

METAMUI

MetaMUI, an Identity-based Blockchain to enable Self-Sovereign Finance and Sustainable Economic Model

Phantom Seokgu Yun Frances Kim, PhD Jihoon Jeong, PhD

Sovereign Wallet Network and SWN Global

December 25, 2023

Version 3.1

TABLE OF CONTENTS

| | |
|---|----|
| Abstract | 4 |
| 1. Introduction | 5 |
| 2. MetaMUI Architecture | 7 |
| 2.1 MetaMUI Parachain Structure for Unified Ledger | 8 |
| 2.2 Identity Blockchain and Decentralized Public Key Infrastructure | |
| 2.3 Bank Nodes, Agents, and Wallets | 9 |
| 2.4 Meta-Blockchain – Multi-ledger Blockchain | 11 |
| 2.5 Chained Cash for Online and Offline Payment | 12 |
| 2.6 Network Chaincode and Mobile Chaincode | 13 |
| 2.7 Consensus Protocol - Instant Confirmation Consensus Protocol | 14 |
| 2.8 Event Sourcing Ledger (Blockchain) and Summary Ledger | 15 |
| 2.9 Rebasing of Genesis Block | |
| 2.10 Algorithmic Central Bank | 16 |
| 2.11 Tradable Certificate | |
| 3. MetaMUI Cloud Service | 19 |
| 3.1 MetaMUI SSID(Self-Sovereign Identity) App | 20 |
| 3.2 MetaMUI Network | 21 |
| 3.3 Certified Messaging and Integrated Communication with DIDs | |
| 4. MetaMUI - Utility token for MetaMUI Network | 23 |
| 5. MetaMUI Blockchain Use Cases | 26 |
| 5.1 Central Bank Digital Currency | |
| 5.2 Asset Tokenization and Tradable Certificates | 28 |
| 5.3 Climate Projects Security Token Offering (STO) Platform | 29 |
| 5.4 Sovereign Yidindji Dollar(SYD) | 30 |
| 5.5 National Bank of Georgia (NBG)'s Digital Gel Pilot | 31 |
| 5.6 Project “Polaris” by the BIS’s Innovation Hub at Nordic Centre | 32 |

| | |
|-----------------------------|-----------|
| 6. Future extensions | 34 |
| 7. References | 35 |

ABSTRACT

MetaMUI^{[1][2][3][4][5][11][12][13][14]} is an identity-based blockchain that introduces the concept of a unified ledger. It dynamically generates specialty blockchains and interconnects them through the identity blockchain. The identity blockchain itself is a multi-ledger system housing specialty ledgers for decentralized identity (DID)^[34], decentralized public key infrastructure (DPKI), and MetaMUI tokens. The MetaMUI Network includes a unified wallet that integrates three types of wallets: a token wallet, a credential wallet, and an asset wallet, alongside parallel blockchains.

Within the MetaMUI ecosystem, every individual, organization, and entity possesses DIDs and can utilize digital signatures to authorize transactions or issue certificates. These signatures are validated using the public keys associated with DIDs on the DPKI.

MetaMUI invented chained cash^{[1][2][31][32]}. This protocol enables non-mediated, peer-to-peer, and instantaneous payments. It functions seamlessly both online and offline, eliminating the need for currency conversion. Additionally, it achieves unlimited scalability through parallel transaction processing.

MetaMUI envisions a sustainable token economic model, supporting various functionalities: massive crowdfunding, atomic asset swaps and payments, asset tokenization, tokenized securities, cross-border peer-to-peer payments, currency conversion, low carbon footprint payments, machine-to-machine commerce, pairwise trust authentication and authorization, DID communication and commerce, peer-to-peer contract signing, and more.

1. INTRODUCTION

At Sovereign Wallet, we aim to deliver financial services to millions of people by leveraging identity-based blockchain. Our flagship technology, MetaMUI, is paving the way for a more sustainable, equitable, and inclusive financial ecosystem. We believe that the future of finance transcends borders, and we're committed to building a platform that empowers individuals and organizations worldwide to participate in the sustainable economic model. We digitize vital national infrastructure – from identity and credentials to financial transactions – eliminating the need for paper and empowering individuals with self-sovereign finance. With MetaMUI, we're breaking the cycle of debt and environmental harm, paving the way for a more equitable and inclusive financial future for all.

The genesis of MetaMUI can be traced back to the foundational ideas presented by Friedrich Hayek in “Denationalization of Money”^[21]. Hayek argued that the role of creating and maintaining currency shouldn't solely rest with governments. He believed diverse, competing currencies issued by private entities could lead to sounder money and greater financial stability. He emphasized the importance of letting the market decide which currencies thrive. In his vision, individuals would freely choose which currencies to use based on their trust in the issuer and the currency's properties. This would incentivize issuers to maintain sound monetary policies and compete for users' trust. To facilitate his vision of a decentralized, user-driven currency market, there is a need for a no-coding cloud platform and a unified ledger system that can enable the creation of custom blockchains.

Satoshi Nakamoto furthered this vision with Bitcoin^[18], intending to decentralize currency issuance, remove financial intermediaries and government intervention, and eliminate the need to gather personal transaction data. However, Nakamoto's approach faced critical limitations. Privacy concerns restricted its use in legal finance, while its focus on digital currency overlooked broader applications like asset tokenization and smart contracts. The emphasis on decentralization hampered efficiency, and ledger immutability hindered future upgrades. Nakamoto's vision aligned more with the Internet era, neglecting the rise of mobile and edge computing environments.

But more importantly, Bitcoin does not operate as a peer-to-peer form of currency, and similarly, blockchain does not function as a peer-to-peer system of payment. A genuine peer-to-peer currency and payment system would resemble physical cash transactions, where both the buyer and seller instantly recognize the ownership transfer of the cash, finalizing the transaction upon physical possession. In contrast, on a blockchain network, transactions are not settled peer-to-peer. Instead, a group of self-selecting intermediaries, known as “miners,” resolve transactions by solving intricate mathematical puzzles, providing proof that the transaction blocks are valid due to their connection to previous transactions. The reliance on those miners exacerbated wealth inequality and environmental concerns.

In response to these challenges, MetaMUI emerged as a solution by integrating the decentralized identity blockchain with the decentralized token blockchain, resulting in an identity-based blockchain. MetaMUI records transaction data in terms of the user's identifier

instead of the public key-based address that is used by most of the blockchain system. The identity and ownership of this identifier are verified and proved in a decentralized matter. Since MetaMUI does not store any kind of private information on the blockchain, it protects the user's privacy the same as other anonymous blockchains. This innovative approach solves the first problem of Satoshi's idea.

MetaMUI's identity blockchain opens the door for the digitization of many financial instruments and positions it for global-scale applications for central banks, digital stock issuance, cross-border payments, among others. The most notable application area is the digitization of paper cash, called Central Bank Digital Currency (CBDC). With MetaMUI's identity-based token blockchain, it is possible to create privacy-preserving CBDC, avoiding the fear of Big Brother who monitors every spending pattern of every citizen. MetaMUI functions as a MetaBlockchain, generating blockchains rather than employing smart contracts atop a virtual machine. This dynamic blockchain creation enables upgrades via added modules. Additionally, MetaMUI adopts a hybrid approach to transaction processing, improving scalability without compromising security. The system innovatively manages data scalability by periodically generating snapshots and creating new genesis blocks, deviating from the immutability of all blockchain data.

Moreover, MetaMUI introduces a two-tier blockchain architecture, balancing decentralization and efficiency, tailored for mobile and edge computing environments. It separates transaction processing from token generation, ensuring fairness in the issuance of tokenized securities or digital currency. Furthermore, MetaMUI introduces advanced concepts like true peer-to-peer payment, decentralized public key infrastructure, edge chain code, instant confirmation consensus protocol, on-chain governance, and multi-ledger structures, emphasizing the need to integrate technologies cohesively to address real-world problems.

To achieve Friedrich Hayek's vision, it is essential that publishing and using the currency be cost-effective and straightforward. Although second-generation blockchain platforms facilitated cryptocurrency publishing, high transaction fees and slow performance impeded widespread adoption. Despite the emergence of third-generation blockchains like Algorand^[23], Avalanche^[24], and Hedera Hashgraph^[26], unresolved issues persist, such as verifying user identities during transactions and managing data scalability.

MetaMUI, a fourth-generation blockchain, encompasses advancements in blockchain and digital currency technologies, incorporating decentralized identity-based accounting to prevent money laundering while safeguarding user privacy. It enables commercial banks to publish their digital currencies dynamically and supports various economic models, heralding the era of decentralized credit banking. As we break the cycle of debt and environmental harm, MetaMUI positions itself as a catalyst for a more inclusive and sustainable financial future for all. MetaMUI transcends the limitations of previous blockchain systems, ushering in a new era of inclusive, sustainable finance. From protecting user privacy with identity-based transactions to empowering individuals with self-sovereign control, MetaMUI rewrites the financial narrative.

2. METAMUI ARCHITECTURE

MetaMUI is focused on implementing the concept of a unified ledger by utilizing an identity blockchain as a relay chain. This identity blockchain serves as the link connecting various specialized blockchains, forming what is known as a parachain network in parallel. Within the MetaMUI ecosystem, the nodes operating on the blockchain are referred to as Bank Nodes, with a specific node known as the Central Bank Node responsible for tasks such as currency creation.

One of the key features of MetaMUI is the provision of a digital identity for every individual user, organization, and entity, known as a Decentralized Identifier (DID). Users interact with MetaMUI through two main agents: the Network Agent and the Mobile Agent. The Network Agent is utilized by organizations possessing a public DID, which contains associated identity information and commonly serves as a communication address. On the other hand, individual users access the platform through the Mobile Agent, which hosts wallets dedicated to users. Notably, MetaMUI's unique advancement lies in its incorporation of both the blockchain core and the respective user wallets within its framework.

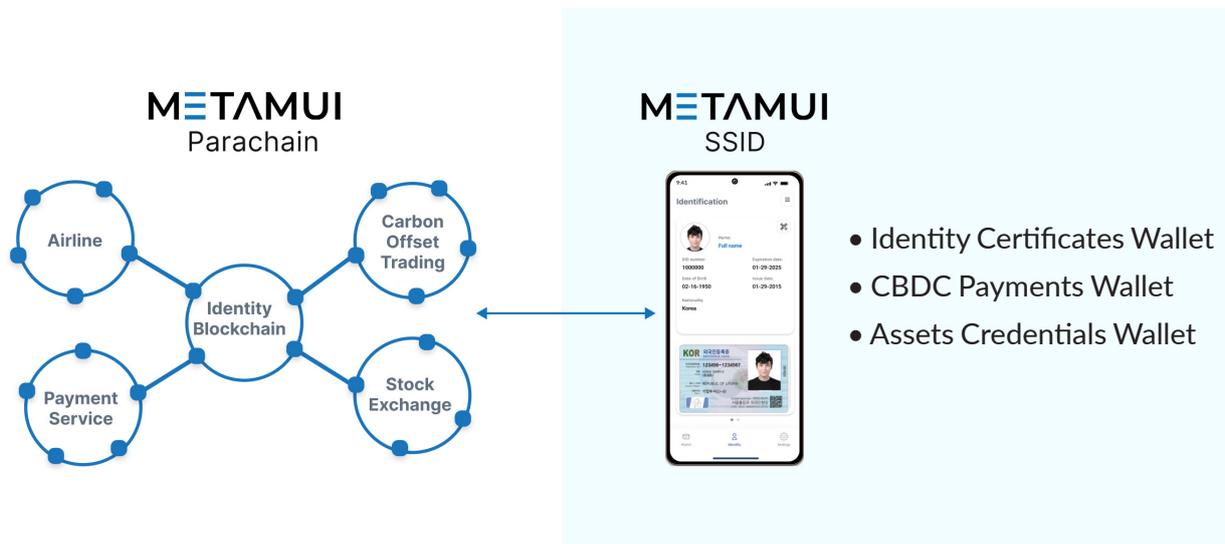


Figure 1. MetaMUI Architecture - Unified Ledger with Unified Wallet

2.1 MetaMUI Parachain Structure for Unified Ledger

The fundamental principle in the MetaMUI blockchain revolves around its parachain structure, a departure from the traditional smart contract-based approach found in conventional blockchain systems. MetaMUI distinguishes itself by enabling the dynamic creation of dedicated ledgers or blockchains intended for specific applications, providing a solution for data scalability concerns. This approach allows for the creation of separate ledgers or blockchains, which contrasts with the inherent difficulty in deleting specific ledger data within a hashed chain structure common to most blockchain systems where all data is intertwined. The segregated nature of separate ledgers facilitates the removal of specific ledger data when it's no longer required, enhancing flexibility and data management.

Moreover, the implementation of separate blockchains or ledgers in MetaMUI enables the customization of consensus protocols for each parachain. This tailored approach to consensus mechanisms for individual parachains enhances adaptability and optimization based on the distinct requirements of each application or use case within the MetaMUI ecosystem.

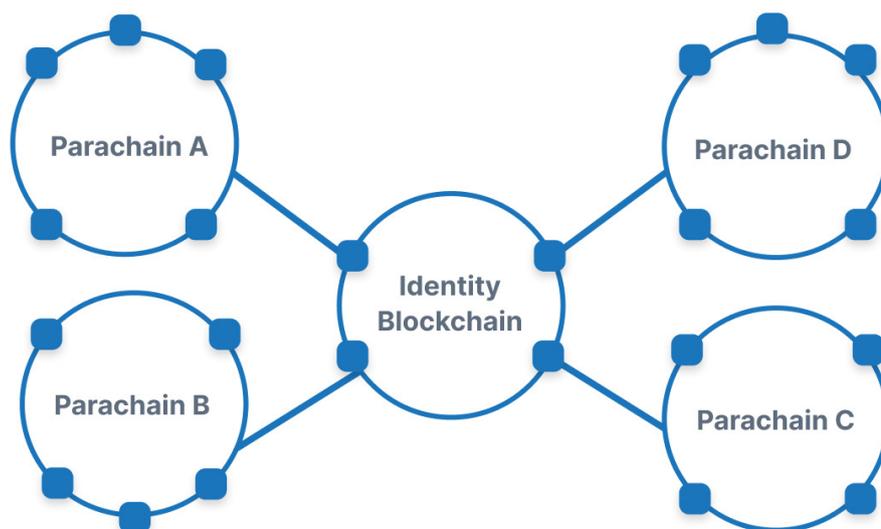


Figure 2. MetaMUI Parachain - Specialty Ledger for each Application

2.2 Identity Blockchain and Decentralized Public Key Infrastructure

At its core, the identity blockchain serves as the linchpin connecting all parachains within the MetaMUI ecosystem. This blockchain functions by establishing a crucial mapping between Decentralized Identifiers (DIDs) and public keys, effectively operating as a decentralized public key infrastructure. MetaMUI employs these DIDs as the basis for recording all transactions. Each DID serves as an identifier, an account address, and a communication address within the system.

Within this framework, specialty parachains document transactions occurring between different DIDs. To authenticate the transfer of assets, a user must digitally sign the transaction using the private key stored securely within their wallet. This process ensures the rightful ownership of assets recorded within the asset parachain.

Verifying the identities of DID users involves a concept known as verifiable credentials. Entities such as governments, banks, and other trusted third parties with public DIDs undertake the task of verifying a user's identity and issue what are termed as verifiable credentials (VCs). These VCs essentially consist of metadata that has been signed by the issuer and specifically allocated to a particular DID user. Subsequently, users store these credentials within their wallets. This allows users to present the VCs as proof of their identity credentials, which could include details regarding nationality, age, educational qualifications, licenses, vaccination records, and more, as required.

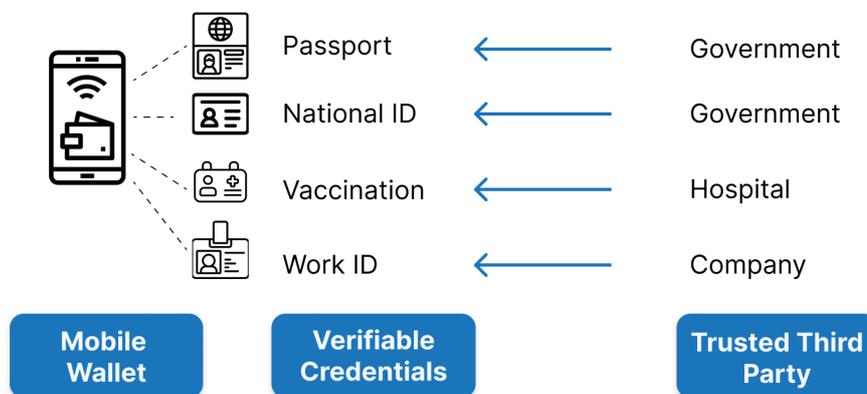


Figure 3. MetaMUI's implementation of Self-Sovereign Identity

2.3 Bank Nodes, Agents, and Wallets

MetaMUI features distinct applications catering to two different types of users: Public DID users and Private DID users. Public DID users utilize the Network Agent, while Private DID users utilize the Mobile Agent. The Network Agent incorporates a built-in Network Wallet, whereas the Mobile Agent integrates a Mobile Wallet. Oversight and control of the Bank Node are managed by the governance council through the Network Agent.

The Bank Node serves as a consensus node for each individual parachain within the MetaMUI Network. It operates as a perpetually active network node. Both pre-built parachains and dynamically generated parachains possess their own Bank Nodes responsible for achieving consensus. Bank Nodes function as permissioned nodes, necessitating authorization from existing Bank Nodes to join the network.

Pre-built parachains encompass various functionalities such as the identity blockchain, chaincode registration blockchain, chain code execution blockchain, and the MetaMUI token blockchain. Dynamically created parachains, on the other hand, encompass specialized functions tailored to specific needs, such as digital currency parachains, asset tokenization parachains, tokenized securities parachains, and so forth. Each of these parachains operates with its dedicated Bank Nodes to facilitate consensus within the MetaMUI ecosystem.

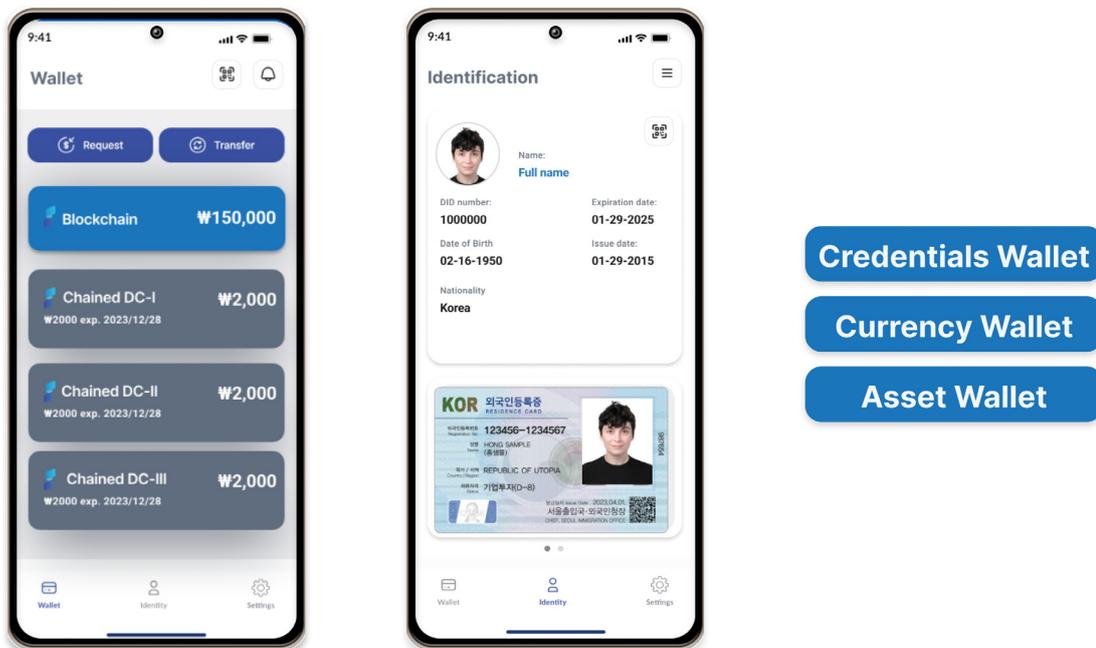


Figure 4. Mobile Agent with Credentials, Currencies, and Assets Wallet

The Mobile Agent encompasses three distinct types of wallets: the identity credentials wallet, assets wallet, and currencies wallet. The identity credentials wallet houses a diverse array of verifiable credentials, encompassing national identity cards, passports, educational certificates, vaccination records, and more.

Within the Mobile Wallet, MetaMUI leverages two types of hardware security modules commonly integrated into Android and iOS devices: a secure key store and a trusted execution environment (TEE). MetaMUI employs these features to store and authorize Chained Cash transactions securely within the TEE, ensuring heightened security for transaction authorizations.

The Mobile Chaincode, an integral component within the Mobile Agent, assumes responsibility for implementing various programmable money functionalities both online and offline. Additionally, it plays a vital role in processing extensive financial data and facilitating the training of federated machine learning components.

Furthermore, the Mobile Agent serves multiple functions including pairwise trust authentication and authorization. It undertakes the responsibility of DID-based communication for diverse peer-to-peer interactions and commercial transactions, ensuring secure and authenticated communication channels.

2.4 Meta-Blockchain – Multi-ledger Blockchain

One of the distinguishing capabilities of MetaMUI is its capacity to generate a new ledger specifically dedicated to a new digital currency using chain code execution. Instead of amalgamating data into a single master ledger within a hosted blockchain, MetaMUI facilitates the creation of distinct ledgers for individual digital currencies. This approach optimizes storage space management, allowing for selective deletion of ledger data associated with obsolete or outdated digital currencies.

The initiation of a new ledger for a digital currency necessitates the presence of at least one Bank Node, acting as the Central Bank Node overseeing the operations related to the new digital currency. The Central Bank Node assumes the responsibility of ensuring the smooth operation of the entire network, encompassing transaction fees for users engaging with the new digital currency. Moreover, the Central Bank has the option to substantiate the existence of collateralized assets linked to the new digital currency by acquiring verifiable credentials from a trusted entity within the Identity Blockchain.

Upon guaranteeing the collateral and staking it, the Central Bank executes a chain code to generate the digital currency. This execution process leads to the creation of a new ledger on the blockchain, and relevant information concerning the newly created digital currency is recorded in the digital currency registration blockchain. Simultaneously, this execution establishes a corresponding pair of ledgers, comprising a digital currency summary ledger.

The Genesis block of the new digital currency features a signed certificate issued by the Central Bank Node. Initially, the Decentralized Identifier (DID) of the Central Bank Node holds all tokens associated with the new digital currency. All Bank Nodes, including the Central Bank Node, participate in the consensus protocol governing the operations of the new digital currency.

Given that the Bank Node serves as the master node overseeing all pre-built blockchains and digital currencies created on-chain, it possesses the capability to execute currency conversions (payment versus payment) and atomic swaps involving currency and assets (delivery versus payment) within the MetaMUI ecosystem. This functionality allows for seamless exchange operations and transactions across various currencies and assets supported by the platform.

2.5 Chained Cash for Online and Offline Payment

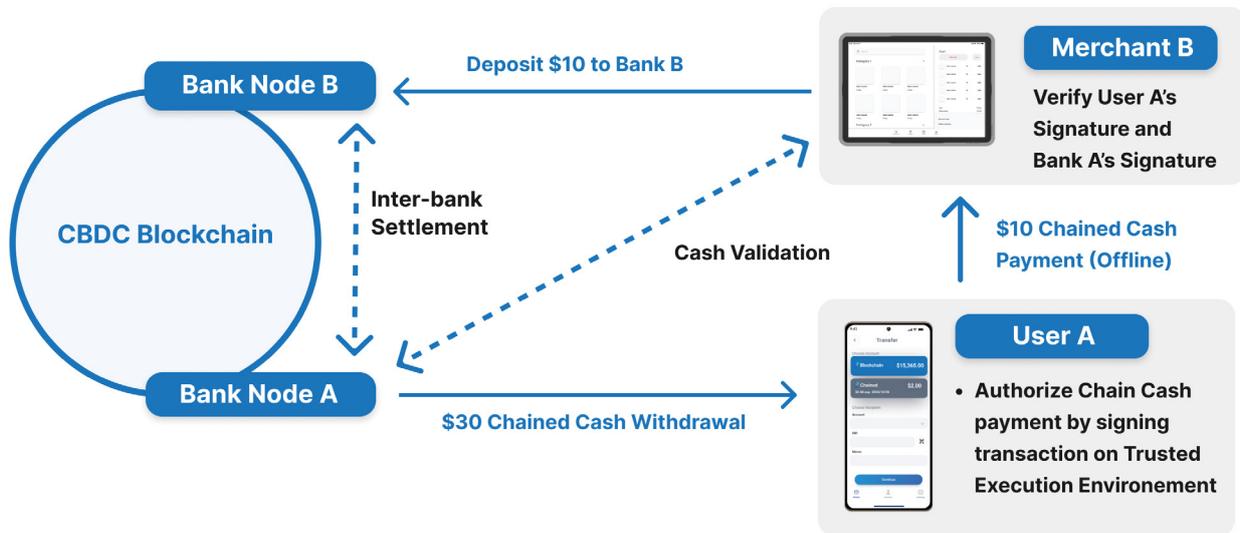


Figure 5. Chained Cash Payment Flow

MetaMUI presents a solution to the blockchain trilemma through its innovative hybrid architecture. It effectively addresses different payment scenarios by employing both centralized and decentralized architectures for optimal performance, security, and decentralization.

In the context of micropayments or retail Central Bank Digital Currency (CBDC), MetaMUI adopts a centralized architecture to ensure high performance and security. This centralized setup facilitates swift transactions and robust security measures, particularly suitable for small-scale transactions such as retail purchases. This approach prioritizes speed and security in retail CBDC transactions.

Conversely, for higher volume payments or wholesale CBDC transactions, MetaMUI utilizes a decentralized architecture. This decentralized structure prioritizes both high security and decentralization, catering to larger-scale transactions with enhanced security features. This approach ensures a higher level of security and decentralization in wholesale CBDC transactions.

The Bank Node plays a pivotal role in the issuance of Chained Cash, a form of digital currency within MetaMUI. Users have the flexibility to select their Bank Node service provider and establish service agreements to issue Chained Cash, resembling debit or credit card arrangements. When users make payments to merchants using Chained Cash, merchants can deposit this currency into their preferred Bank Node. Subsequently, the merchant's service Bank Node executes inter-bank settlements to claim the Chained Cash. This payment process is instantaneous and direct, representing a rapid, non-mediated peer-to-peer payment system with exceptional performance.

For high-volume money transfers, MetaMUI employs a standard blockchain consensus protocol involving all Bank Nodes in the consensus mechanism for multiple digital currencies. This mechanism, akin to a digital cheque payment between identities, operates via blockchain consensus instead of centralized servers for cheque clearance. While this payment process may be slower compared to conventional credit card payments, it is notably faster and more cost-effective than traditional Real-time Gross Settlement (RTGS) systems, offering an efficient alternative for larger-scale transactions.

2.6 Network Chaincode and Mobile Chaincode

In the MetaMUI ecosystem, two distinct types of chaincodes exist: network chaincode and mobile chaincode, each serving different purposes and functionalities.

Network chaincode within MetaMUI functions as the platform's equivalent of smart contracts seen in other blockchain systems. These chaincodes are the focal point of consensus within MetaMUI and are subject to potential upgrades. They are instrumental in executing network-based applications like redenomination, disaster aids, and negative interest, among other functionalities. As these chaincodes are fundamental to the consensus mechanism, their proposals for registration or updates are initiated by Bank Nodes. The proposal undergoes a review process by other Bank Nodes, followed by a voting mechanism where the proposed chaincode must receive a majority vote for confirmation. Upon confirmation, the newly registered or updated chaincode becomes part of the network. For users to access these changes, an upgrade of the Agent application in the Mobile Agent is necessary to download and utilize the newly added or upgraded chaincode.

On the other hand, mobile chaincode serves a distinct purpose within the MetaMUI ecosystem. This type of chaincode is designed to be downloaded and run locally on users' mobile devices through their Mobile Agents. Mobile chaincodes are tailored for personalized services, enabling the implementation of functionalities such as automatic taxation, senior discounts, and other personalized services that cater to individual users' needs and preferences.

Therefore, while network chaincode is primarily utilized for network-based applications subject to consensus and upgrades, mobile chaincode caters to personalized services tailored to individual users, running directly on their mobile devices.

2.7 Consensus Protocol - Instant Confirmation Consensus Protocol

In MetaMUI, an instant confirmation protocol for swift payment validation is implemented through a deterministic, single-block finalization consensus protocol. Building on a proposal by Professor Sier^[22], the protocol simplifies block selection by designating a single proposer for each block creation, thereby streamlining the block selection process.

The selection of the block proposer node is scheduled in advance among known Bank Nodes, akin to the Liquid Proof of Stake scheduling model seen in Tezos^[25]. Several factors influence the selection process, including stake, prior performance, hashed values of DID, and the previous block, ensuring a fair and balanced choice of proposer for each block creation.

Notably, only one block proposer operates during a single block time, eliminating the possibility of forking. Once the proposed block earns majority validation from validator nodes, it is promptly confirmed and finalized.

The role of the proposer extends to proposing the block, while other nodes within the network validate and endorse it. The majority voting confirms the block based on a first-come, first-served incentive rule. The Blockchain's Identity registration ensures the known quantity of Bank Nodes, allowing for the consideration of the earliest half of endorsements for incentivization. Endorsements included in the confirmed block receive incentives.

Additionally, the proposer node acts as a serializer, arranging transactions in the block. Block rewards and transaction fees are directed to the proposer node, while validators receive endorsement rewards when their endorsements contribute to the majority vote.

If there are no transactions during a block time, the proposer announces the absence of transactions, and no block is created. However, if there's at least one pending transaction, the proposer promptly suggests the block.

Failure of the proposer node to produce a block proposal or announce the absence of transactions within the block time leads to penalties, including the slashing of the proposer node's locked stake. This mechanism ensures accountability and incentivizes timely block proposal or communication of lack of pending transactions within the specified block time.

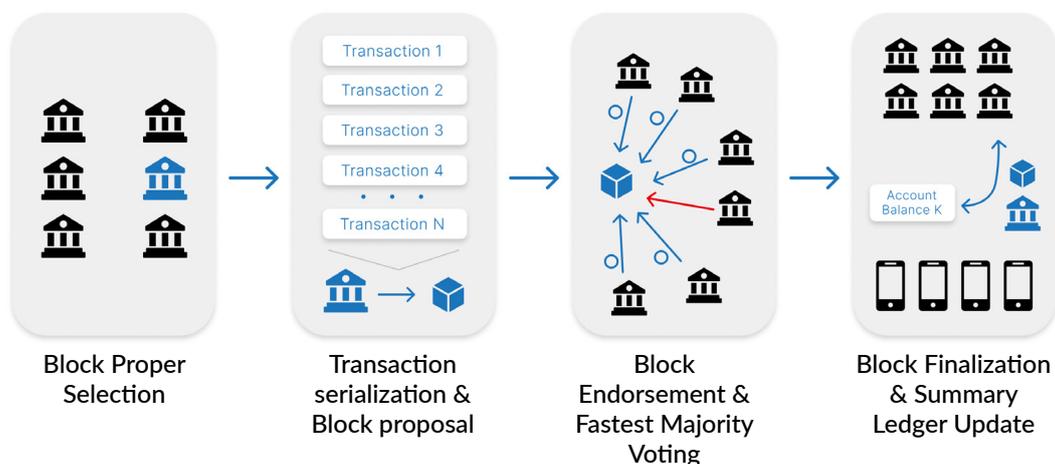


Figure 6. MetaMUI's Instant Confirmation Consensus Protocol

2.8 Event Sourcing Ledger (Blockchain) and Summary Ledger

MetaMUI employs two distinct structures for storing transaction data: the Event Sourcing Ledger and the Summary Ledger, each serving a specific purpose within the system.

The Event Sourcing Ledger represents a conventional blockchain ledger, maintaining data in a hashed chain of blocks. However, while this form of storage ensures the security of the data, it poses challenges when it comes to computational efficiency, communication, and data management. Tracing all blockchain data to compute a user's current account balance can be resource-intensive and inefficient.

To address these limitations, MetaMUI introduces the Summary Ledger, which aims to enhance efficiency in account balance computation and storage. The Bank Node, responsible for managing transactions, computes each user's account balance after the creation of each block. This computed balance is then stored in the Summary Ledger. Notably, the Bank Node maintains both the Event Sourcing Ledger and the Summary Ledger, ensuring the security of the data stored within.

The data within the Summary Ledger is signed by the Bank Node that generated it, ensuring its authenticity and integrity. Moreover, this data can be downloaded and stored on mobile nodes. Mobile nodes receive updates regarding account balances after each block is finalized, enabling users to maintain an up-to-date record of their account balances without having to rely solely on the Event Sourcing Ledger, which may be less efficient for these purposes. This setup streamlines the process of accessing and updating account balance information, improving efficiency in data management and retrieval within the MetaMUI ecosystem.

2.9 Rebasing of Genesis Block

In MetaMUI, the issue of data scalability within the blockchain ledger is addressed through the adoption of a mechanism known as rebasing. To overcome the challenge of storing an unlimited amount of data inherent in the chained block ledger structure, MetaMUI incorporates periodic checkpoints agreed upon by the Bank Nodes.

At these checkpoints, Bank Nodes reach a consensus on a snapshot of the ledger data, effectively establishing this snapshot as the Genesis Block of a new ledger. Once this snapshot becomes the Genesis Block and the subsequent block creation commences successfully, all previous ledger data before the checkpoint is deemed redundant and can be safely eliminated. This process is referred to as the rebasing of the Genesis Block.

By implementing this rebasing mechanism, MetaMUI efficiently manages ledger data by periodically creating new Genesis Blocks based on agreed-upon checkpoints, thus allowing the deletion of older data that precedes these checkpoints. This strategy effectively alleviates the challenge of infinite data accumulation within the blockchain ledger, ensuring more manageable and scalable ledger storage while maintaining the integrity and continuity of the ledger.

2.10 Algorithmic Central Bank

In MetaMUI, a digital currency parachain introduces an innovative concept—an Algorithmic Central Bank (ACB) operated by the Central Bank Node. This ACB plays a crucial role in supporting the value of the digital currency by providing collateralized assets and managing the circulating volumes of the currency, thereby controlling inflation and deflation rates.

The ACB utilizes a sophisticated Generative Transformer model, rooted in the Quantity Theory of Money, which posits a direct relationship between the general price level of goods and services and the money supply in circulation. This model operates based on essential control parameters such as stability rate and collateralization ratio.

At the core of the ACB Engine lies the decision-making process managed by the Central Bank Node. This decision-making involves using the Generative Transformer Model, trained on extensive financial big data, to assess whether to buy back and slash the digital currency, thereby reducing its circulating volumes, or to mint more and sell the digital currency. These decisions are influenced by monitoring the operating profit, which includes factors like transaction fees.

Bank Nodes within the MetaMUI ecosystem gather significant financial big data from various entities. This data is utilized to train the ACB Engine, enabling it to propose appropriate digital monetary policies for the targeted digital currency. By incorporating AI into the operation of the Central Bank, MetaMUI stands as a pioneering blockchain platform that automates central banking functions, effectively regulating digital currencies and making informed monetary decisions. This integration of AI marks a significant advancement in the realm of blockchain technology by introducing automated and data-driven governance mechanisms for digital currencies.

2.11 Tradable Certificate

In the MetaMUI platform, Tradable Certificates (TCs) represent a form of identity-based non-fungible token technology designed to offer unique functionalities related to verification, asset collateralization, and ownership transfer. TCs serve as a means to validate the issuer's identity, verify collateralized assets, and facilitate identity-based transfers of ownership for assets. Among the types of TCs available, Collateralized TCs possess distinctive features that warrant further exploration.

Collateralized Tradable Certificates (TCs)

Collateralized TCs are structured to encompass specific attributes and functionalities within the MetaMUI ecosystem. The core characteristics and functionalities of Collateralized TCs include:

- 1. Issuer Verification:** Collateralized TCs provide a means to verify the identity of the issuer. This validation ensures transparency and trustworthiness in the issuance of the token.
- 2. Asset Collateralization:** These TCs are backed by collateralized assets. The token is linked to and secured by these underlying assets, adding intrinsic value and security to the token.
- 3. Ownership Transfer:** Collateralized TCs enable identity-based transfers of ownership for assets. This feature ensures that ownership changes are securely and transparently recorded and managed within the MetaMUI framework.
- 4. Uniqueness and Non-Fungibility:** Each Collateralized TC is distinct and non-fungible, meaning it cannot be exchanged on a one-to-one basis with other tokens. This uniqueness adds value and differentiation to each individual token.
- 5. Transparency and Trust:** The use of Collateralized TCs promotes transparency regarding the underlying collateral and issuer, fostering a greater level of trust among participants in the ecosystem.
- 6. Enhanced Security:** The collateralization of assets provides an additional layer of security to the token, reducing risks and instilling confidence in its value and authenticity.

Overall, Collateralized TCs within MetaMUI represent a specialized form of non-fungible token technology that leverages identity-based verification, asset collateralization, and secure ownership transfer mechanisms. These tokens play a pivotal role in establishing transparency, security, and trust within the MetaMUI ecosystem, contributing to a robust framework for managing and transferring asset ownership based on verified identities.



Figure 7. Fractionalized Tradable Certificate

Fractionalized Tradable Certificates (TCs)

Fractionalized Tradable Certificates (TCs) represent a transformative concept at the core of asset fractionalization within the MetaMUI blockchain ecosystem. Asset fractionalization involves the division of an asset into smaller, more manageable fractions, with each fraction being represented as a distinct and unique Tradable Certificate (TC). This process establishes a direct correlation between asset fractions and the individual TCs created from them.

The introduction of Fractionalized TCs holds considerable significance and brings about several impactful outcomes:

1. Democratization of Asset Ownership: By breaking down larger assets into smaller fractions represented by TCs, Fractionalized TCs democratize asset ownership. This approach allows individuals to access and own portions of substantial assets that might otherwise be financially out of reach.

2. Enhanced Liquidity: Fractionalization increases the liquidity of assets. Breaking them down into smaller, tradable units enables easier buying, selling, and trading of these fractions. This liquidity enhancement contributes to a more dynamic and accessible market for assets.

3. Accessibility to Asset Ownership: By transforming assets into tradable units, Fractionalized TCs broaden access to asset ownership. They make it feasible for a wider range of investors or individuals to participate in owning valuable assets that were traditionally accessible only to a select few due to high capital requirements.

4. Increased Tradeability: The individual TCs derived from asset fractionalization are designed to be easily tradable. This tradeability offers flexibility for investors or individuals to buy, sell, or exchange these fractionalized units according to their preferences and investment strategies.

In essence, Fractionalized TCs revolutionize the representation and trading of assets on the blockchain. By breaking down assets into smaller, tradable fractions, they democratize asset ownership, enhance liquidity, and significantly expand access to valuable assets, ultimately fostering a more inclusive and dynamic investment landscape within the MetaMUI ecosystem.

3. METAMUI CLOUD SERVICE

The MetaMUI governance council oversees the operation of the MetaMUI Cloud Service, which functions as a Blockchain As A Service (BAAS) platform. This platform offers a no-coding solution for developing Decentralized Applications (DApps). Within the MetaMUI Cloud Service, users have access to a comprehensive package containing the Network Agent, Parachain, and Mobile Agent, consolidating essential components in one integrated solution.

The MetaMUI Cloud Service stands as a convenient and comprehensive service provider, offering a range of pre-built DApps that include functionalities like Digital Currency issuance, Identity Card Issuance, Certificate Issuance, among others.

Notably, users utilizing the services provided by the MetaMUI Cloud Service are required to pay the service charges using the MetaMUI token, the native digital currency associated with the MetaMUI ecosystem. This token serves as the medium of exchange for accessing and utilizing the diverse services offered within the platform.

Overall, the MetaMUI Cloud Service represents a centralized but comprehensive platform that streamlines the development and deployment of DApps, offering pre-built applications and tools to users without the necessity of intricate coding. Users can access and leverage these services by paying for them through the MetaMUI token, fostering a self-contained and efficient ecosystem within the MetaMUI blockchain network.

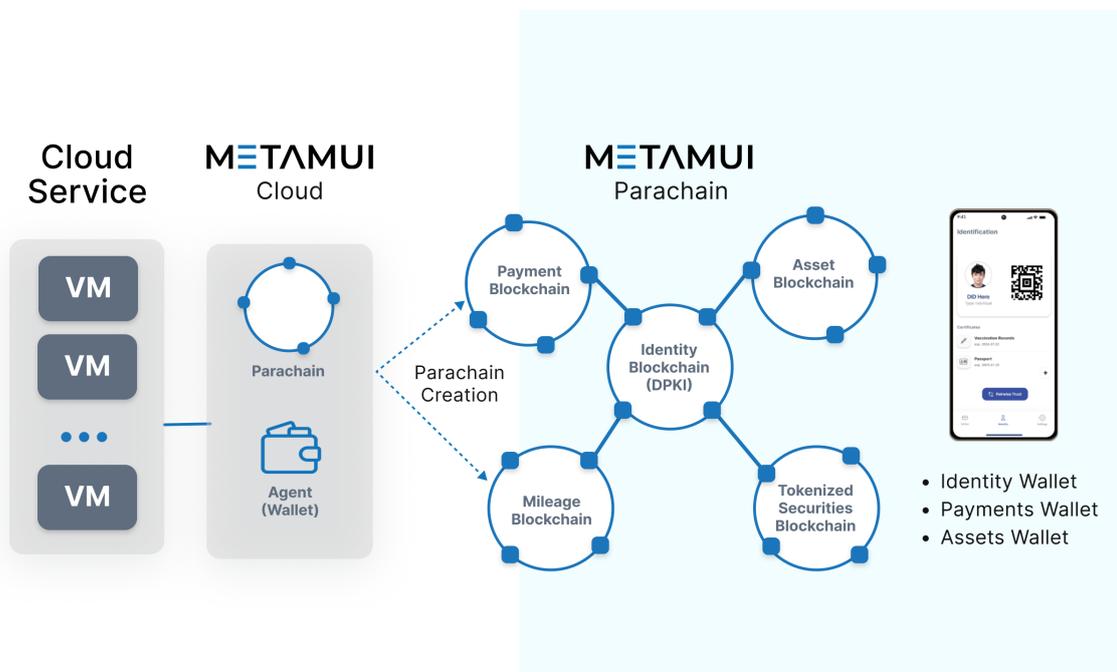


Figure 8. MetaMUI's Blockchain As A Service

3.1 MetaMUI SSID(Self-Sovereign Identity) App

Self-Sovereign Identity Wallet inside the MetaMUI SSID App is a mobile application that is connected to the Identity Blockchain of MetaMUI Blockchain. Self-sovereign identity is a decentralized identity technology in which user is in control of their identity information, compared to other digital identity systems in which a centralized entity or group of entities are in control of the information. It also has the capability of establishing pairwise trust. In pairwise trust, both users and the service site identify themselves. Since the service site also proves its identity to the user, a phishing attack with a fake website can be avoided.

One of the remarkable features of MetaMUI's blockchain technology is its ability to safeguard user privacy effectively. It accomplishes this by enabling the issuance of Verifiable Certificates (VCs) based on partial information. This innovative approach ensures that users can selectively share only the information required for specific transactions, minimizing exposure of their private data.

Let's illustrate this with a practical example. Consider a government entity, such as the Ministry of International Affairs in a country. This entity can issue several VCs, each serving a distinct purpose. One VC may verify a person's age, another their citizenship status, a third their address, and a fourth may contain all the information needed for comprehensive verification. These VCs provide a powerful tool for privacy protection, as the holder of the VC can choose to reveal only the specific information necessary for a particular transaction.

This level of selective disclosure empowers individuals to demonstrate their eligibility for various scenarios without divulging unnecessary personal data. For instance, when claiming a tax exemption or proving eligibility to purchase alcohol, users can confidently present the relevant VCs, keeping the rest of their private information secure. MetaMUI's commitment to privacy and data protection ensures that users have control over their personal data, enabling secure and efficient transactions while safeguarding their privacy.

MetaMUI SSID serves as a payment portal for various payment needs such as bill payment, tax payment, monthly rental, etc. With MetaMUI SSID, users can search for public DIDs of online and offline shops, government organizations, and other various companies and establish pairwise trust, i.e. two-way cryptographic connection. Then the user can sign in to the shop, receive an e-bill, that is digitally signed by the shop and issued to the user, and pay for the bill by authorizing the identity-based fund transfer. In this way, MetaMUI SSID is a single sign-on system and payment portal for various online and offline shops and government offices.

MetaMUI SSID is a store for various VCs (Verifiable Credentials) issued by other entities. VC is a certified document signed by the other DID entities. Most of the time VCs are issued by public trusted entities such as the government, banks, hospitals, universities, etc. VC issued by the hospital can be served as a vaccination certificate. VC issued by the university is a graduation certificate. VC issued by the government is a nationality certificate. With MetaMUI SSID, it is possible to digitize various certified document issuances.

For the members of the governance council, MetaMUI SSID is a voting application for various proposals such as the publication of new tokens, minting, and slashing of the token, incentive distribution, etc. Each central bank node can establish a governance council for the maintenance of their published digital currencies.

3.2 MetaMUI Network

The MetaMUI Network indeed offers a comprehensive ecosystem that integrates a range of functionalities, from permissioned access to the blockchain to programmatically creating new blockchains. Here's a summarized overview:

MetaMUI Network Features:

- 1. Permissioned Public Mainnet:** Access to MetaMUI Network requires identity verification via VC from a public DID, often managed by a bank node operator. To become a bank node operator, permission from the governance council and staking of MetaMUIs is required.
- 2. Programmatically Created Blockchains:** Users can create their blockchain for cryptocurrencies, digital currencies, and tokenized assets. Unlike conventional smart contract-based platforms, tokens reside on separate blockchains, reducing congestion, costs, and allowing compliance with FATF recommendations.
- 3. Built-in Chain Codes:** The MetaMUI Network includes pre-built chain codes for various operations like token management, tradable certificate issuance, redenomination, etc. Central banks can utilize cloud services to issue and control digital currencies, implement UBI, taxation, etc.
- 4. Identity Blockchain:** Serves as a decentralized PKI allowing users and entities to issue and verify digitally signed documents, including vaccination passports, national IDs, contracts, etc.
- 5. Cross-Border Payment Network:** Users' DIDs serve as universal addresses for sending and receiving digital currencies. The MetaMUI Network's features enable the creation of meta-coins to facilitate cross-border payments and international fund transfers between different currencies.

The MetaMUI Network's design appears to address several critical aspects such as identity verification, currency issuance, cross-border payments, and tokenization, all while ensuring efficiency, lower transaction costs, and compliance with regulations.

3.3 Certified Messaging and Integrated Communication with DIDs

In the realm of digital communication and identity verification, the MetaMUI Network introduces a transformative approach to certified messaging and integrated communication through the implementation of DIDs. This innovative paradigm transcends traditional modes of digital correspondence and provides a comprehensive framework for secure and efficient interactions.

- 1. Integrated Communication Addresses:** A central feature of the MetaMUI DID system is

the concept of integrated communication addresses. These addresses consolidate various means of communication, encompassing email, social networking services (SNS), phone calls, and video conferencing. The integration of these diverse communication channels simplifies user interactions and facilitates seamless connectivity with both individuals and public entities.

2. Public Verifiable Discovery and Peer-to-Peer Connections: MetaMUI's DID framework revolutionizes the process of discovering and establishing connections with public institutions, businesses, and other entities. These connections are grounded in a foundation of public verifiability, assuring users that the entities they engage with have undergone stringent authentication procedures. The MetaMUI Network empowers users to confidently initiate peer-to-peer connections, underpinned by transparency and trust.

3. Registered Email and Electronic Messaging: The MetaMUI DID system extends its influence to the domain of electronic messaging, introducing an architecture for registered email and electronic communication. This framework encompasses critical communications, including tax notices and invoices. Leveraging DIDs, these communications are not merely securely transmitted; they are intrinsically tied to the intended recipients, adding a layer of trust and authenticity to these interactions.

4. Peer-to-Peer Smart Contracts: Within the MetaMUI ecosystem, the fusion of Distributed Ledger Technology and DIDs facilitates the deployment of peer-to-peer (P2P) smart contracts. These contracts empower users to engage in seamless online and offline. The MetaMUI Network's inherent identity verification mechanisms lend an additional layer of security and confidence to these transactions.

5. Verifiable Data Generation from IoT Devices and Sensors: The MetaMUI ecosystem extends the reach of its DID system to the domain of the Internet of Things (IoT). IoT devices and sensors are uniquely equipped with DIDs and digital signatures, providing users with the means to engage in verifiable data generation. This not only ensures the trustworthiness of data but also enhances data integrity in various applications.

4. METAMUI UTILITY TOKEN FOR METAMUI NETWORK

The MetaMUI Network operates as a conglomerate of parallel blockchains, with the identity blockchain serving as the relay chain. At the core of this network lies the utility token, MetaMUI, which is utilized for various purposes within the network. To create or access services in the specialized blockchains known as parachains—such as asset tokenization for real estate or tokenized securities for climate projects—users are required to transact using MetaMUI tokens.

A diverse array of entities, including Central Banks, Commercial Banks, Payment Companies, Financial Institutes, and other service providers, are responsible for operating the MetaMUI Network. The value of the MetaMUI token, functioning as a digital sovereign currency, is controlled algorithmically by an innovative AI-powered engine known as the ACB (Algorithmic Central Bank). The intrinsic design of the MetaMUI coin is oriented towards maintaining and augmenting its value over extended periods.

For the issuance of a digital currency, the central bank node of the targeted currency must acquire and deposit MetaMUI tokens into the MetaMUI central bank node. Revenues from these sales are accrued and stored in the MetaMUI treasury, forming project funds. These funds are utilized to purchase MetaMUI tokens from the market, maintaining a predefined price floor. If the MetaMUI token price escalates excessively, reaching a specific ceiling, the MetaMUI ACB intervenes by selling MetaMUI tokens in the market to augment the circulating supply. To prevent hyperinflation, the circulation is capped at 984,596,928.473209 tokens, with 100 million MetaMUI tokens locked as a project team incentive until January 3rd, 2025.

The utmost priority for MetaMUI tokens is the continual increase in their value over time, maintaining their purchasing power relative to major fiat currencies like the US dollar and Euro. To achieve this goal, the MetaMUI ACB computes the next target price by considering two factors: the preceding market price of MetaMUI and the leveraged market price of stable assets like gold, measuring the depreciation of fiat currencies. This approach ensures stability in value, mitigating excessive price fluctuations over short periods, and forms the basis of the permissible price band within which MetaMUI token value is allowed to fluctuate, as described previously.

The MetaMUI ecosystem has defined initial fees for various operations within its network. These fees, which are subject to determination and potential modifications by the governing council through MetaMUI's on-chain voting system, aim to regulate and sustain the network while distributing costs across different entities involved. Here's an outline of the initial fees set up in the MetaMUI ecosystem:

1. Governance Council Membership:

- Stake: To become a governance council member, a minimum stake of 10 million MetaMUI is required.
- Approval: Majority approval from the existing governance council is necessary.
- Penalties: A penalty fee of 1 million MetaMUI is imposed for withdrawing from governance council rights.

2. New Parachain Creation:

- Fee: 1 million MetaMUI for creating a parachain connected to the identity blockchain's central relay chain.
- Additional Cloud System Fee: If using MetaMUI's cloud system, an extra service fee to Sovereign Wallet Network may apply.
- No Fee for Implementing Paid Service: No additional service fee is needed for implementing paid services on the parachain.

3. Tradable Certificates (TC):

- TC Issuance: 1,000 MetaMUI per issuance.
- Fractionalized TC: 10,000 MetaMUI per issuance (used for tokenized securities).

4. Verifiable Credentials (VC):

- VC Issuance: 100 MetaMUI per issuance.

5. Private Key Reset:

- Service Fee: 100 MetaMUI for regenerating private keys and re-registering public keys. Collected by Sovereign Wallet Network and identity verification service entities.

6. Tokens Conversion:

- Conversion Fee: 100 MetaMUI for token conversion between different ledgers.

7. Atomic Swap:

- Service Fee: 100 MetaMUI for atomic swap transactions between asset and payment tokens.

8. Contract Signing:

- Service Fee: 10 MetaMUI for signing contracts.

9. Digital Identity Registration and MetaMUI Transfer:

- Free of Service Fee: No charge for these operations.

10. Offline Operations of Chain Codes:

- Free: Operations such as establishing pairwise trust, zero-knowledge proof of identity, etc., are not subject to service fees.

These fees and charges are designed to cover the operational costs of MetaMUI's functionalities and services, while also ensuring that the network operates efficiently and sustainably.

Note: the cost of each operation on the MetaMUI network will be adjusted by the governance council members of MetaMUI.

5. METAMUI BLOCKCHAIN USE CASES

Sovereign Wallet worked on various use cases based on MetaMUI technology.

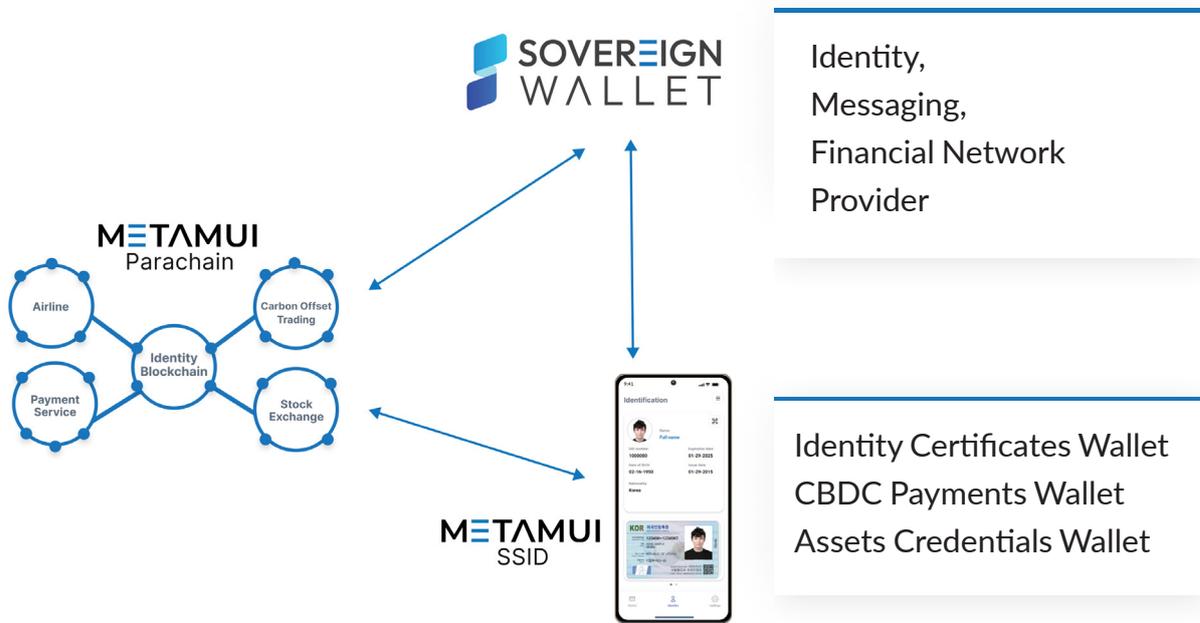


Figure 9. Sovereign Wallet Cloud Service Platform

5.1 Central Bank Digital Currency

The most beneficial application domain of MetaMUI is the publication of CBDC (Central Bank Digital Currency). Utilizing the structure of Bank Node, MetaMUI supports the model of M2 currency publication. Based on the asset of M1 base currency from the central bank, commercial banks can generate M2 currency dynamically on MetaMUI. SovereignWallet users use CBDC and can participate in operating CBDC with a mobile wallet. MetaMUI supports the fractional reserve banking model. Currency Exchange between digital currencies published on MetaMUI can be swapped atomically. This provides a simple currency exchange on a mobile device.

MetaMUI's unique chain code structure and identity-based account system enable special monetary policy to be implemented. **Redenomination** of CBDC can be performed on-chain. The cost of performing on-chain redenomination is just a fraction of the cost of publishing new paper currency and collecting and destroying old currencies.

With MetaMUI's chain code, the implementation of **basic income** or **disaster aid** can be paid programmatically. By running the basic income chain code, it is possible to increase the balance of all citizen's account balances. Based on the user's identity, eligible users can be selected or the user can prove himself or herself to receive the money by presenting VCs (Verifiable Credentials).

Efficient Payroll Distribution

In scenarios involving payroll distribution, MetaMUI's technology streamlines the process and enhances efficiency. A specialized ledger within the system manages critical payroll details, including the fraction of compensation to be paid in digital government-issued digital currency, clock-in and clock-out data, and hourly payment rates. The Commercial Bank Admin Tool empowers organizations to manage their payroll processes effectively by grouping employees based on various criteria. Payroll distribution is carried out seamlessly based on the ledger's reference, ensuring accuracy and transparency.

- Wholesale CBDC
- Retail CBDC (chained cash offline payment)
- Cross-border Payments and remittance
- Programmable money, Tax, and personalized interest
- Financial Big Data (Privacy Protection with Federated
- Machine Learning)
- Algorithmic (Ai) Central Bank
- High Capacity TPS Offerings

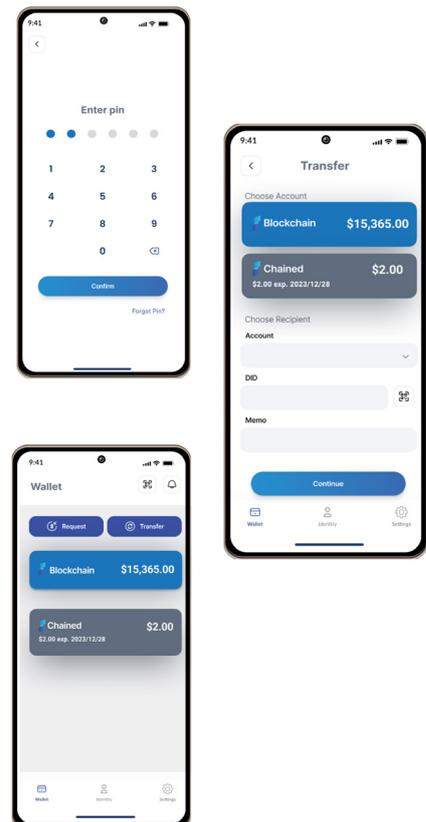


Figure 10. MetaMUI CBDC

Efficient Financial Aid Distribution

In scenarios involving financial aid distribution, MetaMUI's technology plays a pivotal role in achieving comprehensive and efficient solutions. The platform enables the distribution of smart-card-based Digital IDs and Central Bank Digital Currency (CBDC) wallets, promoting full financial inclusion. During times of natural disasters, MetaMUI facilitates the distribution of financial aid to affected populations, aiding in recovery and rebuilding. A standout feature is the system's ability to perform payment and identity verification both online and offline, ensuring access to funds and identity verification even in challenging or disconnected environments.

Enhancing Tourist Experiences

For tourists visiting foreign countries, MetaMUI's digital currency system simplifies their financial interactions. Tourists initiate the creation of a Decentralized Identifier (DID) and a digital wallet upon entering the country, ensuring secure and identity-based transactions. The platform offers a 24/7 Exchange Bank Node for tourists to exchange their native currency for the local Central Bank Digital Currency (CBDC). Tourists use their digital wallets for purchases at local shops, employing a straightforward scan-and-pay method. The system performs an automated calculation and redemption of applicable sales taxes following each transaction, streamlining the shopping experience for tourists.

5.2 Asset Tokenization and Tradable Certificates

MetaMUI's blockchain technology provides a robust foundation for the tokenization of various assets, spanning a wide array of use cases:

Asset Certification and Trading

- **Tradable Certificate**
 - Public Authority Electronically Signed Digital Asset Registration
 - Identity-based ownership registration and transfer
 - Notarization/digital registries
- **Identity-based P2P Transactions**
 - Peer-to-peer contracts and digital signatures
 - Atomic Swaps (simultaneous exchange of assets and payment)
 - Offline Asset Proofing and Transactions
- **Programmable Taxation**
- **Financial Big Data**

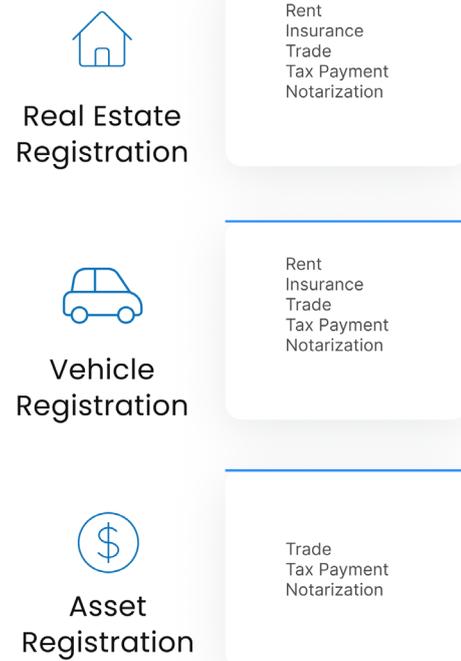


Figure 11. MetaMUI Asset Tokenization

Real Estate Contracts: MetaMUI empowers the tokenization of real estate contracts, enabling fractional ownership and seamless trading of real estate assets.

Digital Securities: This category includes government bonds, stocks, precious metals like gold, and other financial instruments. MetaMUI simplifies the issuance and management of these digital securities.

Commemorative Tokens: These tokens have the potential to celebrate special occasions or events, representing a unique form of digital collectibles.

Intellectual Property: MetaMUI offers secure solutions for tokenizing intellectual property, and simplifying licensing and ownership transfers.

Carbon Credits: The platform facilitates the creation and trading of carbon credits, contributing to sustainable development goals.

Vehicles: Tokenization extends to assets such as vehicles, making it possible to efficiently manage ownership and transactions related to automobiles.

These use cases exemplify the versatility and potential of MetaMUI's technology. By delving deeper into each of these scenarios, we aim to showcase the adaptability and power of our platform in real-world applications.

5.3 Climate Projects Security Token Offering (STO) Platform

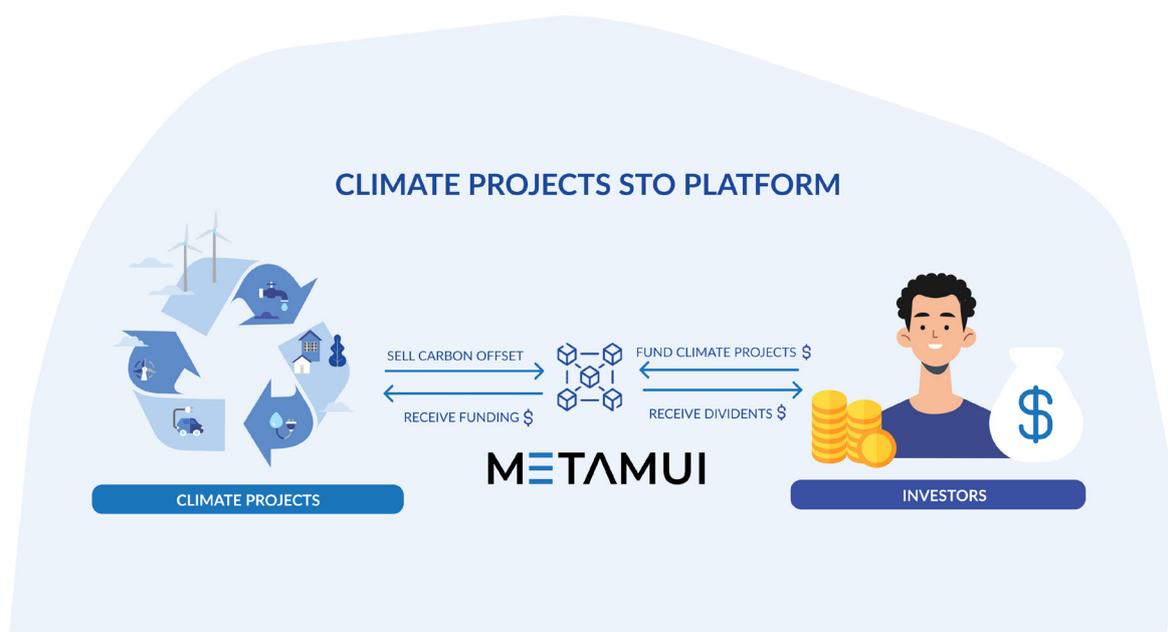


Figure 12. Climate Projects STO Platform

Sovereign Wallet's subsidiary, CO2 Network, is actively engaged in developing an STO (Security Token Offering) platform dedicated to Climate Projects. Securing ongoing funding for various climate-focused initiatives is crucial in the global battle against climate change. However, many climate projects face challenges in securing adequate funding due to their substantial funding requirements or high-risk factors.

To address these challenges, CO2 Network is leveraging MetaMUI's Tradable Certificate technology to revolutionize the funding process for climate projects. By tokenizing and fractionalizing project funding using this innovative technology, CO2 Network aims to make large-scale crowdfunding economically feasible while minimizing transaction costs. This approach ensures that a wider pool of investors can participate in funding climate initiatives, facilitating increased financial support for critical projects.

Moreover, CO2 Network's STO Platform offers additional benefits to investors. It enables secondary trading of tokenized securities, providing investors with opportunities for early returns on their investment. This secondary trading feature enhances liquidity and flexibility for investors, allowing them to engage in trading activities involving tokenized securities linked to climate projects.

By integrating Tradable Certificate technology from MetaMUI, CO2 Network's STO Platform introduces a transformative approach to financing climate projects. This approach not only addresses the challenges related to securing substantial funding for climate initiatives but also provides investors with a mechanism for potential early returns through secondary trading of tokenized securities, fostering a more dynamic and accessible investment landscape in the realm of climate-focused endeavors.

5.4 Sovereign Yidindji Dollar(SYD)

MetaMUI's Self-Sovereign Identity and Central Bank Digital Currency (CBDC) system have been adopted by the Sovereign Yidindji Government, an indigenous nation located in Australia. The Yidindji nation utilized this technology to issue their national identity and launch their digital currency known as the Sovereign Yidindji Dollar (SYD). Notably, these initiatives were



Figure 13. Sovereign Yidindji Dollar

undertaken in January 2022, marking the initial issuance of the national identity followed by the introduction of the CBDC within the same month^[37].

To achieve this milestone efficiently, the Sovereign Yidindji Government leveraged MetaMUI's Cloud Service, enabling them to expedite the process of issuing the CBDC. Remarkably, utilizing MetaMUI's Cloud Service facilitated the issuance of the CBDC in a remarkably short timeframe of approximately 4 hours, showcasing the speed and efficiency of the technology in implementing a sovereign digital currency.

This adoption of MetaMUI's Self-Sovereign Identity and CBDC system by the Sovereign Yidindji Government highlights the platform's adaptability and effectiveness in empowering indigenous nations like Yidindji to establish their national identity and introduce their digital currency, streamlining the process and ensuring a swift implementation of these crucial initiatives.

5.5 National Bank of Georgia (NBG)'s Digital Gel Pilot

Sovereign Wallet's inclusion as a technology partner for the National Bank of Georgia's Digital GEL Pilot Project signifies a strategic collaboration in advancing digital currency initiatives^[36]. An influential factor contributing to this selection was Sovereign Wallet's demonstration of providing offline Central Bank Digital Currency (CBDC) solutions.



Figure 14. National Bank of Georgia's Digital GEL

One distinctive aspect that sets Sovereign Wallet apart from other technologies is its capability to offer offline solutions for CBDC. In the realm of blockchain technology, many platforms primarily rely on consensus-based token systems, lacking the essential offline functionality. However, Sovereign Wallet showcased a unique capacity to address this limitation by enabling offline capabilities within their CBDC framework.

This capability to provide offline solutions for CBDC was likely a pivotal factor in the National Bank of Georgia's decision to partner with Sovereign Wallet. The ability to conduct transactions or perform CBDC-related activities offline can significantly enhance accessibility, reliability, and versatility, thereby making digital currency usage more resilient, especially in scenarios where internet connectivity might be limited or unreliable.

Sovereign Wallet's involvement in the Digital GEL Pilot Project underscores its innovative approach and commitment to advancing CBDC technology, particularly in offering offline solutions that cater to the needs of financial ecosystems seeking enhanced reliability and functionality in their digital currency initiatives.

5.6 Project “Polaris” by the Bank of International Settlement(BIS)’s Innovation Hub at Nordic Centre

SWN Global is actively collaborating with the BIS Innovation Hub at the Nordic Centre, participating as one of twelve companies in a collaborative effort to develop a comprehensive design guide for implementing Central Bank Digital Currencies (CBDCs)^{[31][32]}. Within the Polaris project, SWN Global has made significant contributions by showcasing MetaMUI’s Chained Cash technology.

MetaMUI’s Chained Cash technology stands out among other software-based offline payment protocols, and SWN Global has played a role in highlighting its innovative features. Notably, Chained Cash is a unique payment protocol that operates securely in offline scenarios, utilizing the built-in hardware security modules available in most Android and iOS devices. This security feature ensures robustness and reliability, making it suitable for real-world payment scenarios.



Figure 15. BIS’s Project Polaris, High-level Design Guide for CBDC Online and Offline

One of the key distinguishing factors of MetaMUI’s Chained Cash technology is its ability to function seamlessly in both online and offline environments. This feature eliminates the need for currency conversion, offering a streamlined and consistent payment experience. Moreover, as a non-mediated, peer-to-peer payment protocol, Chained Cash demonstrates exceptional speed, with transaction times completing in under 1 second.

SWN Global’s involvement in highlighting and showcasing MetaMUI’s Chained Cash technology within the collaboration with the BIS Innovation Hub underscores the significance of this innovative payment protocol in revolutionizing CBDC implementation. Its capability to operate both online and offline, coupled with its speed and security features, positions Chained Cash as a promising solution for real-world payment scenarios and reinforces its potential in shaping the future landscape of digital transactions.

Indeed, MetaMUI’s blockchain technology presents a transformative force across various sectors, promising impactful changes in realms such as digital currencies, asset tokenization, and streamlined financial operations like payroll and aid distribution. Positioned as a frontrunner in technological innovation, MetaMUI stands out by delivering tangible solutions that prioritize efficiency, security, and accessibility.

The application of MetaMUI’s blockchain technology spans multiple sectors, offering

groundbreaking advancements. In the domain of digital currencies, it facilitates the issuance and management of secure and efficient CBDCs, enhancing the digital financial landscape. Additionally, through asset tokenization, it enables the fractionalization and trade of assets, democratizing ownership and liquidity.

Moreover, MetaMUI's technology streamlines financial operations by optimizing payroll systems and facilitating the equitable and efficient distribution of financial aid. By focusing on enhancing efficiency, ensuring robust security measures, and promoting accessibility across its applications, MetaMUI stands as a pioneering force in reshaping how industries operate in the digital era.

In conclusion, MetaMUI's blockchain technology emerges as a driving force for innovation, revolutionizing diverse sectors and offering practical, real-world solutions. Its commitment to efficiency, security, and accessibility positions it at the forefront of technological advancement, poised to continue shaping and transforming various industries in the times to come.

6. FUTURE EXTENSIONS

The creation of MetaMUI, an identity-based unified ledger blockchain, marks just the initial phase of our journey. While we proposed a cloud-based parachain platform and a unified wallet for accelerating the expansion of the MetaMUI ecosystem, we firmly believe that the ongoing advancements in artificial intelligence (AI) technologies, such as generative AI and transformers, will be pivotal in reshaping the blockchain landscape. MetaMUI remains committed to continual innovation, seeking to integrate advanced AI technologies into blockchain systems. This convergence is expected to yield a potent combination, offering enhanced flexibility through AI and ensuring transactional robustness and stability via the blockchain platform.

The on-chain governance mechanism inherent in MetaMUI's chain code is a key driver enabling the evolution of various aspects within the MetaMUI ecosystem. Our team is dedicated to consistently upgrading the protocol and chain code to foster continuous improvement and development. Furthermore, our vision includes implementing a secure voting system atop MetaMUI, utilizing an online voting protocol synergized with the Identity Blockchain, thus ensuring secure and transparent voting procedures.

The digitization of currency presents novel prospects for digital monetary decision-making. The Bank node, functioning as an early iteration of an Algorithmic Central Bank, employs monetary decisions rooted in financial big data. We envision the application of federated learning algorithms within the central bank node, enabling the aggregation and learning of a decentralized model across numerous mobile agents.

In essence, MetaMUI remains committed to embracing cutting-edge technologies, particularly AI advancements, and leveraging these innovations to continually enhance the capabilities and functionalities of our blockchain platform. Our ongoing efforts are directed toward the fusion of AI-driven flexibility and the steadfastness of blockchain technology, creating a robust and adaptable ecosystem to meet the evolving demands of the digital landscape.

7. REFERENCES

- [1] Seokgu Yun, Sovereign Wallet Co., Ltd., “Method for Operating Offline Cash Payment System”, *KR10-2023-0117367*, 2023
- [2] Seokgu Yun, Sovereign Wallet Co., Ltd., “Blockchain System that includes Bank Nodes each having separate Ledgers for Identity, Digital Currency, and other functions, and operation method thereof”, *KR10-2020-0110742*, 2020
- [3] Seokgu Yun, Sovereign Wallet Co., Ltd., “e-Wallet, Server Performing the e-Wallet, and Atomic Swapping Method of Different Blockchain Tokens using the Server”, *KR10-2020-0066895*, *KR10-2020-0066902*, *KR10-2020-0066908*, 2020
- [4] Seokgu Yun, Sovereign Wallet Co., Ltd., “e-Wallet and Atomic Swapping Method of Two Different Blockchain Tokens using the e-Wallet”, *KR10-2020-0035777*, 2020
- [5] Seokgu Yun, Sovereign Wallet Co., Ltd., “Operation Method of Blockchain Currency Remittance Service System and Electronic Wallet for Currency Remittance”, *KR10-2020-0017717*, 2020
- [6] Seokgu Yun, Sovereign Wallet Co., Ltd., “Method for Operating Application Performing Security Function and Corresponding Application”, *KR10-2101614*, *KR10-1951201*, *KR10-1951201*, 2019, 2016
- [7] Seokgu Yun, Sovereign Wallet Co., Ltd., “Device for Self-Defense Security based on System Environment and User Behavior Analysis and Operating Method thereof”, *Singapore 11201804011V*, *Japan 2018-547246*, 2018
- [8] Seokgu Yun, Sovereign Wallet Co., Ltd., “Self-Defense Security Server with Behavior and Environment Analysis and Operating Method thereof”, *KR10-1905771*, *PCT/KR2017/000204*, 2016
- [9] Seokgu Yun, Sovereign Wallet Co., Ltd., “Method of Securing Application using Self-Protection”, *KR10-2016-0032906*, 2016
- [10] Seokgu Yun, Sovereign Wallet Co., Ltd., “Secure Chat Method using Distributed Key Exchange Protocol and Self-Defense Security”, *KR10-1596479*, *PCT/KR/2016/000887*, 2015
- [11] Mehrdad Kiamari, Bhaskar Krishnamachari, Muhammad Naveed, and Seokgu Yun, “Blizzard: Distributed Consensus for Mobile Devices using Online Brokers”, In *IEEE International Conference on Blockchain and Cryptocurrency*, 2020
- [12] Martin Martinez, Arvin Hekmati, Bhaskar Krishnamachari, and Seokgu Yun, “Mobile Encounter-based Social Sybil Control”, In *The Seventh International Conference on Software Defined Systems (SDS-2020)*, 2020

- [13] Martin Martinez, Arvin Hekmati, Bhaskar Krishnamachari, Seokgu Yun, “Mitigating Mobile Device-based Sybil Attacks using Supervised Machine Learning and Generative Adversarial Networks”, In *IEEE Conference on Computer Communications*, 2021
- [14] Ayten Kahya, Bhaskar Krishnamachari, Seokgu Yun, “Reducing the Volatility of Cryptocurrencies – A Survey of Stablecoins”, Papers 2103.01340, <https://arxiv.org/abs/2103.01340>, March 2021
- [15] David Chaum, Amos Fiat, and Moni Naor. “Untraceable Electronic Cash”. In Proceedings of the 8th Annual International Cryptology Conference on Advances in Cryptology. CRYPTO '88. London, UK, UK: Springer-Verlag, 1990, pp. 319-327. ISBN: 3-540-97196-3. URL: <http://dl.acm.org/citation.cfm?id=646753.704915>
- [16] B. Clifford Neuman and Gennady Medvinsky, “Requirements for Network Payment: The NetCheque Perspective,” In *Proceedings of IEEE COMPCON'95*, March 1995
- [17] Gennady Medvinsky and B. Clifford Neuman. “NetCash: A design for practical electronic currency on the Internet”. In *Proceedings of the First ACM Conference on Computer and Communications Security*, November 1993.
- [18] Satoshi Nakamoto. “Bitcoin: A peer-to-peer electronic cash system”. In: *Consulted 1* (2008), p.2012
- [19] Gavin Wood. “Ethereum: A Secure Decentralized Generalized Transaction Ledger”, In <https://ethereum.github.io/yellowpaper/paper.pdf>, September 2020
- [20] Leonard Adleman, Rolfe R. Schmidt. “Designing Money [Extended Abstract]”. In <https://adleman.usc.edu/aurum-digital-currency/>, March 2018
- [21] Friedrich Von Hayek. “The Denationalization of Money: An Analysis of the Theory and Practice of Concurrent Currencies”, *The Institute of Economic Affairs, Third Edition*, 1990
- [22] Ittay Eyal, Adem Efe Gencer, Emin Gun Sirer, Robbert van Renesse, “Bitcoin-NG: A Scalable Blockchain Protocol”. In *Proceedings of the 13th USENIX Symposium on Networked Systems Design and Implementation*, March 2016
- [23] Jing Chen, Silvio Micali, “Algorand: A secure and efficient distributed ledger”, In *arXiv report* <http://arxiv.org/abs/1607.01341>, May 2017
- [24] Team Rocket, Maofan Yin, Kevin Sekniqi, Robbert van Renesse, Emin Gun Sirer, “(Avalanche) Scalable and Probabilistic Leaderless BFT Consensus through Metastability”, In *arXiv report* <https://arxiv.org/abs/1906.08936>, August 2020
- [25] L.M Goodman, “Tezos – a self-amending crypto-ledger White paper”, In https://tezos.com/static/white_paper-2dc8c02267a8fb86bd67a108199441bf.pdf, September 2014

- [26] Leemon Baird, Mance Harmon, and Paul Madsen, “Hedera: A Public Hashgraph Network & Governing Council”, In <https://www.hedera.com/hh-whitepaper-v2.0-17Sep19.pdf>, September 2019
- [27] Ethan Buchman, Jae Kwon, and Zarko Milosevic, “(Tendermint) The latest gossip on BFT consensus”, In <http://arxiv.org/abs/1807.04938>, November 2019
- [28] Elli Androulaki, Artem Barger, Vita Bortnikov, et al., “Hyperledger Fabric: A Distributed Operating System for Permissioned Blockchains”, In <https://arxiv.org/abs/1801.10228>, April 2018
- [29] The Financial Action Task Force, “12-Month Review of The Revised FATF Standards on Virtual Assets and Virtual Asset Service Providers”, In <https://www.fatf-gafi.org/publications/fatfrecommendations/documents/12-month-review-virtual-assets-vasps.html>, July 2020
- [30] Marek Palatinus, Pavol Rusnak, Aaron Voisine, and Sean Bowe, “BIP39: Mnemonic code for generating deterministic keys”, In <https://github.com/bitcoin/bips/blob/master/bip-0039.mediawiki>, September 2013
- [31] Bank for International Settlements(BIS) Innovation Hub Nordic Centre, “Project Polaris: high-level design guide for offline payments”, In <https://www.bis.org/publ/othp79.pdf>, October 2023
- [32] Bank for International Settlements(BIS) Innovation Hub Nordic Centre, “Project Polaris: handbook for offline payments with CBDC”, In <https://www.bis.org/publ/othp64.pdf>, May 2023
- [33] Bank for International Settlements(BIS) Annual Economic Report 2023, “Blueprint for the future monetary system: improving the old, enabling the new”, In <https://www.bis.org/publ/arpdf/ar2023e3.pdf>, June 2023
- [34] Alex Preukschat and Drummond Reed, “Self-Sovereign Identity - Decentralized Digital Identity and Verifiable Credentials”, ISBN 9781617296598, Manning Publications Co., May 2021
- [35] David Birch, Ed Conway, “Identity is the New Money”, ISBN 9781617296598, London Publishing Partnership, April 2014
- [36] National Bank of Georgia, “The Digital Gel Pilot Project”, <https://nbg.gov.ge/en/media/news/the-national-bank-of-georgia-plans-to-select-a-single-technology-partner-for-the-digital-g>, September 2023
- [37] Cointelegraph, “Yidindji Dollar issued and deployed by Sovereign Yidindji Government”, <https://cointelegraph.com/press-releases/yidindji-dollar-issued-and-deployed-by-sovereign-yidindji-government>, January 2022

www.swnglobal.com