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## CRYPTWAY: BLOCKCHAIN BASED DECENTRALIZED PLATFORM FOR ONLINE TRANSACTIONS

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### Abstract

*The advent of blockchain technology and cryptocurrencies has transformed the landscape of online transactions, offering unparalleled security, transparency, and efficiency. With Ethereum's ERC20 token standard, decentralized finance (DeFi) platforms have become increasingly versatile, enabling extensive applications from e-commerce to streaming services. The work proposes "Cryptway", a novel blockchain-based platform that leverages these advancements to provide a decentralized solution for online transactions through innovative use of ERC20 tokens. Cryptway offers three primary services: Cryptway Faucet, Cryptway Swapping, and Cryptway Transaction Service. Through the Cryptway Faucet, users can purchase ERC20 tokens Cryptway Gold, Silver, and Bronze—each with varying values and benefits. These tokens can be stored in crypto wallets such as MetaMask and used across various services, with higher-value tokens offering premium features. Cryptway Swapping allows users to exchange tokens, providing flexibility in their holdings. The Cryptway Transaction Service facilitates token transfers between wallets with applicable gas fees. By integrating these services, Cryptway aims to escalate user experience and promote the adoption of decentralized finance in everyday digital transactions.*

**Keywords:** Blockchain, Decentralized Finance (DeFi), ERC20 Tokens, Cryptway, Online Transactions, Token Swapping, Smart Contracts, Token Transfers

### 1. INTRODUCTION

The foundational work introduced Bitcoin, establishing the concept of a peer-to-peer electronic cash system [1]. This groundbreaking paper laid the groundwork for subsequent blockchain developments [2-14]. The decentralized cryptocurrency gained huge popularity in the digital currency market due to its novelties. The issues pertaining to centralized exchanges [15-18] were addressed by several blockchain based decentralized solutions [19-28]. The Blockchain interacts with the network with private and public keys which are stored in a cryptocurrency wallet [29-32]. A comprehensive look into the broader implications of cryptocurrencies explores their technological, economic, and regulatory aspects. The expansion of the blockchain paradigm was based on Ethereum, a platform for next-generation smart contracts and decentralized applications [9-14]. Blockchain technology besides purely supporting cryptocurrency transactions also opens a new avenue for building decentralized transactions especially for smart contracts [33-41]. The rapid advancement of blockchain technology has initiated a new era of decentralized finance (DeFi), transforming the way online transactions are conducted. Blockchain's inherent attributes of

security, transparency, and immutability have made it an ideal foundation for developing platforms that facilitate secure and efficient digital transactions. One significant development in this domain is the Ethereum blockchain and its ERC20 token standard, which has become a cornerstone for numerous decentralized applications (dApps).

The paper proposes "Cryptway" a cutting-edge blockchain-based platform that is designed to leverage these advancements and provide a comprehensive solution for online transactions. The paper contributes as follows:

The platform integrates three primary services Cryptway Faucet, Cryptway Swapping, and Cryptway Transaction Service each designed to enhance user experience and promote the widespread adoption of decentralized finance.

The Cryptway Faucet enables users to purchase ERC20 tokens, specifically Cryptway Gold, Silver, and Bronze. These tokens, each with distinct values and benefits, can be stored in crypto wallets such as MetaMask. Users can utilize these tokens across various services, with higher-value tokens offering premium features. This system not only simplifies the process of acquiring tokens but also adds a layer of utility and flexibility

for users. Cryptway Swapping provides an efficient mechanism for users to exchange one type of Cryptway token for another. This feature is critical for maintaining the flexibility of the user's token holdings, allowing them to optimize their token portfolio according to their needs and preferences.

The Cryptway Transaction Service facilitates the transfer of ERC20 tokens between wallets, ensuring secure and seamless transactions with the application of gas fees. This service is essential for peer-to-peer transactions and integrating Cryptway tokens into other decentralized applications, further enhancing their utility and interoperability. By offering these services, Cryptway aims to bind traditional finance and decentralized finance, making the latter more accessible and practical for everyday use. This paper delves into the architecture, functionality, and potential impact of Cryptway, highlighting its role in the evolving landscape of online transactions.

## 2. LITERATURE SURVEY

The literature on blockchain technology, smart contracts, and decentralized finance (DeFi) is extensive and multifaceted. This survey aims to provide a comprehensive overview of key research and developments in these areas, highlighting significant contributions from various studies.

A plethora of review and survey work is contributed by various authors [42-48] on cryptocurrency transactions. Many researchers have documented their work on blockchain based smart contracts in the form of surveys covering various parameters. A comparative study of various surveys on blockchain and smart contracts is found in a work by Khan S.N et al [33]. Manimuthu et al [43] discuss a very exhaustive study on bitcoin highlighting its need, implications and challenges. Another survey on fungible and non-fungible tokens is provided by Darisi et al. [44] where the authors provide an overview of tokens and comparative analysis of present day token standards available in the field of crypto. In [45] Gowda et al. try to investigate why recently crypto transaction is finding attention through an exclusive comparison between traditional and crypto currency transaction. Sarpong et al. [46] present a systematic review of various available and emerging coins so as to facilitate consumers explore its usage, while Gad et al. [47] present a comprehensive survey of literature published in web of Science highlighting the trends in citation and yearly publications, most liked publication venues, most influential papers, most trending research areas and emerging trends and frontiers of Blockchain. The work provides an insight to new researchers by guiding with open challenges and new research avenues. Above studies reveal the widespread and growing popularity of blockchain technology. To use blockchain technology to perform transactions without involving any intermediary "smart contract" was defined. Smart contracts are digital programs (codes) embedded on blocks in a blockchain to execute agreements between participants using if-then logic to get instant out-comes of a transaction. These codes are copied across network of computers which make up a blockchain. The blockchain further executes the actions when predetermined

conditions have been met and verified. Once conditions are met, the blockchain is updated with the completed and immutable transaction. Thus block chains open new avenues by introducing a truly immutable ledger that proves not only a given event occurred but also the conditions under which it occurred.

Smart contract eliminates the need for intermediary and facilitates efficient, robust and fair work in various domains for achieving secure and automated transactions. Smart contracts can be executed on various blockchain platforms. The same is explored by M. Suvitha et al [48]. The smart contract is the vital element of the blockchain, which has made blockchain a technology to go beyond the borders of cryptocurrencies and find applications in varied fields like supply chain, IoT, healthcare, business etc.

Huge amount of work is done with smart contracts by many researchers. Rouhani et al. [49] publish a survey report on security methods, performance enhancement techniques, and applications of smart contracts. Another exhaustive comparative analysis of existing techniques in blockchain-based smart contract is carried out by V Devi et al [50]. The survey focuses on security issue, smart contract design, and privacy issue in smart contract platform. They evaluate various performance metrics such as, transaction cost consumption cost, processing time and time overhead to understand performance of the smart contract in different applications. In addition, towards mitigating security issues faced by the crypto exchange platforms, the authors in [37] propose a "geofencing" technique to mitigate the security risks. Here user parameters are mixed with coin to implement security and randomness in the block.

B. K. Mohanta et al [51] present a kick start to smart contracts, its building blocks and working principle. The work highlights the merits of smart contracts in blockchains and analyses the various use cases of smart contract. The work also describes challenges in implementing smart contracts for real applications.

Shi et al. [52] find the applications of smart contracts in the design of a "Fault-Tolerant Incentivisation for Mobile P2P Crowd Services" to encourage mobile users to participate in mobile peer to peer crowd services. The work proposes the design of a MPCS Token smart contract to facilitate its service auction, payment settlement process and task execution on Ethereum blockchain.

Further according to Abubashim et al. [53] blockchain finds varied applications in modern urbanization process to improve technologies of healthcare, transportation, and governance integrated in IoT. Under these techniques large data is gathered. Blockchain can be used to integrate various services like IoT, smart parking with transportation in the design of smart cities. To facilitate the same various smart contracts are designed to support querying and indexing blockchain.

According to Martinez et al [54] block chain finds application in

IoT providing offloading solutions for constrained devices. The work presents “SmartEdge” a smart contract based on Ethereum for edge computing providing management of compute-resources. Blockchain based technologies provide assistance in this process by tracking usage and managing payments.

Apart from crypto transactions blockchain and smart contracts also find applications in varied other fields. Kononets et al [55] investigate the use of smart contracts in food supply chain to eliminate unfair trading. Samanta et al [56] find an application in developing secure examination system based on smart contract while Chen et al [57] also contribute their findings of application of smart contracts in the field of education. The work by Bandhu et al.[58] propose a Blockchain based electronic voting system which makes use of smart contract and encryption algorithm.

We also find another application of smart contracts in the design of employment contracts [59] being stored in blockchains which makes them immutable. The work also proposes to store wages payment of employees in blocks using smart contracts. The authors in [60] find applications of smart contracts in the legal field. They propose a low cost Blockchain-based smart contract management avoiding intermediary involvement to solve disputes hassle free.

In [61] the authors present a blockchain based smart bidding system based on smart contracts. The work is built on ethereum platform and ensures secure and private transactions. The smart contract constitutes the bidding details.

Further in [62] the authors propose implementation of the SmartCon framework. The work designs dual blockchains where Blockchain is used to store smart contracts and the

second TBlockchain is used to store data generated. Adding blocks in a blockchain plays a significant contribution as it leads to selection of a longest chain in a branch selection.

The work by Lin Chen [63] investigates the probability that a certain branch is selected based on a “Biased Ballot Problem”. It tries to investigate users preferences based on various conditions like transaction history and users following the longest chain.

In [64] the authors investigate the use of uniswap protocol to exchange crypto-coins on the blockchain Ethereum platform. It provisions the user to buy or sell the ERC20 tokens by using an Ethereum smart contract in the decentralized distributed network.

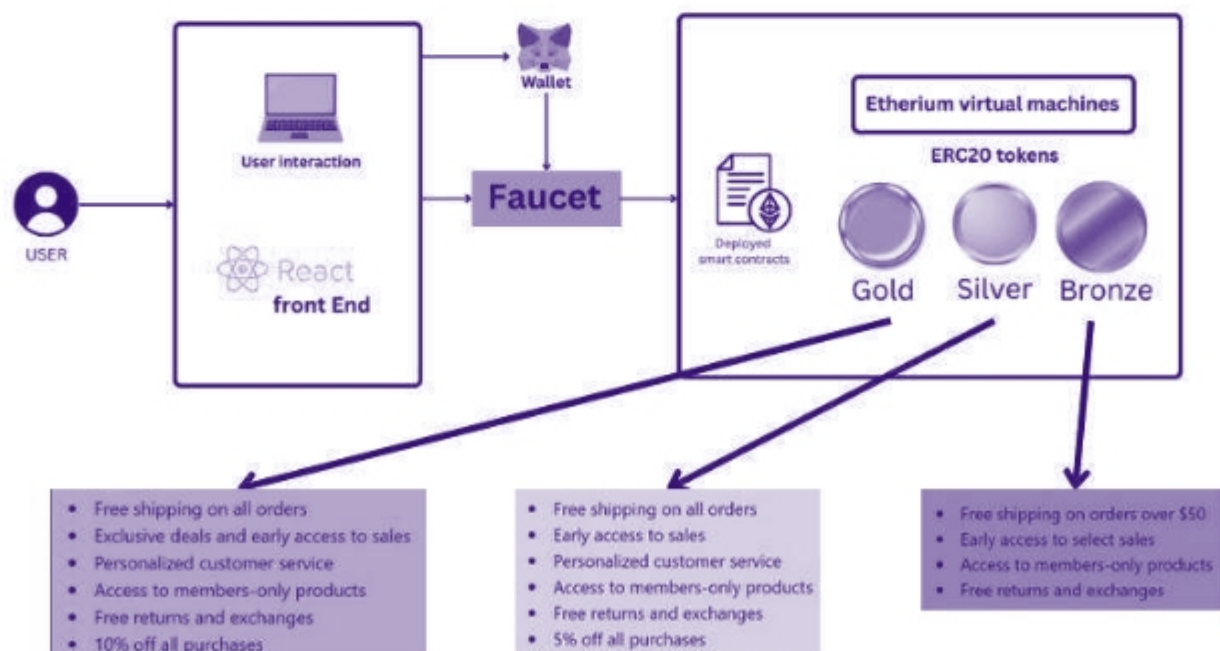
Lastly the literature by Panayotov et al. [65] and Mike et al. [66] try to analyze the effectiveness of smart contracts their technical limitations and real-world complexity in implementation.

### 3. PROPOSED METHODOLOGY

The objective of the proposed method is to replace traditional transaction services with cryptocurrencies and Ethereum-based blockchain technologies. Cryptway, a blockchain-driven decentralized platform, emerges as a solution to revolutionize online transactions. It comprises of three essential services: Cryptway Faucet, Cryptway Swapping, and Cryptway Transaction Service it facilitates the seamless exchange of ERC20 tokens, such as Cryptway Gold, Silver, and Bronze. These tokens, stored in crypto wallets like MetaMask, offer users enhanced value propositions across various online services. By examining Cryptway’s operational framework, this research endeavors to

illuminate its potential to reshape the landscape of decentralized finance and online transactions

Figure 1: Cryptway Faucet



**3.1 User Authentication and MetaMask Integration:** User authentication in Cryptway is implemented through integration with MetaMask, a popular crypto wallet that allows users to interact with the Ethereum blockchain directly from their web browsers. MetaMask enables users to securely manage their private keys and sign transactions, ensuring that only authorized users can access and interact with their digital assets on Cryptway. MetaMask facilitates user authentication by allowing users to connect their wallets to the Cryptway platform. Once connected, users can easily buy, sell, and manage their ERC20 tokens. This seamless integration enhances the user experience by providing a secure and convenient method for accessing the Cryptway ecosystem.

**3.2 Cryptway Faucet: Buying ERC20 Tokens:** The Cryptway Faucet serves as a store where users can purchase ERC20 tokens: Cryptway Gold, Silver, and Bronze. These tokens have varying values, with 1 Gold token equivalent to 100 Silver tokens and 1 Gold token equivalent to 10000 Bronze tokens. The faucet allows users to acquire these tokens using Ether (ETH), which is facilitated through smart contracts deployed on the Ethereum blockchain. The smart contract governing the faucet ensures that transactions are executed securely and transparently. Users send ETH to the smart contract, which then issues the corresponding amount of ERC20 tokens to their MetaMask wallet. This automated process eliminates the need for intermediaries and ensures that token transactions are executed accurately and efficiently.

**3.3 Smart Contracts and Ethereum Virtual Machine (EVM):** In Cryptway, smart contracts are used to manage the creation, distribution, and transfer of ERC20 tokens. These contracts are deployed on the Ethereum blockchain and run on the Ethereum Virtual Machine (EVM), which ensures that they are executed in a secure and decentralized manner. The EVM is a decentralized computing environment that enables the execution of smart contracts on the Ethereum network. It provides the computational power necessary to process transactions and enforce the rules defined by the smart contracts. By leveraging the EVM, Cryptway ensures that its smart contracts are tamper-proof and operate exactly as intended.

**3.4 ERC20 Tokens: Gold, Silver, and Bronze:** Cryptway utilizes ERC20 tokens, a standard for creating interoperable tokens on the Ethereum blockchain. The platform offers three types of tokens: Cryptway Gold, Silver, and Bronze. Each token type represents a different value, with Gold being the highest, followed by Silver and Bronze. These tokens can be used to access various services on the Cryptway platform, such as e-commerce websites and streaming services.

The ERC20 standard ensures that these tokens are compatible with other decentralized applications (dApps) and crypto

wallets, including MetaMask. This interoperability is crucial for providing a seamless user experience and promoting the widespread adoption of Cryptway's services.

### 3.5 Token Hierarchy and Value Relationships

#### *Cryptway Gold*

Value: highest among the three tokens

Conversions: 1 Gold = 100 Silver

1 Gold = 10000 Bronze

#### *Cryptway Silver*

Value: intermediate value

Conversions: 1 Silver = 0.01 Gold

1 Silver = 100 Bronze

#### *Cryptway Bronze*

Value: Lowest value

Conversion: 1 Bronze = 0.0001 Gold

1 Bronze = 0.01 Silver

### 3.6 Utility of Tokens

**1. Cryptway Gold: Premium Services:** Gold tokens provide access to premium features and services within the Cryptway ecosystem. For example, using Gold tokens for a streaming service might offer ad-free viewing and exclusive content.

**High-Value Transactions:** Due to its high value, Gold is ideal for significant transactions or purchasing high-value goods and services.

**2. Cryptway Silver: Standard Services:** Silver tokens are used for standard services that do not require the premium benefits associated with Gold. For instance, they might provide a mid-tier level of service on e-commerce platforms

**Intermediate Transactions:** Suitable for transactions that fall between high and low value, offering flexibility for everyday use.

**3. Cryptway Bronze: Basic Services:** Bronze tokens cater to basic services and transactions within the Cryptway platform. They are ideal for micro-transactions or purchasing low-value items.

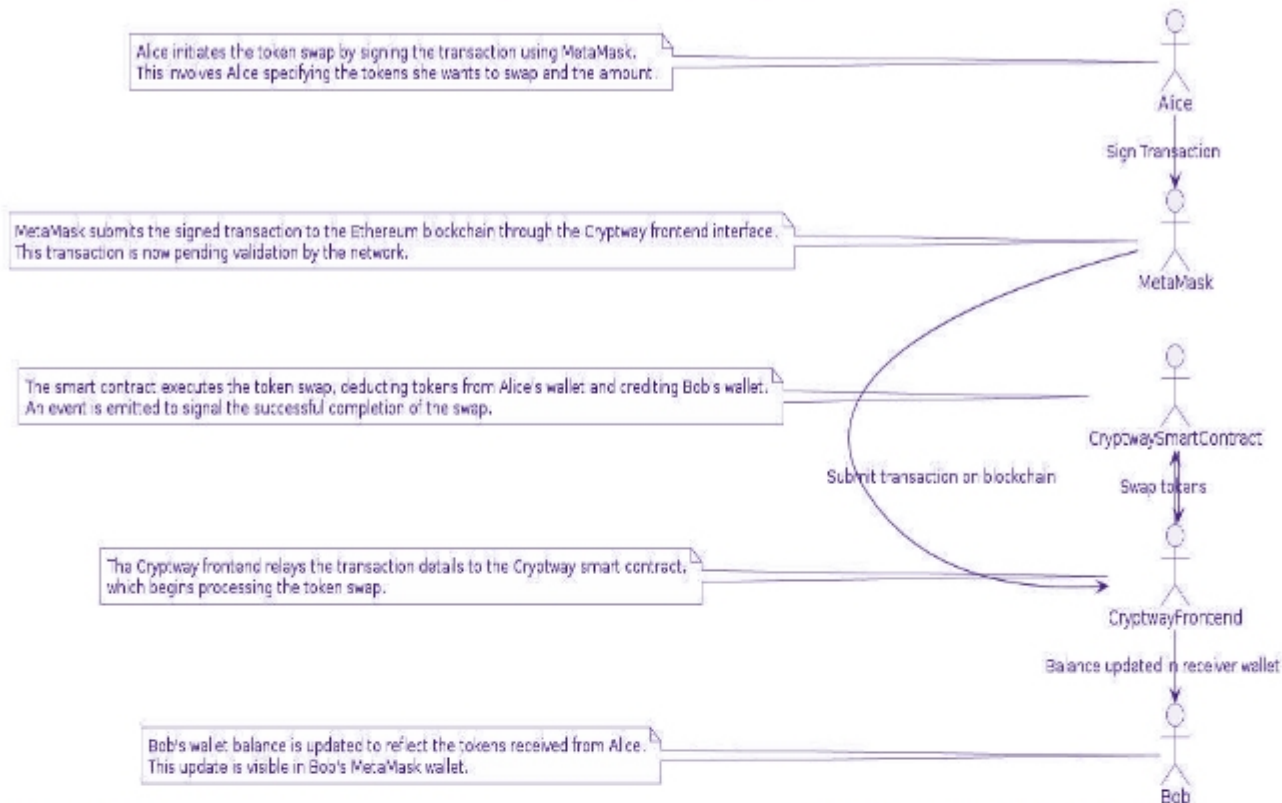
**Entry-Level Access:** Bronze tokens make it easy for new users to engage with the platform without significant investment, promoting widespread adoption.

#### **Enhanced User Experience**

**Premium Features:** Users enjoy premium features and exclusive benefits by using higher-value tokens (e.g., Cryptway Gold), enhancing their overall experience across various services.

**Convenience:** The ability to use the same tokens across multiple platforms simplifies the user experience, making transactions more straightforward and efficient.

Figure 2: Cryptway swapping



3.7. Cryptway Swap

This feature allows users to seamlessly exchange between the different tiers of ERC20 tokens—Gold, Silver, and Bronze—facilitating flexibility and adaptability in their holdings. The swapping mechanism is designed to be secure, transparent, and efficient, leveraging the capabilities of Ethereum smart contracts to automate and manage the process. Service Access: Smart contracts facilitate the seamless execution of services based on the type and number of ERC-20 tokens used. For example, a smart contract can be triggered to provide premium e-commerce features or ad-free streaming once the appropriate token is verified. Automated Benefits: The smart contract automatically grants users access to specific benefits, such as 30-minute delivery for e-commerce purchases or early access to shows on streaming platforms, eliminating the need for manual intervention.

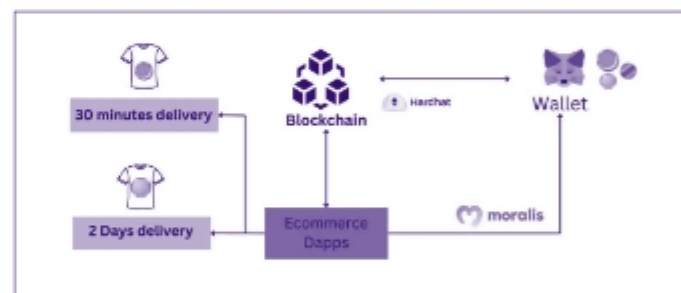
**Increased Service Adoption:** Attractive Incentives: Third-party services can attract more users by offering premium features and benefits in exchange for Cryptway tokens, leading to increased adoption and customer loyalty. **Token Utility:** The integration increases the utility of Cryptway tokens, making them more valuable and desirable for users who frequent multiple platforms.

3.8 Use Cases of Integration

3.8.1 E-Commerce Platforms:

**Premium Delivery:** Users can utilize Cryptway Gold tokens to receive premium delivery services, such as 30-minute delivery times, ensuring faster and more efficient shopping experiences.

Figure 3: E-Commerce use case



**Exclusive Discounts:** Cryptway tokens can be used to unlock exclusive discounts and offers, enhancing the value proposition for users.

**3.8.2 Streaming Services: Ad-Free Viewing:** By using Cryptway Gold or Silver tokens, users can enjoy ad-free streaming, providing a more enjoyable viewing experience. **Early Access:** Tokens can also grant users early access to new shows and movies, allowing them to enjoy content ahead of general release schedules.

**3.8.3 Subscription Services: Premium Access:** Users can leverage Cryptway tokens to access premium subscription features, such as additional content, enhanced support, or extended trial periods.

4. SYSTEMARCHITECTURE

The Cryptway platform is designed as a decentralized application (dApp) built on the Ethereum blockchain. It leverages the robustness and security of blockchain technology to facilitate decentralized finance (DeFi) transactions. The

architecture comprises several key components that interact seamlessly to provide a secure, efficient, and user-friendly experience. The major components are discussed below:

**4.1. User Interface (UI):** The UI is the primary point of interaction for users, designed to be intuitive and accessible. It provides features for:

- Registering and logging into the platform.
- Accessing and managing user profiles.
- Purchasing, swapping, and transferring tokens.
- Viewing transaction history.
- Integrating with third-party services.

The UI is built using modern web technologies, including React.js for a responsive and dynamic user experience. It interacts with the backend via RESTful APIs and directly communicates with the MetaMask extension for blockchain transactions.

**4.2 Authentication and Wallet Integration:** User authentication is handled through the MetaMask crypto wallet, which serves as the gateway to the Ethereum blockchain. MetaMask Integration: Allows users to securely manage private keys and sign transactions.

OAuth Protocol: For additional security, third-party OAuth providers can be used for authenticating user sessions.

**4.3. Smart Contracts:** Smart contracts form the backbone of the Cryptway platform, automating and securing all transactions. The smart contracts are written in Solidity and deployed on the Ethereum blockchain.

- ▶ **Token Purchase Contract:** Facilitates the buying of Cryptway tokens (Gold, Silver, Bronze) using ETH.
- ▶ **Token Swap Contract:** Enables the exchange of one type of Cryptway token for another.
- ▶ **Transaction Contract:** Handles the transfer of tokens between user wallets.
- ▶ **Third-Party Service Contract:** Manages interactions with external services, ensuring secure and verifiable transactions.

These contracts ensure that all transactions are executed transparently and immutably, leveraging Ethereum's decentralized nature.

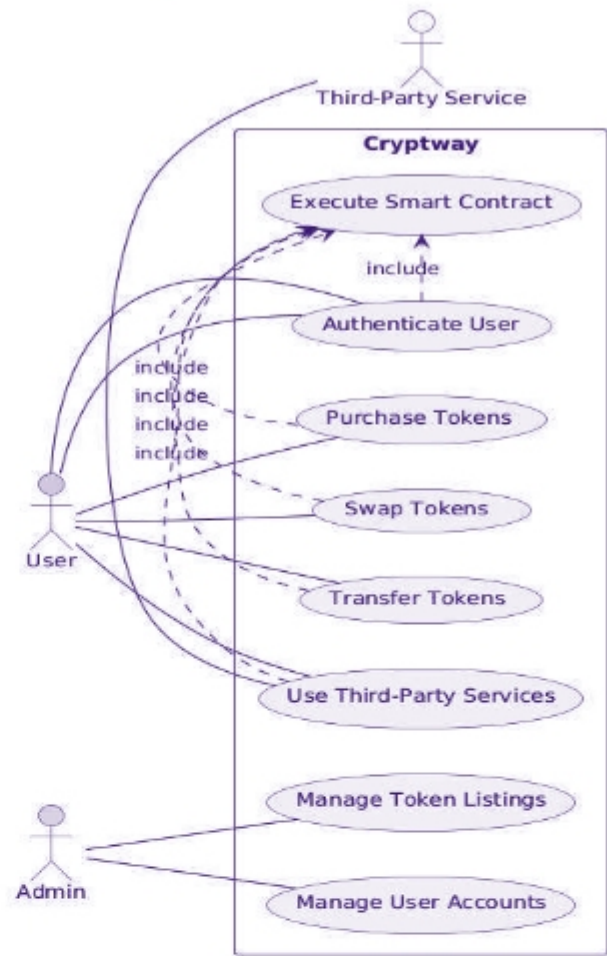
**4.4. Token Management System:** The token management system is crucial for maintaining the value and utility of Cryptway tokens. It includes: ERC20 Token Standard: All Cryptway tokens adhere to the ERC20 standard, ensuring compatibility with various wallets and dApps.

**Token Hierarchy:**

- Cryptway Gold: Highest value token.
- Cryptway Silver: Intermediate value token.
- Cryptway Bronze: Lowest value token.

**Smart Contract Integration:** Smart contracts are used to manage the creation, distribution, and transfer of these tokens.

Figure 4: Use case diagram



**4.5. Decentralized Exchange (DEX) Mechanism:** The DEX mechanism allows users to swap tokens without relying on centralized intermediaries. Automated Market Maker (AMM): Utilizes smart contracts to determine the token exchange rates based on liquidity pools. Liquidity Pools: Users can provide liquidity to pools in exchange for rewards, enhancing the platform's overall liquidity. Real-Time Swaps: Immediate execution of token swaps through smart contracts, ensuring transparency and efficiency.

**4.6. Third-Party Service Integration:** Integration with third-party services enhances the utility of Cryptway tokens. This integration involves:

- ▶ **Secure API Connections:** Use of secure APIs to connect with external services.
- ▶ **Smart Contract Verification:** Ensuring that tokens used for third-party services are verified via smart contracts.
- ▶ **Service Access:** Allowing users to use Cryptway tokens for various services such as e-commerce and streaming.

**5. RESULTS AND DISCUSSION**

**Cryptway Swap:** It utilizes Ethereum smart contracts for automated ERC-20 token exchanges, leveraging Automated

Market Maker (AMM) protocols. It employs liquidity pools for token swaps, ensuring decentralized and trustless transactions. Real-time oracle feeds provide accurate price data for fair exchange rates. The platform integrates with MetaMask for

secure user authentication and transaction signing. By eliminating centralized intermediaries, it ensures enhanced security, reduced counterparty risk, and improved liquidity.

Figure 5 : Cryptway Transfer user view

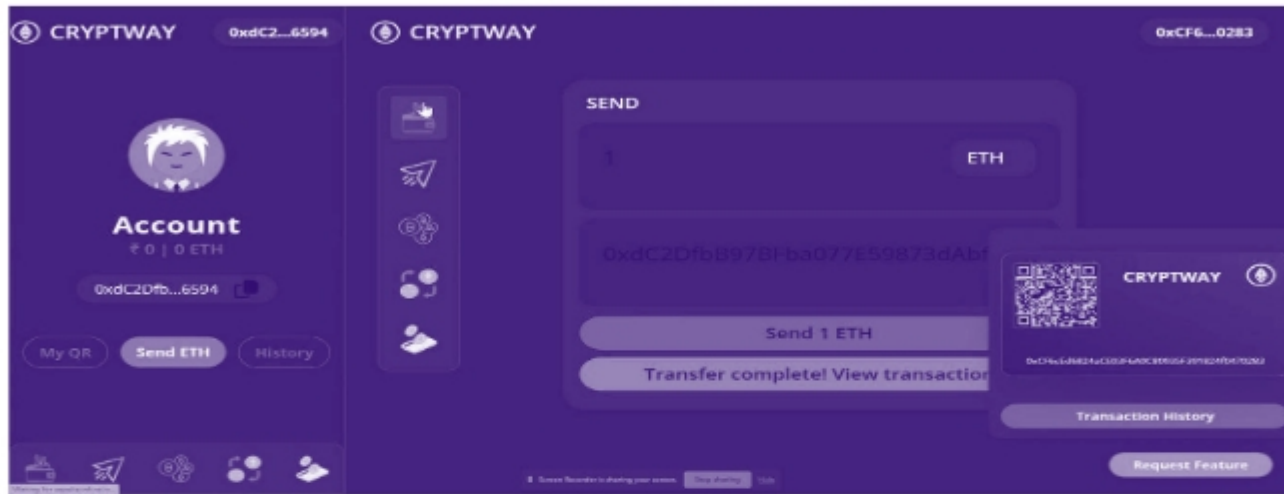


Figure 6 : Cryptway Swap User view

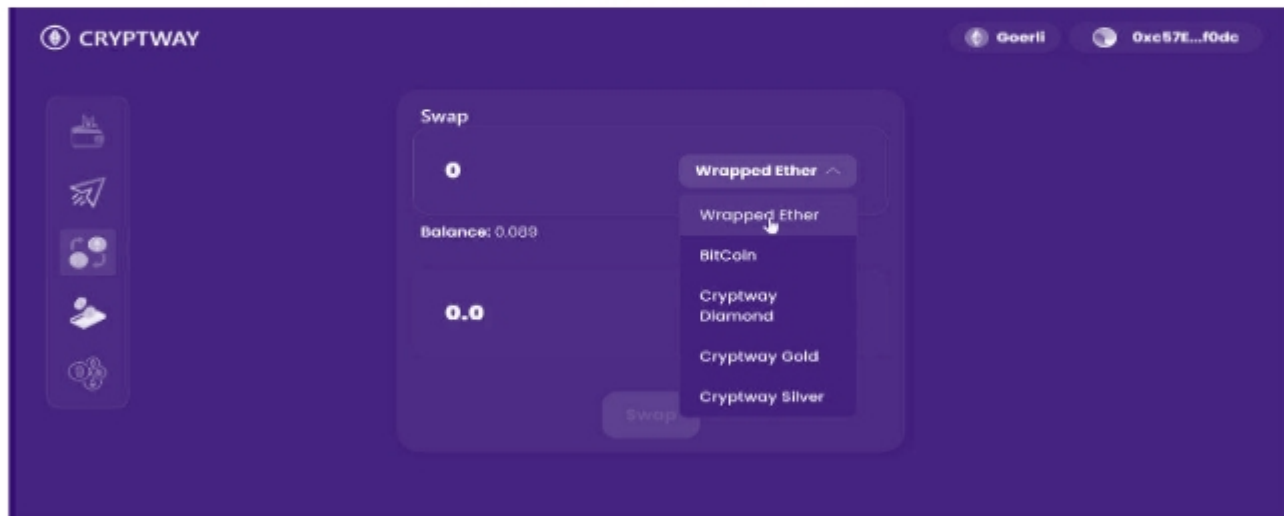
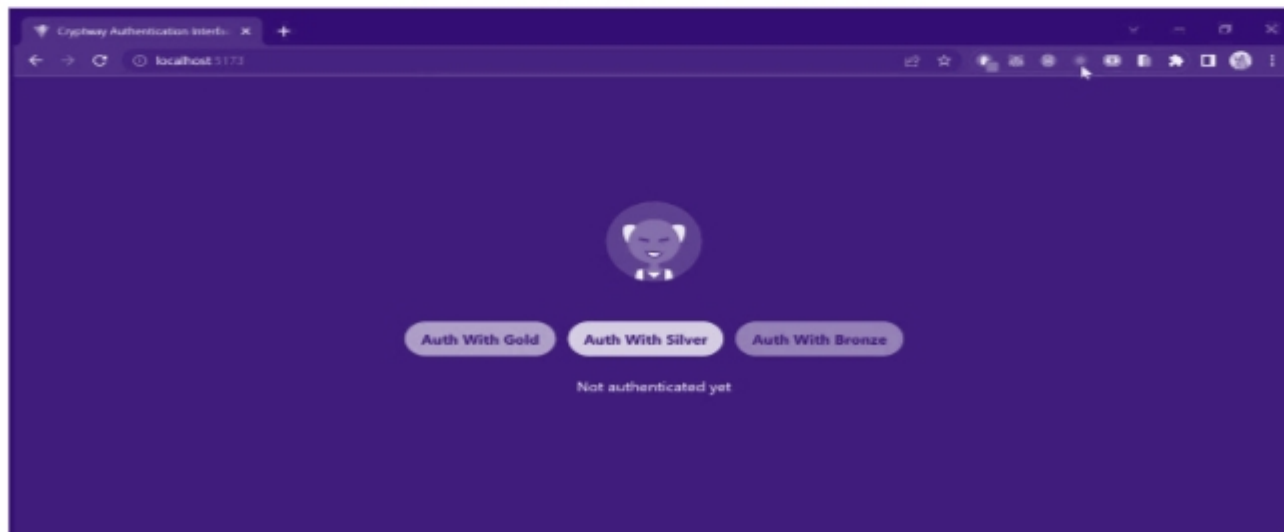


Figure 7 : Cryptway Authentication User View



Cryptway Authentication: It leverages MetaMask for secure user authentication, utilizing Ethereum-based public-private key cryptography as depicted in figure 7. It employs OAuth protocols for additional security layers. Smart contracts verify user credentials and manage access control. The system ensures secure, decentralized user login and transaction signing, eliminating reliance on centralized authentication servers and reducing the risk of unauthorized access.

## 6. CONCLUSION

This work demonstrates the potential of blockchain technology in creating secure and efficient decentralized applications, specifically through the development of the Cryptway platform. Cryptway addresses the need for a robust infrastructure for cryptocurrency exchanges by leveraging smart contracts for peer-to-peer transactions. The platform's two main features are the facilitation of seamless cryptocurrency transactions and the efficient swapping of ERC-20 Ethereum tokens. Smart contracts reduce the need for intermediaries, reducing costs and processing times while enhancing transaction reliability and integrity. These smart contracts ensure that transaction conditions are met before execution, providing a high level of confidence among users. Cryptway employs decentralized exchange (DEX) protocols for token swapping, allowing users to exchange ERC-20 tokens without relying on centralized systems. This approach enhances liquidity, reduces counterparty risk, and improves security. The platform also integrates advanced token valuation mechanisms, leveraging real-time market data to ensure fair exchange rates during the swapping process, thereby promoting transparency and trust. The platform supports a hierarchy of tokens—Cryptway Gold, Silver, and Bronze—each offering unique benefits. These tokens can be managed through crypto wallets like MetaMask, and are used for various transactions and services within the Cryptway ecosystem. The smart contracts manage the creation, distribution, and transfer of these tokens, ensuring a seamless user experience. To facilitate successful transactions, Cryptway's architecture includes smart contracts that act as intermediaries, holding transaction requests until the specified conditions are met. This safeguards users' funds and ensures that all parties fulfill their obligations, providing a robust and trustworthy transaction framework. Cryptway exemplifies the strengths of blockchain technology in decentralized finance. By integrating smart contracts and DEX protocols, the platform offers a reliable, transparent, and efficient solution for cryptocurrency transactions, setting the stage for wider adoption of decentralized financial systems.

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