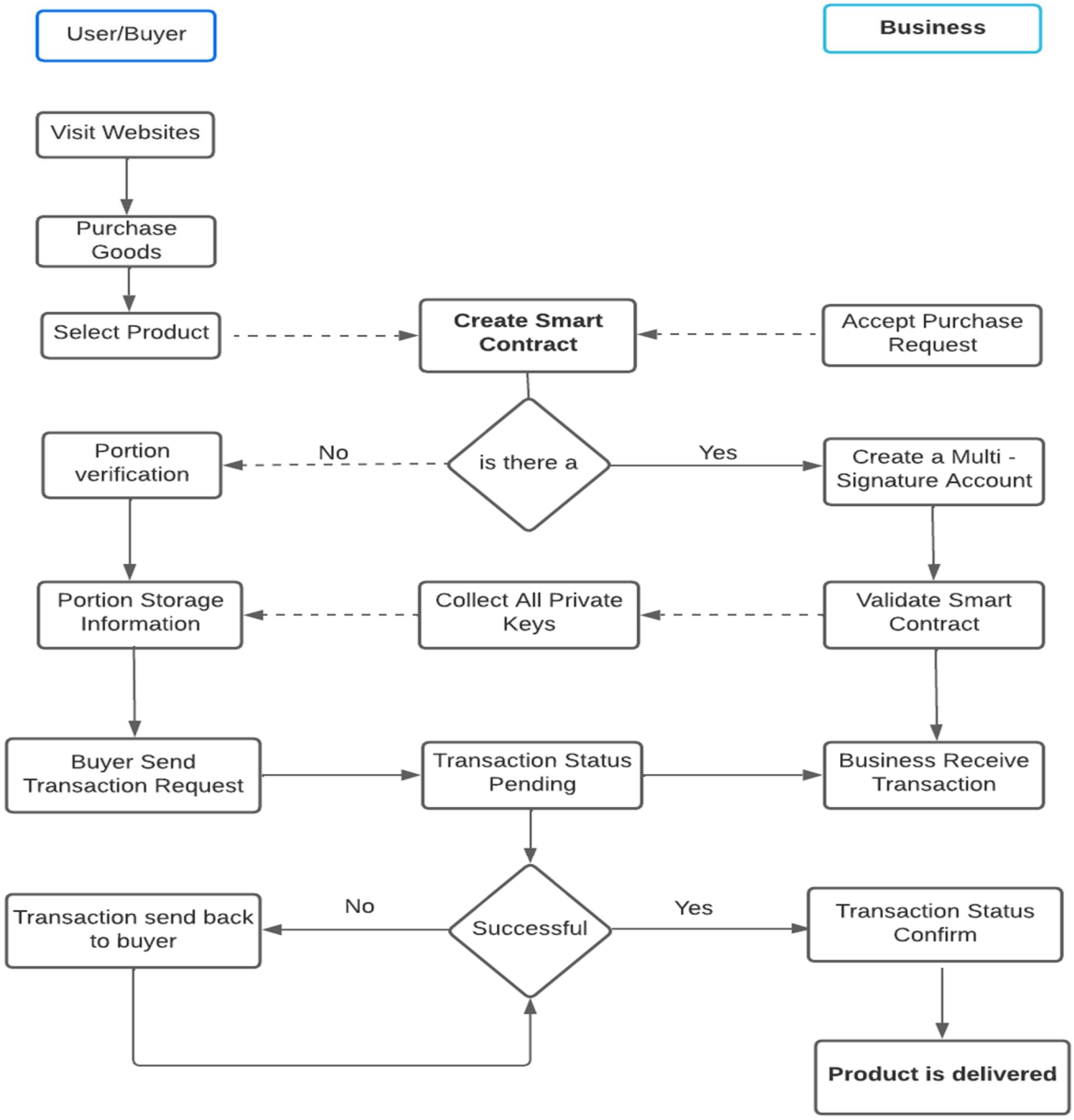

Fig.1 Data Flow Diagram

IV. RELATED WORK

A. *Exploring E-commerce Business Models within the Web 3.0 Paradigm*

Authors Fernando Almeida1, José D. Santos2 and José A. Monteiro3

The paper explores the emergence of Web3.0, its impact on businesses, and the challenges and opportunities it presents. The authors argue that Web3.0 offers an enhanced user experience and novel ways of transaction for consumers and businesses. They further discuss the need for companies to adapt their business strategies to leverage the potential of Web3.0. The paper also highlights the emergence of new business models enabled by blockchain technology, where users directly pay for access to services. The authors propose conducting an international statistical study to gather the opinions of CEOs from diverse companies on this topic

B. Web3.0 E-Commerce Decentralized Application

Authors Priyadarsh SS, Ashutosh K, Brindha R

The authors of this paper have presented a new regulation for user-controlled data sharing. They have introduced a decentralized application (Dapp) that allows the creation of verifiable records for financial transactions. In their Dapp, data is shared within a private blockchain network and is not stored on a public blockchain. This system provides transparency and control over the access to personal data by enterprises, allowing users to know which data is being accessed, when, and for what purpose.

C. Transforming E-commerce through the Integration of Blockchain Technology and the Implementation of Smart Contracts.

Authors Nesat Tasneem RoJa, Faris A. Almalki, and Maha Aljohani3

The authors of this paper have created a blockchain-based system that ensures data security and integrity for various business applications, not just limited to e-commerce platforms.

V. SYSTEM DESIGN

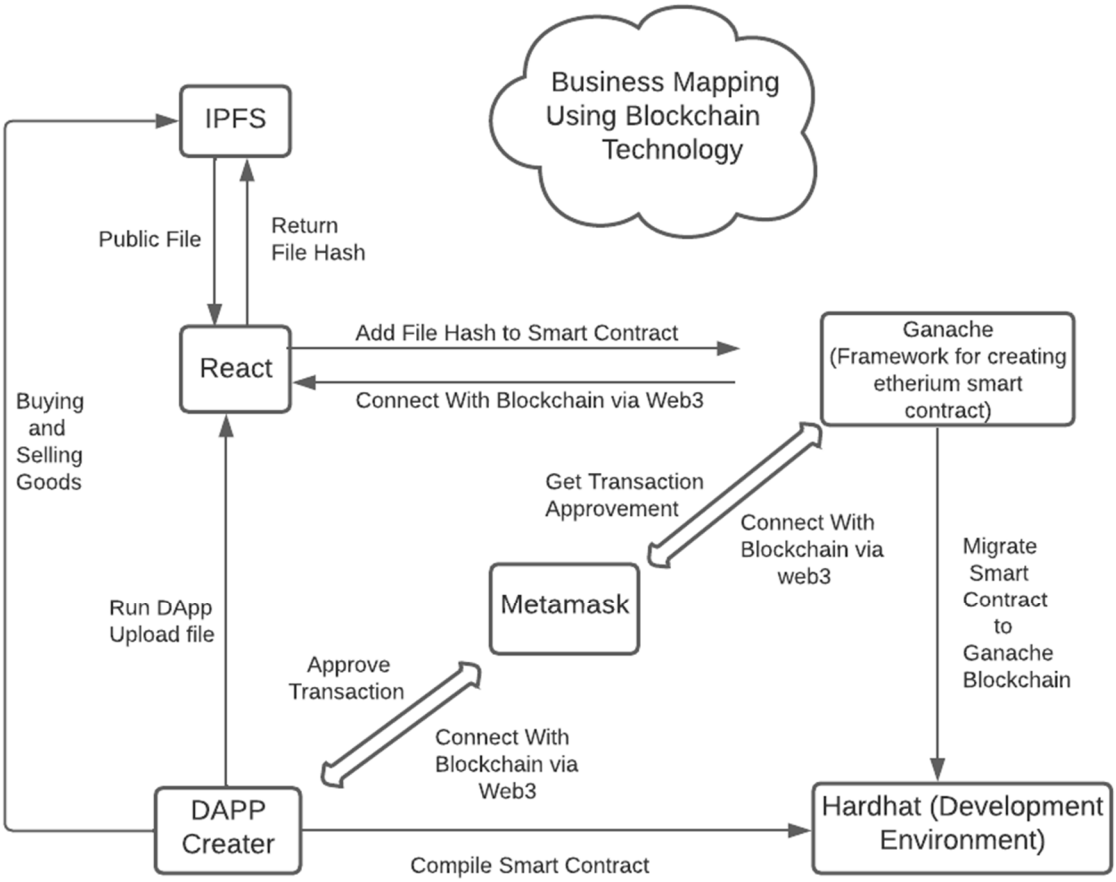

Fig.2 The Advance System Architeture

A. Simulation Setup

Here are the specifications required for implementing the decentralized application:

Processor: Intel(R) Core i5

RAM: 8 GB

Operating System: 64-bit

Processor Architecture: X64-based

Node Version: 14.16.0-x64

The programming language used for writing smart contracts is Solidity. For the front-end web GUI, React.js and JavaScript are used. The development of the decentralized application is done using various tools.

B. Smart Contract

In our project, we have implemented smart contracts using the Solidity programming language. These contracts are self-executing and are stored on a private Ethereum blockchain network. They are designed to enforce agreements between two parties, such as in financial transactions, by automatically executing the terms of the contract when certain conditions are met. Our smart contracts play a crucial role in our decentralized network by facilitating trustless transactions between consumers and businesses. By using the blockchain technology, we ensure the integrity and security of the transactions, as well as reducing transaction costs and increasing transparency.

To interact with our smart contracts, we have developed a front-end web GUI using React and JavaScript. This allows users to easily communicate with the blockchain and execute transactions on the network. We have also integrated IPFS, the InterPlanetary File System, to store files and documents related to the transactions, which can be viewed and downloaded by users. Overall, the implementation of smart contracts in our project provides a powerful and efficient way to enforce agreements and facilitate transactions in a decentralized manner.

C. Hardhat

In our project, we are utilizing Hardhat to deploy our smart contracts, run tests, and debug Solidity code in a safe and controlled environment without the need for dealing with live networks. Hardhat Network provides us with a local Ethereum network that is optimized for development, allowing us to simulate the behavior of the Ethereum network and test our contracts in a controlled environment. This helps us to identify and fix any issues or bugs before deploying the contracts on the live network. Hardhat also provides a range of development tools and plugins that make the development process more streamlined and efficient.

D. Solidity

Our project is utilizing Solidity as the primary programming language for writing smart contracts. Solidity has an object-oriented syntax that closely resembles other popular programming languages such as C++, Python, and JavaScript. To write our smart contracts, we are utilizing the Remix IDE, which provides a user-friendly interface and various built-in tools that enhance the solidity programming environment. The Remix IDE enables us to easily write, debug, and test our smart contracts, and it supports the efficient creation of reliable and secure smart contracts for our blockchain-based system. By utilizing the features and capabilities of the Remix IDE, we are able to effectively develop and deploy robust smart contracts that meet the requirements of our project.

E. IPFS

In our project, we are utilizing the InterPlanetary File System (IPFS) to store and share data in a decentralized manner. IPFS is a peer-to-peer network that uses content-addressing to uniquely identify each file in a global namespace that connects all computing devices. This allows us to store and share data in a more secure, efficient, and scalable way. The celestial body filing system of IPFS makes it possible for us to access and share data without relying on a centralized authority, providing greater transparency and resilience. we have used IPFS to store product images to achieve and decentralization.

F. Ganache

In our project, we are utilizing Ganache, a blockchain-based emulator, to execute various tests and commands. Ganache is designed to control the operation of the blockchain by inspecting the states of the system. It was previously known as Test RPC and was later renamed to Ganache. With Ganache, we are able to access information such as the Visual MNEMONIC, which is a key phrase for Ganache accounts, as well as account addresses. This emulator provides us with a local and private blockchain network for testing and debugging our smart contracts before deployment on the main Ethereum network.

G. Meta Mask

MetaMask is a cryptocurrency wallet that enables users to connect to the distributed web and interact with the Ethereum blockchain. With MetaMask, users can buy, sell, or transfer assets on the blockchain. In our decentralized application project, users can log in and make payments for products using MetaMask, and vendors can receive payments directly to their MetaMask wallets upon purchase of a product from the user.

MetaMask provides transparency, security, and faster transactions since it is based on the Ethereum blockchain.

H. Implemesntation Details

Our project aims to address the security concerns associated with ecommerce transactions by leveraging the decentralized nature of blockchain technology and the capabilities of Web3.0. In this section, we will provide a detailed overview of the implementation details of our project. The project is built using the Ethereum blockchain, which allows for the creation of smart contracts that can execute transactions automatically and securely. We use the Solidity programming language to write the smart contracts and Hardhat, a development environment for Ethereum-based projects, to deploy and test them. We also use Truffle, a popular framework for building decentralized applications (Dapps), to manage our smart contracts and Dapp development. To interact with the Ethereum blockchain, we use Web3.js, a JavaScript library that provides an interface for developers to interact with Ethereum nodes. This enables us to build a frontend application that can interact with the smart contracts on the blockchain.

The frontend of our project is developed using React.js, a popular JavaScript library for building user interfaces. The application uses MetaMask, a popular cryptocurrency wallet, as a gateway to the blockchain, allowing users to buy, sell, and trade digital assets securely. For product images, we use the InterPlanetary File System (IPFS), a distributed network for storing and sharing files in a decentralized manner. This ensures that product images are stored securely and cannot be tampered with. To ensure the security of transactions, we implement various security measures such as encryption, multi-factor authentication, and secure communication protocols. We also perform rigorous testing and evaluation of the system to ensure that it meets our performance and security standards.

In conclusion, our project is designed to provide a secure and efficient ecommerce transaction platform by leveraging blockchain technology and the capabilities of Web3.0. Our implementation details include the use of Ethereum smart contracts, Web3.js, React.js, MetaMask, IPFS, and various security measures to ensure the security of transactions.

I. Communication Interfaces

The communication interfaces for our decentralized application include the user's browser, which they use to connect to the application through their crypto wallet, such as MetaMask. The application communicates directly with the smart contract, which is written in Solidity and deployed on the Ethereum blockchain. When a customer purchases a product, the payment is made through their MetaMask wallet, and the merchant receives it. The smart contract then creates an individual product order that needs to be fulfilled for the customer. These communication interfaces ensure that each transaction is transparent and secure, and reduce the risk of fraud or unauthorized transactions.

VI. CONCLUSTION

In conclusion, our proposed system harnesses the power of blockchain technology and smart contracts to create a robust, decentralized application that enables trustless transactions between consumers and businesses. The use of a distributed peer-to-peer network and hashing techniques enhances the security and integrity of each transaction, increasing transparency and reducing the risk of fraud.

Our system also provides increased product traceability, allowing consumers and businesses to track their goods, reducing complications such as theft and loss. This application represents a significant step towards a fully decentralized network, enabling organizations to transition from traditional systems to a more secure and transparent system. The mapping of businesses within the context of web3.0 also shows the potential for blockchain technology to revolutionize various industries. Overall, our proposed system represents a promising direction for the future of decentralized applications and blockchain technology.

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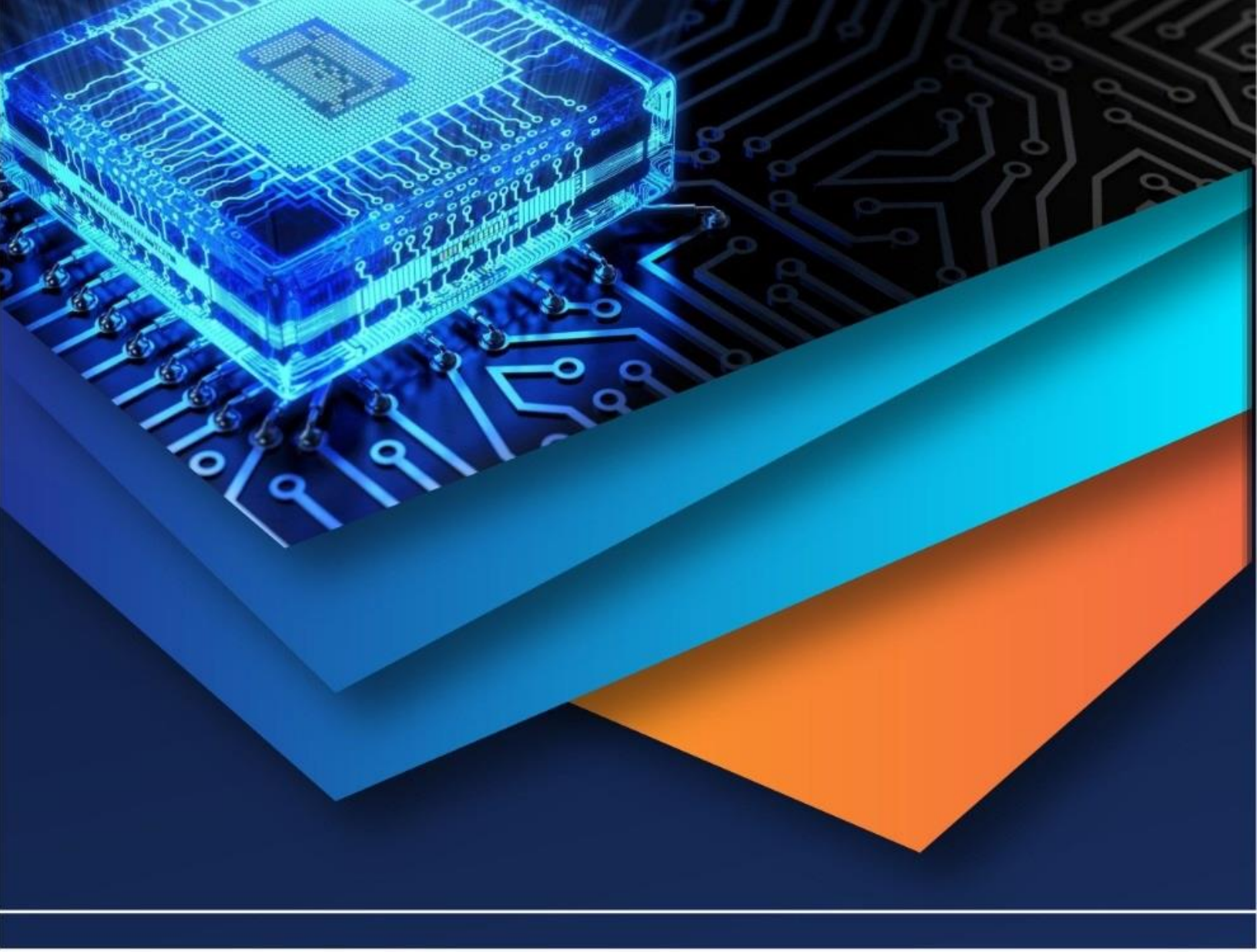

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