

# 1. Problem

For the first time in history, the dominance of financial intermediaries in asset custody and exchange is yielding to a decentralized, cryptographic clearing process known as blockchain. Blockchain, a General-Purpose Technology (GPT), facilitates the transfer of digital assets between parties; the centralized control of this decentralized process by banking institutions complements and advances the legacy operations of current regulated financial organizations. It drives innovation, enhances service quality, and offers a wide array of value-added enhancements in the monetary environment.

Initially overlooked by many business leaders outside the tech and cryptocurrency sectors, blockchain, utility tokens, and smart contract systems (SCS) are now at the forefront of strategic discussions in banks and credit unions, with blockchain being recognized as a key driver of growth.

Certificates of Deposit (CDs) have long been a staple of the banking industry, offering a safe and predictable way for individuals to grow their savings. As the financial industry undergoes digital integration and process transformation, traditional banking products must adapt to meet the changing expectations of consumers. Blockchain technology presents a unique opportunity for banks to modernize the issuance and management of CDs.

Recently the U.S. banking system reported well over \$1.41 trillion in deposits held in non-negotiable certificates of deposit (CDs). These deposits, static by past and current design, are utilized by banks for investments, loans, and reserve accounts. Dynamically, this market lacks an independent mechanism for auditing the actual owner of the deposit at any given time, except for the bank or institution holding the deposit.

Since their inception, transfer restrictions on Certificates of Deposits (CDs) have had limited utility in diversified investment portfolios, relegating their role to 'protecting and preserving' cash through FDIC insurance. Investment in Certificates of Deposits as 'risk-off' trades, in laddered positions, for example, can still be profitable with portfolio design methods. Hundreds of billions asset appreciation locked away due to interest rate fluctuations – historically, the CD was designed as a one-dimensional 'safe' investment that paid marginally higher interest rates than other deposit types. Despite serving the needs of depositors for decades, with inherent restrictions and limitations, the realization of the near future deployment of Central Bank Digital Currencies (CBDCs) leads us to conclude, that a digital currency restructuring of the financial system is gaining momentum and is underway globally – with the US leading the way. Private concerns such as ours, CDXchange wish to provide practical, thoughtful, intelligent, and sensible digital banking products and solutions, while embracing the requirements of the regulatory community; indeed, there is a critical mission presently in the banking industry to comply with regulations all the while upgrading to new ways of conducting business.

Any CBDC issued by the US Federal Reserve, along with other permitted forms of money such as: Central bank money which is a liability of the central bank. In the United States, central

bank money comes in the form of physical currency issued by the Federal Reserve and digital balances held by commercial banks at the Federal Reserve. Commercial bank money is the digital form of money that is most commonly used by the public. Commercial bank money is held in accounts at commercial banks. Nonbank money is digital money held as balances at nonbank financial service providers. These firms typically conduct balance transfers on their own books using a range of technologies, including mobile apps.

All forms of “allowable capital” outlined above and/or approved, would be directly interfaced and translated to a Blockchain CDX Exchange; a current working model show this works.

The CDX Exchange interface offers a range of benefits. For example, the exchange will provide households and businesses a convenient, electronic form of central bank money, with the safety and liquidity that would entail. CDX Exchange, as a platform on which to create new financial products and services; support faster and cheaper payments (possibly including cross-border payments); and expand consumer access to the financial system. By using the CDX Exchange and utilizing the FED CBDC or other permitted money, the system technology could also eliminate certain risks and would answer a variety of important policy questions: including how it might affect financial-sector market structure first by integration, later by practical action, lowering the cost yet expanding the availability of credit, while improving the safety and stability of the financial system, and the efficacy of monetary policy. By having the CDX Exchange in place Interbank, Intrabank, FED, BIS and Treasury Department goals will be achieved by innovation, and regulatory and management edicts.

CDX is not a cryptocurrency. The CDX Exchange is not a Crypto Exchange rather, it represents a practical, highly efficient, and profitable institutional blockchain banking solution that leverages a permitted controlled Blockchain and Artificial Intelligence. The reader should clearly understand that while a digital asset medium of exchange is utilized, the work product is a new, robust banking operating system with sophisticated real world innovation.

## 2. Solution

CDXchange’s proprietary technology, including fractionalized CD products under a Web 3 proprietary trading platform, enables investors through qualified licensed institutions, to realize assets and manage debt coverage dynamically. This empowers prime users, end users, and investors to fully leverage the intrinsic value return potential of CDX products.

CDXchange is designed as an issuance, trade and settlement exchange for both institutional and eventually, retail participants (through their designated bank) in the dynamic trillion dollar CD marketplace. The CDX Exchange simply, at the top level was initially designed to move conventional legacy CDs, issued by Banks and Credit unions, to the Blockchain. The CDXchange enables depositors, banks, and credit unions to monetize static, non-negotiable asset and liability CDs, and issue new CDs directly to the blockchain with minimal friction and cost.

When CDX created a mechanism to move conventional standard CDs to the Blockchain it also created a “value chain” since the digital world allows for additional product innovation.

CDX has proposed that the downstream “value chain” of moving conventional legacy CDs to the Blockchain provides new opportunities. The CDX can harness the power of blockchain, tokens, smart contracts, and oracles to repackage the cash flows of existing and new issue CDs into investment products (similar to MBS and CMOs). This allows institutional and retail investors to hedge, leverage, and in the future speculate (while protecting principal) with these deposit products through synthetics such as forwards and options, known as Depository Trading Receipts (DTRs).

To start however, at a basic level, banks can underwrite new issue blockchain FDIC/NCUA insured deposits on CDXchange, significantly reducing the costs of obtaining funds. Importantly, the underlying legacy CD remains intact. There is no requirement to take advantage of any value chain. The company has developed a fully functional prototype demonstrating the efficacy of standard legacy CD

The basic construct for a bank or credit union to issue to the blockchain is a digital label within the CDX system, known as Monetize Certificates (MCert) – or Monetary Certificates of Deposits. This semantic label MCert is the CD placeholder on the Blockchain lodged in the CDXchange firmware offers the following benefits:

**Enhanced Security:** CDX Blockchain's cryptographic principles provide unparalleled security, reducing the risk of fraud and unauthorized access.

**Transparency:** CDX Blockchain's transparent and immutable ledger ensures that all CD transactions are recorded and can be audited by both customers and regulators, enhancing trust.

**Accessibility:** CDX Blockchain technology allows for 24/7 access to CD issuance and management, accommodating customers' diverse schedules and global reach.

**Efficiency:** CDX Blockchain streamlines the administrative process associated with CD issuance, reducing paperwork, manual reconciliation, and operational costs.

**eSmart Contracts:** CDX Smart contracts on blockchain automate interest rate calculations, maturity dates, and redemption processes, reducing errors and administrative overhead.

**Advantages for Bank-Credit Unions (CU) Customers: Real-time Updates:** Customers can access real-time updates on their CD status, including interest accrual and maturity date, through a user-friendly interface.

**Reduced Counterparty Risk:** CDX Blockchain ensures that CD contracts are self-executing and trustless, mitigating counterparty risk.

**Fractional Ownership:** Blockchain can enable fractional ownership of CDs, making it easier for customers to diversify their investments.

**Competitive Advantage:** a. **Attracting Tech-Savvy Investors:** Embracing blockchain technology for CD issuance can help banks attract younger, digitally native investors who value transparency and accessibility.

Bank and Credit Unions require privacy when conducting financial activities. At the same time, CDX provided authorities the needed tools to combat illegal activities such as money laundering, tax evasion, and terrorism financing. These methods work in tandem with cybersecurity.

CDX Exchange utilizes several methods to achieve Privacy Methods on the exchange:

**Anonymity Tiers:** CDX provides institutions with different levels of anonymity. For instance, a Bank or Credit Union could have multiple tiers, with varying degrees of privacy. Some transactions could be fully private, while others might require user identification.

**Zero-Knowledge Proofs (ZKPs):** Zero-knowledge proofs allow institutions to prove that a statement is true without revealing the underlying data. CDX transactions can be made more private by using ZKPs, which verify the transaction's validity without disclosing any details.

**Confidential Transactions:** This cryptographic technique conceals the transaction amount but still allows validation by CDX network participants. Confidential transactions can enhance privacy without compromising security.

**CDX Ring Signatures:** Ring signatures enable a CDX transaction to be signed by a group of users, making it difficult to circumvent legitimate transactions or identify the specific user initiating the transaction.

**CDX Multi-Signature Wallets:** FED designated wallets can be designed with multi-signature capabilities, requiring multiple signatures to authorize a transaction, thus increasing privacy and security.

**CDX Decentralized Identifiers (DIDs):** CDX DIDs allow users to control their identity information, sharing only what is necessary for a particular transaction. This approach enhances privacy while still allowing for identity verification when required.

**CDX Off-Chain Transactions:** Some CDX transactions can be conducted off-chain, meaning they occur outside the blockchain and are settled later. This can provide a degree of privacy.

**CDX Regulatory Considerations:** CDX Exchange Privacy-enhancing methods align with regulatory requirements. Central banks and regulatory authorities' rules and standards are "built in" to the CDX Exchange Platform.

**CDX Education and User Consent:** CDX Users are educated about the privacy features and any limitations. Consent mechanisms are in place to allow users to choose their preferred level of privacy for transactions.

**Staying Competitive:** Banks that adopt CDX blockchain technology early will be well-positioned to compete.

Regulatory Compliance: Banks and Credit Unions can integrate regulatory compliance protocols directly into the CDX blockchain system, ensuring adherence to financial regulations. A CDX Smart Contract Rules engine will deploy FED and Treasury Regulations at the top level while admin may append permitted customization for policing.

Preliminary Conclusion: Issuing Certificates of Deposit on the blockchain using the CDX Exchange represents a significant opportunity for traditional banks to modernize their offerings, improve security, enhance transparency, and attract a new generation of customers. The benefits of blockchain technology, including real-time updates, reduced counterparty risk, and efficiency gains, make it a compelling choice for banks and credit unions looking to stay competitive. For regulators, control and integration with CDX systems are essential.

## 3. Technical Overview of CDX Blockchain

### 3.1 Introduction of Blockchain Technologies

A blockchain is a distributed, digital ledger comprising records known as blocks, which are used to record transactions across many computers. Once a block is part of this chain, it cannot be altered retroactively without modifying all subsequent blocks. This feature allows participants to independently and inexpensively verify and audit transactions. Tokens add cryptographic security, while Smart Contract Systems (SCS) direct the actions involving digital assets at any given moment. Blockchain enables financial institutions to efficiently reconcile cross-organization transactions by allowing real-time validation by all participants, including buyers, sellers, and regulators. With a shared ledger where transactions are recorded only once, duplication of effort typical in traditional business networks is eliminated. For example, banks can use distributed ledgers as a settlement log for digital assets bought and sold between market participants.

Cryptographic tokens are sets of rules encoded in a smart contract, known as the token contract. Each token belongs to a blockchain address, which is accessible by CDXchange managing the public-private key pair associated with the address. The owner or custodian of the token, who possesses the private key for that address, can access the tokens. In cases where the token represents an asset, the owner can initiate a transfer of the tokens by signing with their private key, creating a unique digital fingerprint or signature.

A Smart Contract System (SCS) is a set of rules stored on the blockchain, executed automatically to expedite transactions. An SCS can define conditions for any digital asset and is particularly effective with derivatives. Our world is full of various asset classes, from money to gold, real estate, securities, and intellectual property (IP), many of which are challenging to trade or subdivide physically. Blockchain technology provides solutions to these challenges, allowing for the design of digital information units that contain 'property rights.' Owners have direct, exclusive, and defensible access against third parties. This technology includes tools to program a unique set of information that attributes property rights and enables secure, registered public transfers of new types of digitally defined properties. The introduction of SCS at the application level of blockchain adds immutable functions and property terms to digital

assets, facilitating the execution of contractual terms and conditions. This also allows for the creation of co-ownership-like structures. A digital asset, registered on the blockchain, may execute coded functions governed by an SCS, following either coded or manual inputs by an agreed party known as an “Oracle”.

## 3.2 Essential Components in CDX Blockchain Design for CD Transactions

The CDX blockchain incorporates several key components, both internal and external, to enable seamless CD transactions:

### 1. CD Factory Smart Contract

The CD Factory Smart Contract, integral to the CDX blockchain, is tasked with creating individual CD smart contracts. It operates based on specific parameters of each issued CD, such as interest rate, maturity date, and interest payout methods. Deployed directly within the CDX blockchain, this smart contract automates the generation process, ensuring consistency and adherence to predefined criteria for each CD.

### 2. CD Smart Contract

The CD Smart Contract plays a crucial role in issuing a unique, non-fractional NFT token to the CD purchaser. This NFT not only represents the CD ownership but also ensures its transferability among investors. This functionality is fundamental to facilitating the Mcert transaction, allowing for fluid movement of CD ownership within the investment ecosystem.

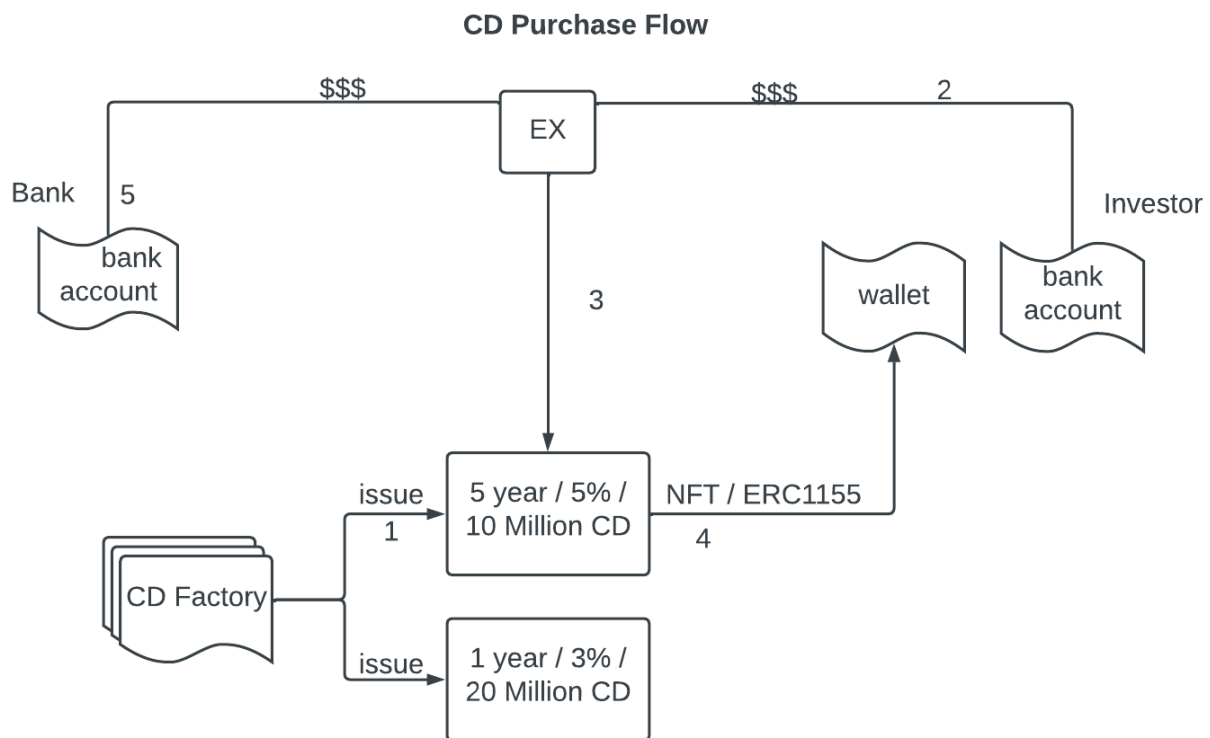
### 3. CDX Exchange & Interbank Blockchain

A key element of the system is the CDX Exchange Interface. This innovative platform allows banks and investors to efficiently convert traditional currencies, such as dollars, into CDX ERC1155 tokens, and vice versa. Acting as a pivotal bridge, the exchange connects conventional financial assets with blockchain-based assets, offering unparalleled flexibility and ease for users managing their investments within the CDX ecosystem.

The CDX Exchange facilitates a seamless exchange of value, catering specifically to banks and businesses. It meets the increasing demand for a system that integrates smoothly with existing financial frameworks, yet leverages the advantages of blockchain technology. This integration enables traditional institutions to engage securely and effortlessly in markets such as Certificates of Deposit, expanding their reach.

Moreover, the CDX Exchange introduces a regulated layer, merging institutional safety with the cutting-edge blockchain solutions of CDX. Furthermore, the CDX Exchange enables near-instantaneous peer-to-peer settlements across different jurisdictions, significantly mitigating settlement and credit risks.

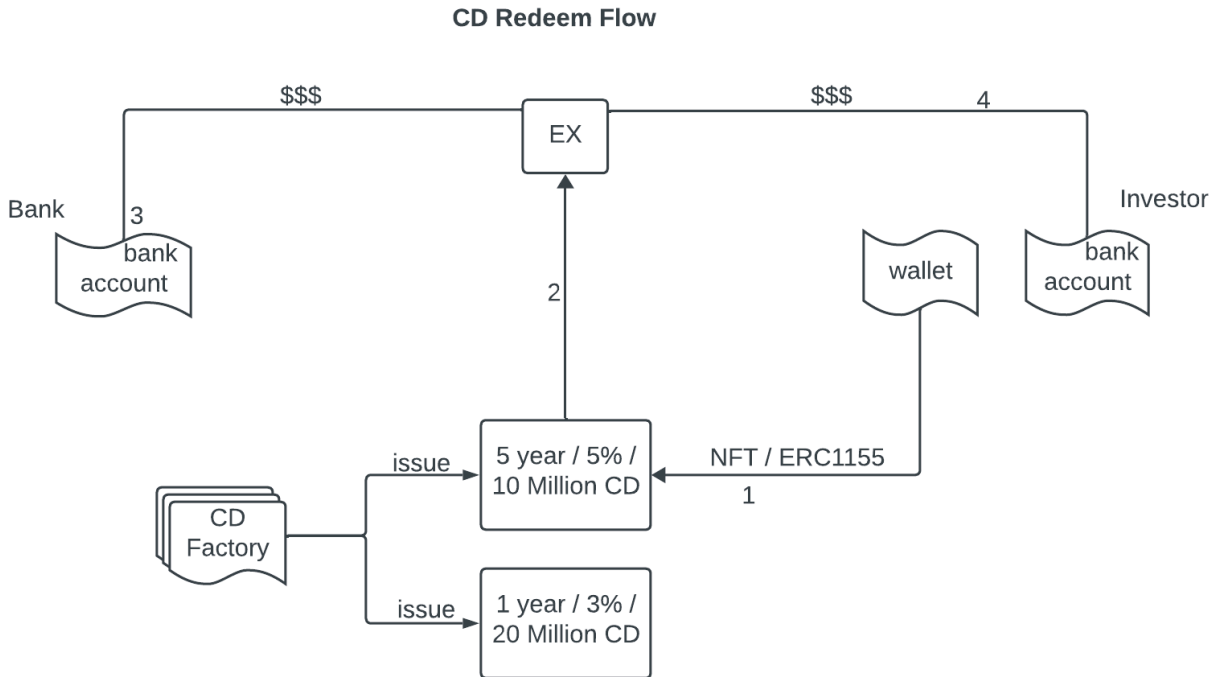
### 3.3 CD Purchase Flow



#### CDX Blockchain Process for Certificate of Deposit Issuance and Investment

1. **CD Issuance by a Bank:** The process begins with a bank issuing a Certificate of Deposit (CD) through the CDX blockchain. This issuance utilizes the CDX blockchain's "CD Factory" feature, which streamlines and automates the creation of the CD.
2. **Investor's Initial Deposit:** An investor starts by depositing a specified sum of money into the exchange. This amount is subsequently converted into CDX's ERC1155 tokens. These tokens are a form of standardized utility NFT tokens that operate within the CDX ecosystem.
3. **Notification to CD Smart Contract:** Following the deposit, the exchange notifies the CD smart contract, prompting the creation of an ERC1155 NFT token.
4. **Issuance of CD as an NFT:** The CD is then issued in the form of a Non-Fungible Token (NFT) and is transferred to the investor's digital wallet. This NFT acts as a digital certificate, signifying the investor's ownership of the CD.
5. **Bank Receives Fiat Currency:** Concurrent with the NFT issuance, the bank receives the corresponding fiat currency, completing the transaction.

### 3.4 CD Redeem Flow



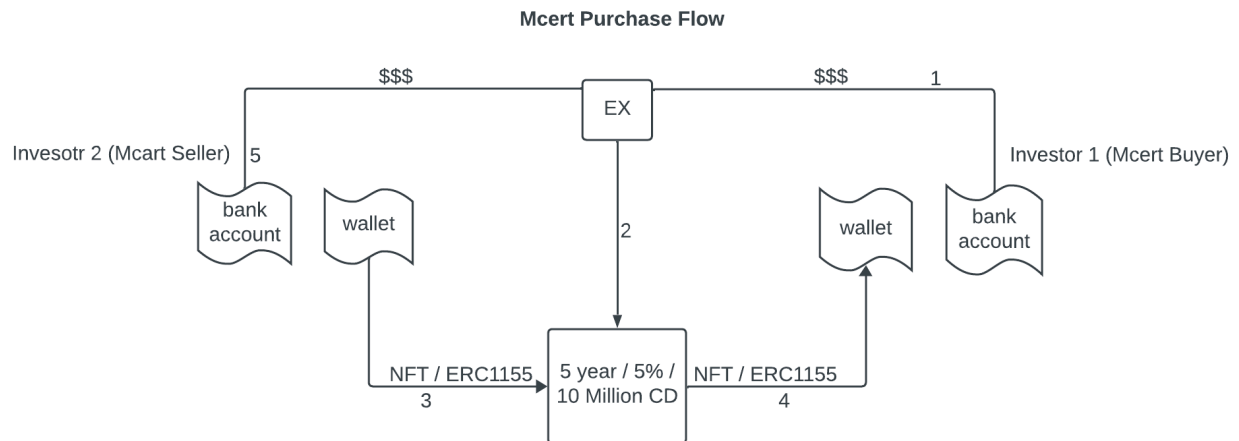
#### CDX Blockchain Process for CD Redemption

The redemption process for a Certificate of Deposit (CD) on the CDX blockchain is similar to the purchase procedure but with distinct steps:

1. **Initiation of Redemption by Investor:** The process starts when the investor initiates redemption. This is done by transferring the CD NFT back to the CD smart contract. The CD NFT is then marked for burning, which symbolizes the conclusion or termination of the CD.
2. **Notification from CD Smart Contract to Exchange:** Upon receiving the CD NFT, the CD smart contract informs the exchange. This triggers the process of transferring the fiat currency from the bank's account to the investor's account.
3. **Bank's Transfer of Fiat Currency:** In response to the notification, the bank proceeds to transfer the fiat currency to the exchange. This step is crucial as it mobilizes the funds necessary for the investor's redemption.
4. **Exchange Transfers Fiat Currency to Investor:** Finally, the exchange completes the process by transferring the fiat currency into the investor's bank account, thus concluding the redemption of the CD.



### 3.5 Mcert Purchase Flow

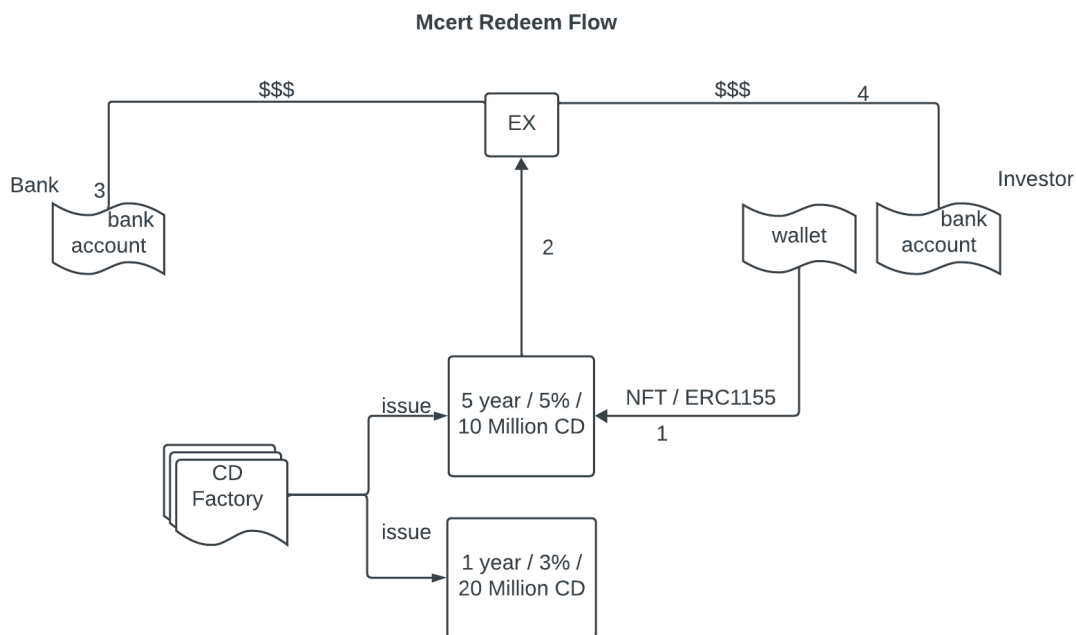


#### CDX Blockchain Process for Mcert Transaction (CD Transfer Between Investors)

The Mcert transaction on the CDX blockchain facilitates the transfer of a Certificate of Deposit (CD) between two investors. This process involves transferring the ownership of the CD without creating a new CD NFT. Instead, the existing NFT is moved from one investor's wallet to another's.

1. Initial Deposit by Investor 1: The transaction begins with Investor 1 depositing a specific amount of money into the CDX exchange. This deposit is the precursor to the transfer of the CD.
2. Notification to CD Smart Contract for Transfer: Following Investor 1's deposit, the exchange notifies the CD smart contract. This notification serves as an instruction to transfer the CD NFT from Investor 1's wallet to Investor 2's wallet.
3. Transfer of CD NFT to the CD Smart Contract by Investor 2: In response, Investor 2 sends the CD NFT from their Web3 wallet to the CD smart contract, signaling readiness to receive the CD.
4. CD NFT Transfer to Investor 1: The CD NFT, which represents the ownership of the CD, is then transferred from the CD smart contract directly into Investor 1's wallet. This action effectively shifts the CD ownership to Investor 1.
5. Funds Deposited in Investor 2's Account: Completing the transaction, the fiat currency is deposited into Investor 2's bank account. This final step concludes the financial aspect of the Mcert transaction.

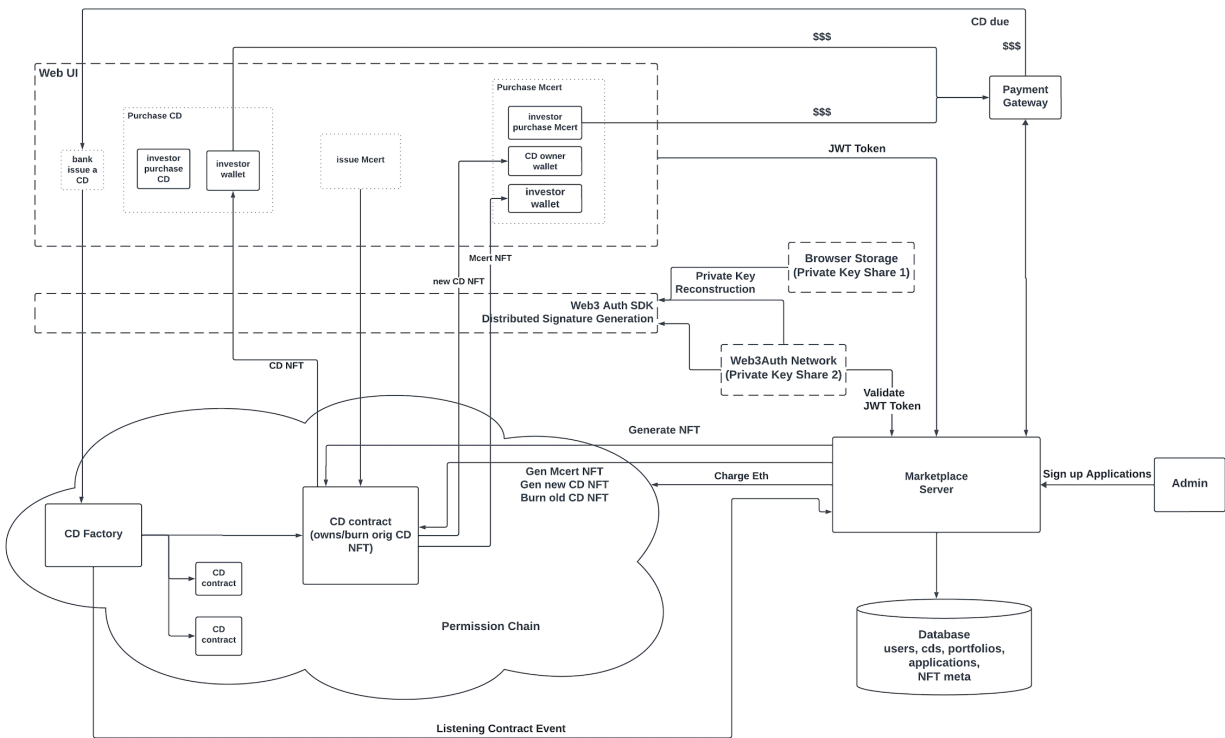
### 3.6 Mcert Redeem Flow



The process for redeeming an Mcert is almost the same as redeeming a Certificate of Deposit (CD) on the CDX blockchain mirrors the purchase flow, with a few key differences:

1. **Initiation of Redemption by Investor:** The process starts when the investor initiates redemption. This is done by transferring the CD NFT back to the CD smart contract. The CD NFT is then marked for burning, which symbolizes the conclusion or termination of the CD.
2. **Notification from CD Smart Contract to Exchange:** Upon receiving the CD NFT, the CD smart contract informs the exchange. This triggers the process of transferring the fiat currency from the bank's account to the investor's account.
3. **Bank's Transfer of Fiat Currency:** In response to the notification, the bank proceeds to transfer the fiat currency to the exchange. This step is crucial as it mobilizes the funds necessary for the investor's redemption.
4. **Exchange Transfers Fiat Currency to Investor:** Finally, the exchange completes the process by transferring the fiat currency into the investor's bank account, thus concluding the redemption of the CD.

### 3.7 System Architecture



#### The Need for a Permissioned Blockchain in CDX:

In the financial sector, where the issuance and trading of Certificates of Deposit (CDs) are critical, the need for a robust, secure, and efficient system is paramount. This is where the CDX platform, as a permissioned blockchain, plays a pivotal role. Unlike public blockchains, a permissioned blockchain like CDX offers several key advantages tailored to the needs of the financial market.

**Enhanced Security and Trust:** In a permissioned blockchain, access is restricted to a selected group of users. This controlled access ensures enhanced security, a crucial aspect when dealing with sensitive financial transactions. It builds a trusted environment where participants can confidently engage in the issuance and trading of CDs, knowing their transactions are protected against unauthorized access and malicious activities.

**Regulatory Compliance and Oversight:** The financial market is heavily regulated, and compliance with these regulations is not just essential but mandatory. CDX's permissioned nature allows for regulatory bodies to be integrated into the network, ensuring that all activities comply with existing financial regulations and standards. This integration is pivotal for maintaining the integrity of the financial system and for upholding the trust of all stakeholders involved.

**Efficient Transaction Processing:** In a permissioned blockchain, the transaction processing is often faster and more efficient compared to public blockchains. This efficiency is due to the

reduced number of nodes needed to validate transactions. For CDX, this translates into quicker issuance and trading of CDs, enhancing the overall user experience and effectiveness of the financial market.

**Customization and Control:** A permissioned blockchain like CDX can be customized to suit the specific needs of the financial market. This flexibility allows for the creation of tailored solutions for the issuance, trading, and management of CDs, providing a competitive edge in a market that is constantly evolving.

**Interoperability with Existing Financial Systems:** The permissioned nature of CDX facilitates easier integration with existing financial systems and infrastructures. This interoperability is crucial for seamless transactions and for bridging traditional financial practices with innovative blockchain technology.

In summary, the choice of a permissioned blockchain for CDX is a strategic one, aligning with the need for security, regulatory compliance, efficiency, customization, and interoperability in the financial sector. This approach not only enhances the trust and reliability of CDX as a platform for issuing and trading CDs but also positions it as a forward-thinking solution in the evolving landscape of financial technology.

#### **CDXchange permissioned blockchain technology:**

CDXchange has been implemented with several key benefits as a permissioned blockchain platform, making it an attractive choice for financial businesses looking to leverage blockchain technology:

1. **Simplified Consortium Building and Deployment:** CDXchange simplifies the process of creating consortia and deploying private blockchain networks. This is particularly beneficial for businesses that need to collaborate with various stakeholders while maintaining control and privacy over their blockchain network.
2. **Permissioned Ethereum Protocol:** By providing a permissioned implementation of the Ethereum protocol, CDXchange ensures authenticated identities for its participants, backed by digital certificate chains. This feature enhances security and trust among network participants, a crucial factor for businesses handling sensitive or proprietary data.
3. **Open and Flexible Platform:** The platform is designed to be highly open and pluggable, allowing businesses to integrate various digital assets and tokenization strategies. This flexibility is essential in the rapidly evolving world of Web3, where adapting to new standards and technologies is key.
4. **Reduced Complexity and Quick Setup:** CDXchange's platform reduces the hurdles and complexity typically associated with enterprise-grade blockchain implementations. It enables businesses to quickly register and configure a private environment to meet their specific needs, thus accelerating the adoption and practical use of blockchain technology.

5. Enterprise-Grade Web3 Solutions: As an enterprise-grade Web3 platform, CDXchange is tailored to meet the demands of businesses. This includes offering robust, scalable solutions that cater to the unique challenges faced by enterprises when adopting blockchain and digital assets.

6. Comprehensive Blockchain Solution: The platform offers a comprehensive solution for creating, connecting, and scaling blockchain networks and digital assets. This comprehensive approach ensures that businesses have all the tools and capabilities they need in one platform, streamlining their blockchain initiatives.

7. Security and Compliance: Given its focus on enterprise use, CDXchange likely emphasizes strong security measures and compliance with relevant regulations, which are critical for businesses, especially those in regulated industries.

In summary, CDXchange's permissioned blockchain platform stands out for its ease of use, flexibility, security, and enterprise-grade capabilities. These features make it well-suited for businesses seeking to deploy blockchain solutions efficiently and securely, while maintaining the ability to adapt to the evolving landscape of digital assets and Web3 technologies.

#### **CDXchange's dedicated wallet and authentication Service:**

CDXchange has built an authentication and wallet service for accessing both the centralized backend and the permissioned CDX blockchain which:

1. Streamlined User Onboarding: the authentication service simplifies the process of onboarding users, making it more intuitive and less time-consuming. This is especially beneficial for users who are new to blockchain technology, as it offers an experience they are comfortable with, thereby increasing user adoption and satisfaction.

2. Enhanced Security: The platform's wallet infrastructure enhances security for decentralized applications and blockchain wallets. By leveraging unique cryptographic key providers for each user and application, the authentication service ensures that each transaction and interaction on the CDX blockchain is secure and authenticated.

3. Intuitive Wallet Management: the authentication service's infrastructure is designed to make the management of cryptographic wallets more user-friendly. This includes distributing a user's private key across multiple key shares, which forms a 'web of trust' and enables multi-factor account handling. Such an approach increases security while maintaining usability, which is crucial for financial transactions on the blockchain.

4. Non-Custodial and Seed Phrase-Free Wallets: The use of Multi-Party Computation (MPC) in the authentication service allows for the creation of secure, non-custodial wallets that are seed phrase-free. This feature is significant in enhancing user trust and security, as users have full control over their wallets without the risk associated with managing seed phrases.

5. Threshold Cryptography for Wallet Shares: the authentication service utilizes threshold cryptography for the management of wallet shares. This method of managing wallets through

generated shares adds an extra layer of security. It ensures that no single entity has complete control over a wallet, which is vital for protecting users' assets on the CDX blockchain.

6. **Compatibility with Centralized Systems:** The integration of authentication service with both the permissioned CDX blockchain and centralized backend systems provides a seamless experience for users. This compatibility is essential for systems that operate with a combination of decentralized and traditional centralized architectures.

7. **Flexibility and Adaptability:** the authentication service's pluggable nature allows for greater flexibility and adaptability in integrating with various blockchain networks and applications. This can be particularly beneficial for the CDX blockchain as it evolves and scales.

8. **Regulatory Compliance:** For financial applications like CDX, compliance with regulations is crucial. Web3Auth's secure and authenticated user management system aids in adhering to regulatory requirements, particularly those concerning user identification and transaction security.

In conclusion, incorporating an authentication service into the CDX blockchain platform for authentication and wallet services brings a host of benefits, including enhanced security, streamlined user experience, and improved regulatory compliance, all of which are crucial in the context of financial blockchain applications.