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"Creating An E-Commerce web application using Blockchain"

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ABSTRACT - *This research paper determines the utilization of blockchain technology in the development of e-commerce platforms. The rapid development of the e-commerce sector has brought about several problems, including security flaws, a lack of confidence in middlemen, intermediaries' fees, and high transaction costs. Blockchain can solve these issues and advance the e-commerce industry as a decentralized and transparent technology. The truffle-suite and the solidity programming language were used to construct it. Ethereum smart contracts contain all of the components of this application. The creation of client-side apps included using the web3.js API (Application Programming Interface). The Truffle framework is used for the interaction, and MetaMask, which uses ETH tokens, is utilized for the transactions. The React JS library and JavaScript are used to develop the dApp. As a result, by integrating the blockchain with front-end applications and Web 3.0, an e-commerce website that is safe, immutable, trustworthy, and simple to use is made possible.*

Key Words: E-commerce, Blockchain, Ethereum, Smart Contract, Web 3.js, Decentralized

1.INTRODUCTION

1.1 Blockchain

The fact that blockchains are built to record transaction data makes them appropriate for e-commerce. However, for security reasons, this information need not be financial; rather, it might relate to any specific action that calls for an immutable record, such as acts connected to payments and order fulfillment.

Blockchain technology is used to securely and reliably store specified information (databases) on a peer-to-peer network of linked blocks. In other words, blockchain decentralizes the whole network by replacing a single, centralized server with a network of connected computers.

Blockchain may be compared to a digital ledger where Bitcoin or other cryptocurrency transactions are chronologically and publicly recorded. An immutable public record of a digital transaction is a digital ledger.

The blockchain is a prime example of such a digital ledger. A blockchain is nothing more than a data structure where each block is linked to every other block in a time-stamped chronological manner. Bitcoin transactions are tracked via a decentralized system.

The starting place block of the blockchain is referred to as the birth block, and each block is related via its cryptographic hand. The vital capabilities of a blockchain are as follows: each new file might be authenticated throughout the community preceding to being located in its block.

The primary characteristics of the Blockchain are as follows: every new record is vindicated in a decentralized network earlier than it may be fitted into one block. All data in the record is dependable and may be checked, but cannot be altered. We need to pass from the most recent these days created block into the primary block that allows you to advantage statistics for the primary block.

1.2 E-commerce:

E-commerce has placed a strong emphasis on factors that contribute to its popularity, including high-quality goods and services, intelligent transactions, and much more relatable services. Some of the fields that are required to discuss and fulfill any request, such as generated IDs, locations, and even phone numbers, may pose privacy concerns, particularly for the comments section under any product. It may be impossible to warn any customer about their offered assessments of the products in this case. One of the technologies we employ to regulate such conduct and ensure consumer security for their product reviews and electronic payment information is blockchain.

1.3 Ethereum

On the well-known blockchain platform Ethereum, the concept of smart contracts was first introduced. Developers may create decentralized apps (dApps) and execute smart contracts on its blockchain using the Turing-complete programming language Solidity. Ethereum's architecture allows for a wide range of applications, including those in gaming, banking, and decentralized exchanges.

1.4 Smart Contracts

Smart contracts, sometimes referred to as self-executing contracts, employ blockchain technology to automatically enforce predefined conditions and actions. They enable frictionless and open communication between parties, obviating the need for middlemen and boosting the effectiveness and security of transactions.

Smart contracts are computer protocols that enable, confirm, or enforce the negotiation or fulfillment of a contract without the use of middlemen.

Smart contracts can be programmed to automatically carry out tasks depending on predetermined criteria. They may carry out tasks including asset transfer, data verification, and transaction settlement, assuring dependable and impervious operations. Smart contracts operate automatically and in line with predetermined rules, reducing the need for human intervention.

Accountability and transparency are ensured since all parties may view transactions and contract implementation on the blockchain. To offer robust security against manipulation and unauthorized access, smart contracts leverage cryptographic techniques and the decentralized nature of the blockchain. By using code and consensus mechanisms, smart contracts do away with the requirement to have faith in a centralized authority or counterparty.

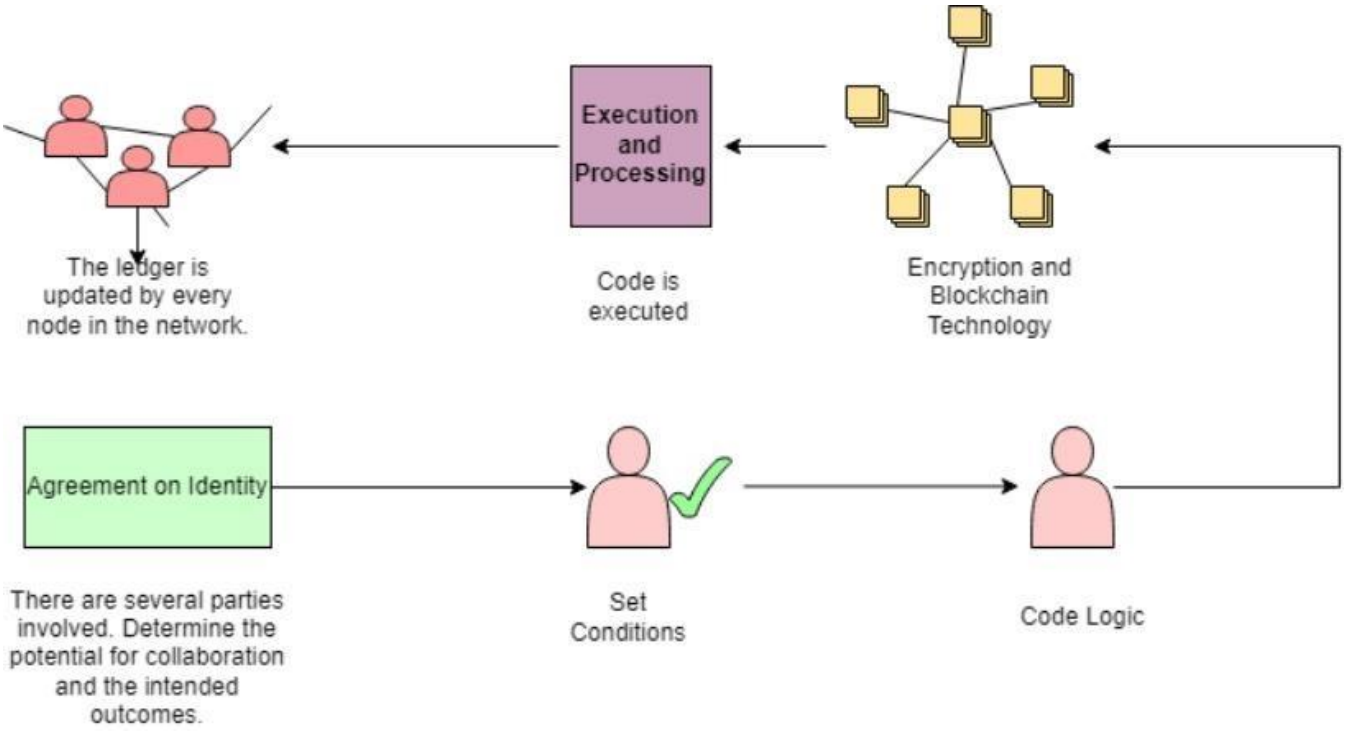

Figure 1: Working of Smart Contract

1.5 Decentralized

Blockchain operates on a peer-to-peer network, therefore there is no need for a centralized organization or mediator. The system is more open, safe, and robust as a result of its decentralized architecture because no single entity has authority over it.

1.6 Web 3.js

A JavaScript library called Web3.js offers a selection of utilities and methods for dealing with the Ethereum blockchain and other compatible blockchain networks. It is frequently employed to create decentralized apps (dApps) that take advantage of blockchain technology's features.

By serving as a conduit between a web application and the Ethereum network, Web3.js enables developers to engage with smart contracts, read from and write to the blockchain, and conduct other tasks. Developers may communicate with the Ethereum Virtual Machine (EVM) and the supporting blockchain infrastructure via its user-friendly and easy API.

To create decentralized apps, incorporate blockchain technology into web applications, and communicate with smart contracts, developers in the Ethereum ecosystem frequently employ Web3.js. Developers may more easily make use of the capabilities of decentralized technology since it makes the difficulties of communicating with the blockchain more manageable.

2. LITERATURE SURVEY:

One of the most important transactional channels nowadays is e-commerce.

E-commerce deals encompass all three of the public and private sectors. Based on a range of application scenarios, many e-commerce models have been developed. The most common variations are business-to-business (B2B) [5], business-to-customer (B2C)[6], customer-to-customer (C2C)[7], online-to-offline (O2O)[8], and government-to-business (G2B)[9]. The most prevalent problems with e-commerce models include the following:

The security of the personal information of the millions of users of e-commerce platforms must be ensured. We routinely learn about cyber-security issues involving breaches or exposures of private consumer data to unintended recipients, who then use it inappropriately.

Breach of data integrity and security has repeatedly had devastating results. Therefore, e-commerce websites must have total control over the security of user-sensitive information, such as personal data and related financial data. When providing their private bank account information and other data on a reliable e-commerce site, customers should not worry about hackers stealing their personal information.

Therefore, to protect user-sensitive data from hackers, these websites must make use of advanced data encryption technology.

Another simple yet essential component of an eCommerce website that controls logistics is supply chain management (SCM). SCM is a crucial component of every organization, whether it be in agriculture, online food delivery, or even an e-commerce platform. From the producer, via the wholesaler, the retailer, and ultimately the eventual consumer, a thing or commodity must travel a long way. The product must first overcome a large number of obstacles along the whole supply chain, including subpar raw materials, sluggish production, poor vendor communication, problems with payment processing, and many, many more before it can ultimately reach its final destination, the client.

An efficient payment transaction ledger is a must for every e-commerce effort. To keep a history of each minor or big occurrence during the process, countless transactions that must be securely documented in ledgers or account books

[10] are just a few instances. These interactions cover recording client orders, collecting payment information, following an order's progress via the logistics chain, sending the goods to the consumer, returning them for a refund, etc.

Blocks, which can be collections of data packages that generally include multitudinous deals, are the simple structure blocks of a blockchain. With every new block, the blockchain, which serves as a radical report of every sale, expands. Blocks can be demonstrated by using the network using cryptographic strategies. each block also contains the deals, a timestamp, the hash price of the block that got then before it (the" parent"), and a nonce, which is a arbitrary range used to validate the hash. The integrity of the chain asa total is assured with the aid of this idea.

Blockchain's benefits for e-commerce platforms:

1. Enhanced Security: Decentralized and unchangeable blockchain technology enhances security for e-commerce systems. emphasize that transactional integrity is protected by distributed ledger technology. Increased security reduces risks including fraud, unauthorized access, and data breaches while fostering trust between customers and sellers.

2. Transparency and Trust: Blockchain technology makes e-commerce transactions more transparent and trustworthy. Due to the decentralized nature of blockchain, all users can see the history of all transactions, promoting accountability and transparency. asserts that blockchain's transparency can help with the difficulties of fake goods since it gives customers an unchangeable record of a product's history and legitimacy.

3. Increased Efficiency and Cost Savings: Blockchain technology can increase the effectiveness and lower the expenses of e-commerce platforms. Blockchain simplifies operations, lowers transaction costs, and accelerates settlement times by doing away with middlemen.

Smart contracts automate several processes, including payment settlements and product delivery, which further improve efficiency.

The literature analysis concludes by highlighting the important benefits and promising possibilities of using blockchain technology into e-commerce systems. Blockchain is an appealing answer to the problems the ecommerce sector is facing because of the improved security, transparency, and efficiency it offers. Additionally, a bright future for blockchain-based ecommerce platforms is suggested by the integration of blockchain with cutting-edge technology, its potential influence on supply chain management, and the transformation of payment systems.

3. PROPOSED SYSTEM:

Create the website's front end: We developed Authentication, Navbar, Dashboard, AddtoCart, ExploreMenu, Admin section Submenus, and other subcomponents in the front end using ReactJs.After the front end was finished, the blockchain components for the e-commerce website were defined.

Creating the user interface and integrating it with the blockchain's components will be part of this.

The term "smart contracts" refers to self-executing software that may be used to automate transactions and enforce corporate standards. Define the smart contracts that will be used by our e-commerce website for things like processing payments, monitoring orders, and product verification.

3.1 Essentials Functions:

- generateWallet(“ETH”): GenerateWallet will produce an Ethereum-based wallet that can store our Ethereum balance when called with the command generateWallet("ETH"). It gives back an

object that includes our wallet's private key and wallet address.

- getBalance(wallet address): getBalance(wallet address) offers an Ethereum balance in Wei format, which we must translate to an Ethereum format to obtain the precise number of others in our wallet. It requests the wallet address as an input and responds with the wallet's balance.

- Web3(url of the blockchain server): This constructor creates an instance of the web3 object for the specified blockchain provider that we supply as a parameter in the function. This instance allows us to access various methods offered by this library.

- signTransaction() subscribing to an Ethereum sale the use of an account's particular secret is fulfilled by the operation ofWeb3.js' signTransaction() function. The act of subscribing to a sale demonstrates the account's power and authority to hold it out at the Ethereum community.

- sendSignedTransaction() A linked Ethereum sale can be transferred to the community for prosecution of the operation of theWeb3.js sendSignedTransaction() API. To broadcast a sale to the Ethereum community and have it booby-trapped right into a block after subscribing it using the signTransaction() point, use sendSignedTransaction().

3.2 Proposed System Architecture

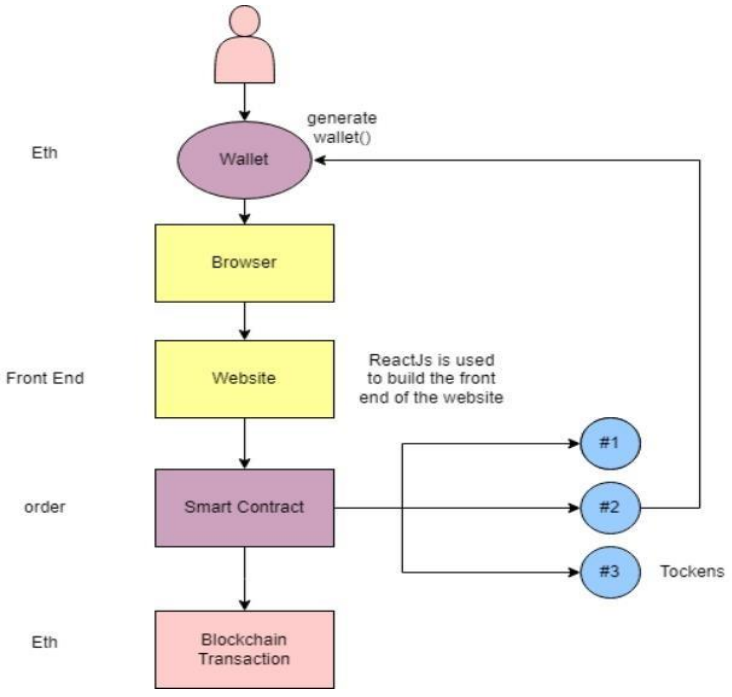

Figure 2: Proposed System Architecture

3.3 Proposed System Algorithms

- **Generate Wallets**: When calling the registration API, utilize the generateWallet() function to create amethod for new users. With the wallet address andthe private key to access the wallet, this function will return a wallet object.

- **Save the wallet details**: Keep the created wallet and other user information in our database so that we may utilize them for future transactions.

- **Add To cart**: After logging in to our system, the user will browse the products and add items to the user's basket based on his or her preferences.

- **Place order**: Once the order is placed, the user willbe led to the checkout page, where it will successfully fill out all of the user's information before triggering the put order API.

- **Initiate the transaction:**
  - Fetch the wallet details from the requested user:
  - Get the wallet address of the user's wallet
  - Check the balance of the user's wallet
  - If a balance is present Initiate the transaction
  - Create the web3 instance of the blockchain
  - Generate transaction object to pass to the next step
  - Verify the user's wallet and its authenticity
  - Initiate the transaction to the admin's wallet
  - Store the transaction hash to keep a record of the transaction
  - Send transaction token as a successful transaction response

4. RESULT

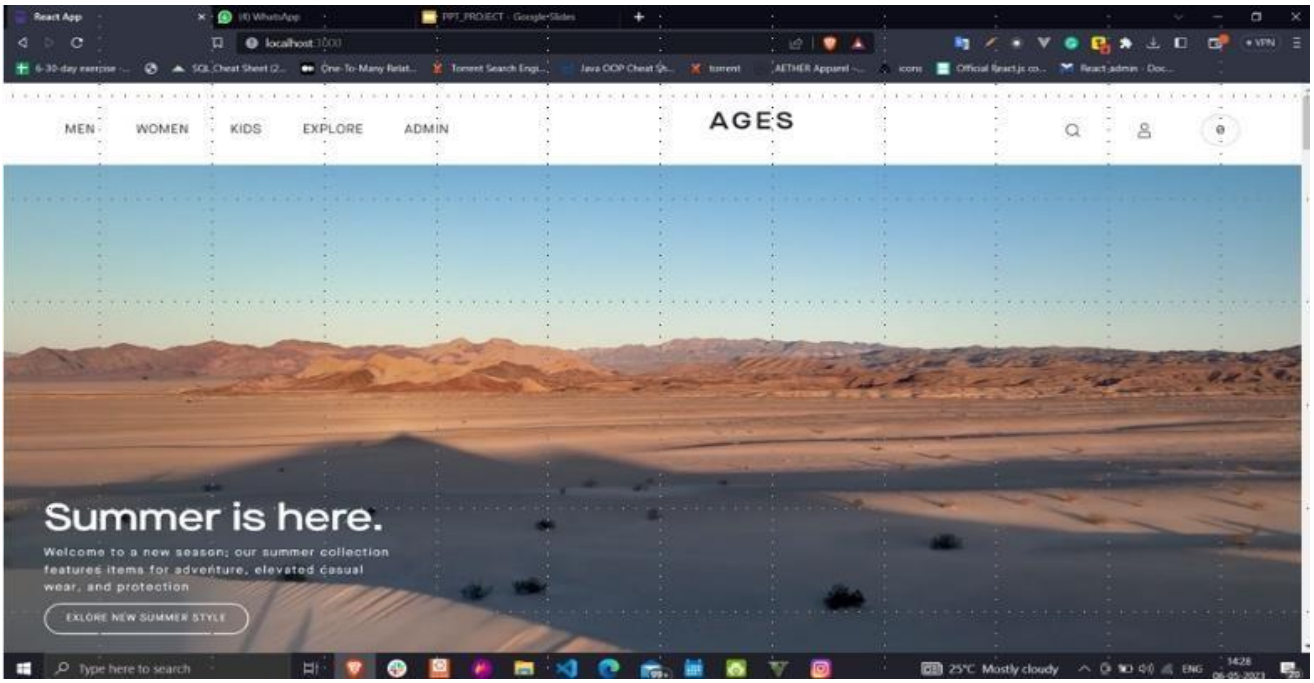

Figure 3: Home Page

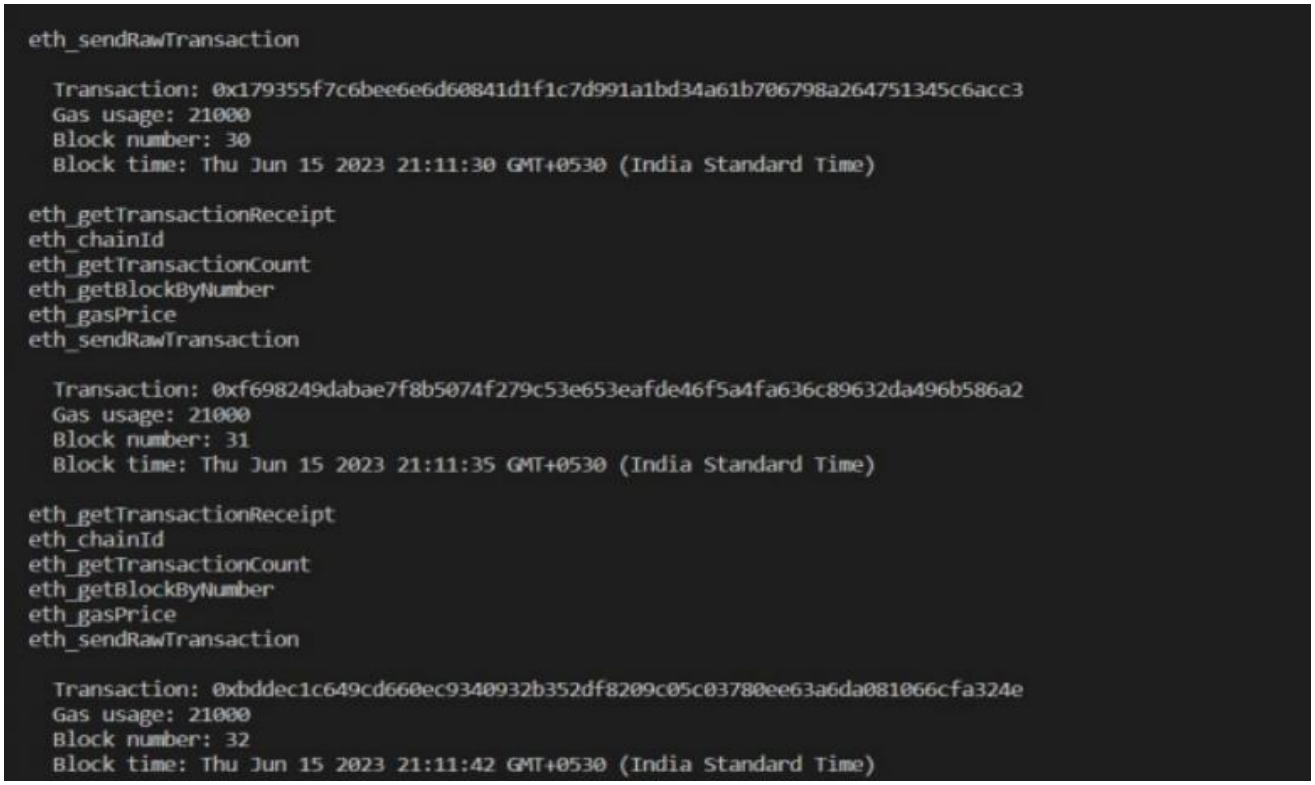

Figure 5: Our Blockchain and transaction

5. CONCLUSION:

In general, today's firms must always seek to develop the next greatest thing that consumers will want since people expect their products, services, and so on to be better, quicker, and cheaper. Businesses must adapt to changing customer requirements and trends in this age of new technology because it is critical to their success and survival. E-commerce is always evolving and becoming increasingly vital to businesses as technology advances, and it is something that should be utilized and applied.

Since the invention of the Internet and e-commerce, the opportunities for both businesses and customers have been limitless. Increasing profit and advancement chances for enterprises while providing more alternatives for customers.

However, e-commerce, like anything else, has drawbacks, including customer uncertainty, but nothing that cannot be handled or avoided via solid decision-making and business practices.

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