



Whitepaper

Deposit Token Infrastructure
Bringing Banks On-Chain

Abstract

This paper anatomizes internal (web3-native) and external (traditional) market demand for tokenized, on-chain fiat currency units.

The argument herein is structured in three parts. The first examines organic market demand for stable-valued digital assets within and beyond the web3 space, and defines the characteristics that a fiat-pegged token must possess in order to both (1) serve as a volatility hedge within the digital asset space and (2) serve as an acceptable medium of exchange in the broader financial landscape. Subsequently, this section evaluates stablecoins through the lens of these characteristics, and delineates the inherent structural flaws that have prevented stablecoins from maintaining their pegs in on-chain environments, and have effectively siloed the digital asset space from financial institutions and banks seeking to leverage Distributed Ledger Technology (DLT) and public blockchains in their operations.

The second part introduces a comprehensive model for deposit tokens: stable-valued on-chain tokens that can be issued directly by banks based on core banking deposits, and whose reserves can be monitored in real time using core banking apis. By disintermediating issuance, redemption, and cross-border transfer processes, deposit tokens drastically reduce costs, latency, and counterparty risk.

The third part addresses the viability of deposit tokens by presenting Fluent's proprietary tech stack as a middleware infrastructure that enables banks to issue and redeem deposit tokens directly on public blockchains, and to settle seamlessly with other banks. In closing, this section presents USPlus, Fluent's pilot project that exhibits the core capabilities of Fluent's technologies.

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I - Web3: A Modern Market Analysis

Despite amassing a \$1 trillion market capitalization and drawing the attention of institutions and governments, the digital asset space continues to grow in parallel to – and often at odds with – the traditional financial landscape. Aside from internal efforts to spin up private blockchains, banks and financial institutions have almost entirely refrained from adopting web3 technologies, in spite of the many systemic benefits they confer in process efficiency, programmability, cost reduction, and verification functions.

The failure of digital assets to achieve mass market penetration was originally attributed to volatility concerns. However, while the emergence of the hundred-billion dollar stablecoin sector has proven to be a potent growth driver for web3-native applications, stablecoins have entirely failed to pick up traction in traditional use case scenarios.

Benefits, Barriers, and Pain Points

Web3 technologies and digital assets they support confer a number of measurable and tangible benefits to the prevailing systems in use in legacy finance.

Enhanced Process Efficiency:

Web3 technologies vastly improve process efficiency through disintermediation. The processes that make up legacy financial systems – and in particular, correspondent banking – are notoriously clunky, expensive, and saturated with intermediaries. Web3 technologies leverage smart contracts to automate and simplify otherwise-complex task flows, allowing for seamless, borderless, and highly efficient capital transfers that drive down costs and diminish latency.

Programmability:

In addition to expediting critical processes, smart contracts and other web3-native tooling enable a degree of programmability and versatility several orders of magnitude beyond the rigid, inflexible financial systems in use today. In conjunction with proper integrations, web3 technologies stand to provide financial institutions and their clients with access to a new class of investment vehicles and financial instrumentation, some of which has already taken form in web3's emergent, billion-dollar decentralized finance (DeFi) sector.

Verification:

Public blockchains provide an unparalleled degree of transparency for transactions, account balances, and identity information that can be employed in superior verification systems.

As a nascent industry, web3 technologies also introduce novel challenges and pose novel risks to institutions and organizations – including those friendly to and familiar with innovation.

Volatility: Notorious for extreme price swings, web3's speculative appeal, high-risk derivatives sector, and relatively low liquidity have together rendered its digital assets unfit for traditional use case scenarios. Stable-valued tokens backed by established markets and robust real world assets (RWA) will play integral roles in facilitating the adoption of web3 technologies.

Compliance: In order to properly account for digital assets, conduct business development with service providers within the web3 space, and remain compliant with existing legislation, banks and

financial institutions need clear guidelines pertaining to the operations and classifications of various web3 technologies and digital assets.

Security and Counterparty Risk:

Web3's early-stage tech stacks and the bridges that facilitate capital flows between them have proven to be ripe with attack vectors. Leading on-chain data analytics firm Chainalytics declared 2022 the "Biggest Year Ever for Crypto Hacking"¹ in a report covering more than 250 hacks that resulted in the displacement of \$3.8 billion. Accountability, security, and counterparty risk remain web3's greatest barriers to picking up traction in traditional use case scenarios.

The Stablecoin: A Makeshift Solution

The stablecoin was conceived to serve a singular function: to provide web3 users with a tokenized, on-chain alternative for fiat currency exposure. Initially, stablecoins acted as a growth driver for web3 ecosystems by increasing on-chain capital retention. Coupled with the rise of DeFi, stablecoins experienced several iterations of parabolic growth, ultimately becoming some of web3's largest and most popular digital assets by market capitalization.

However, in spite of their early-stage role as an on-chain safe-haven, stablecoins have been plagued by systemic risk and inefficiencies that have rendered them both unsafe and unstable. Opaque reserve management, inadequate reporting, and compliance issues have produced frequent depeggings, insolvencies, and several catastrophic meltdowns.

The fundamental challenge that stablecoins have always faced revolves around their issuance and custody. Stablecoins are issued by lean web3 startups that have an intimate understanding of on-chain environments, but little experience in the world of traditional custody, compliance, and reporting. Stablecoin issuers must take it upon themselves to arrange a loosely affiliated network of banks, accounting firms, and legal experts to manage and audit their reserves across jurisdictions, while depending on highly intermediated processes to facilitate issuance and redemption.

In addition to requiring significant intermediaries and centralized process flows, stablecoin operations carry inherent risks and uncertainties that are untenable for traditional institutions, and a degree of fragility that has harmed unwitting web3 users who have been left out to dry during depeggings and insolvencies.

Tokenized Fiat: The Unresolved Dilemma

For several years, the stablecoin sector has extended its unsatisfactory tenure as web3's leader in tokenized on-chain fiat due to the inertia created by its market dominance and the lack of viable alternatives entering the market.

Nonetheless, 2023 has been a year of much-needed transition. Most notably, a surge in demand for stable, compliant, and fully backed on-chain fiat currency tokens materialized and has begun to pick up momentum. Financial institutions have both publicly expressed interest in use cases for tokenized RWAs and taken action to develop in-house stablecoin-alternatives. Citigroup announced the launch of a private digital token service for its institutional clients in September,² while June saw JPMorgan and 6 Indian banks announce their commitment to settle dollar-denominated trades on Onyx, JPMorgan's permissioned system that acts as an internal payment rail and ledger.³

¹ Chainalysis Team. (2023, August 17). 2022 biggest year ever for crypto hacking.
<https://www.chainalysis.com/blog/2022-biggest-year-ever-for-crypto-hacking/>

² Di Salvo, M. (2023, September 18). Citigroup will let rich clients use private blockchain to transfer assets. Decrypt.
<https://decrypt.co/197602/citigroup-launches-smart-contract-digital-token-service-for-institutions>

Looking ahead, many in the traditional financial industry are beginning to eye the prospect of tokenizing not only fiat currencies, but a massive, multi-trillion dollar RWA sector, whose related investment vehicles and financial institutions have just as much to gain from seamless cross-border transfers, reduced latency and fees, and simplified verification. With a vast expanse of private investments lined up for tokenization in the on-chain world, the missing piece for many players in the traditional financial space is a sustainable proxy for on-chain fiat whose custody, reserve management, and compliance can be trusted.

Naturally, banks and financial institutions would prefer not to take on the brunt of the work in building out deposit token infrastructure for public use. The expenses and workload required to run nodes, manage wallets, and perform api integrations are a major undertaking. However, the potential for an on-chain RWA sector would establish numerous \$100 million endpoints and provide such immense systemic benefits that banks have extended themselves to build out early, private iterations of what will ultimately become a cohesive, public layer ecosystem. A network of walled gardens and siloed private ledgers will not make for a seamless next-generation global financial system, and public ledgers and infrastructure that support fundamental deposit token operations will play an integral role in bringing these technologies to market.

Meanwhile, within the web3 space, 2023 has dropped early hints at a systemic departure from stablecoins. Even without an adequate on-chain alternative, users have exhibited a consistent, rising preference for conventional treasuries and banking deposits amidst diminishing trust for stablecoins. In July 2023, the stablecoin sector recorded its sixteenth consecutive month of declining market capitalization.⁴

While trust in and demand for stablecoins continues to attenuate, broader demand for tokenized on-chain fiat is poised to surge throughout the remainder of the decade. A public layer for the issuance of trusted, on-chain tokenized fiat currency is not only the critical catalyzing agent for the adoption of web3 technologies in traditional finance, but for the integration of a multi-trillion dollar RWA sector into the on-chain domain.

II - Public Layer Deposit Token Infrastructure

Within web3 ecosystems, deposit tokens support the same core functionalities as stablecoins. Like stablecoins, deposit tokens represent tokenized fiat currency units on public blockchains. Also like stablecoins, deposit tokens are minted, burned, and exchanged in on-chain environments maintained by decentralized bodies of nodes, where transactions, balances, and wallet addresses can be verified in real time.

The critical feature that distinguishes deposit tokens and their potency to catalyze mass market adoption lies in their issuance model. Unlike stablecoins, deposit tokens are issued directly by banks based on fiat currency deposits in their core banking systems. On this accord, deposit tokens represent tangible reserves held at regulated financial institutions that operate under strict reporting standards. Deposit tokens allow web3 users, traditional financial institutions, and their clients to reap the benefits of both worlds: the robust security, regulatory compliance, and trusted custody present in traditional finance, and the efficient, flexible, and borderless paradigm native to on-chain ecosystems.

³Crawley, J. (2023, June 5). JPMorgan, 6 indian banks to settle dollar trades on Onyx blockchain system: Bloomberg. CoinDesk Latest Headlines RSS. <https://www.coindesk.com/business/2023/06/05/jpmorgan-6-indian-banks-to-settle-dollar-trades-on-onyx-blockchain-system-bloomberg/>

⁴Lindrea, B. (2023, July 21). Stablecoin dominance slides as market cap falls to near 2-year lows: CCData. Cointelegraph. <https://news.oprimex.com/altcoin-news/stablecoin-dominance-market-cap-nears-two-year-low/>

Unlike private layer deposit token systems developed by individual institutions, public layer deposit token infrastructure acts as an inclusive, open network that allows banks to issue tokens based on core deposits without taking on the burden of managing an entire network and related integrations. To provide security and ensure trust, all processes of deposit issuance and redemption are conducted directly through the bank where deposits are held, whereas the remainder of a deposit token's life cycle takes place in open, and borderless on-chain ecosystems.

Systemic Benefits & Opportunities

Deposit tokens not only streamline processes related to capital transfers, but they also eliminate the unnecessary middlemen that occupy and obfuscate stablecoin issuance models. For public layer deposit token infrastructure, the benefits of direct issuance, trusted custody, regulatory compliance, and low barriers to entry are immense and far-reaching.

By providing banks with an effective plug-and-play solution for deposit token issuance, public layer deposit token infrastructure disintermediates all cross-border transfer processes, enabling highly efficient international trade and commercial operations, as well as low-latency procedures for bank-to-bank settlement.

Public layer deposit token infrastructure also provides financial institutions and their clients with simple, secure, and instant access to web3 ecosystems and applications, and all yield opportunities therein. Deposit tokens allow individuals and institutions to move capital between their deposit accounts and web3 wallets without going through centralized exchanges or other expensive, high-latency alternatives.

Most importantly, by providing a disintermediated issuance model, real time reserve transparency via core banking apis, and compatibility with traditional finance and core banking systems, deposit tokens introduce the first trusted form of tokenized, on-chain fiat with extremely low counterparty risk.

As such, deposit tokens provide the necessary sustainability and robustness to serve web3 users as a stable volatility hedge, but also enlist the necessary reserve transparency, compliance, and trusted custody to serve institutions in traditional use case scenarios. In practical terms, with deposit tokens, moving stable-valued capital is as easy and cheap as verifying the reserves that back it.

Prominent Use Cases

In the current financial landscape, deposit tokens stand to provide immediate value in two primary use case scenarios.

International Trade Finance:

Even in the modern world's rapidly growing international trade sector, transferring capital across borders is a capital- and time-intensive process that enlists a host of intermediaries. While current fintech solutions alleviate some of the friction, the latency and costs inherent in correspondent banking simply cannot compete with the instant finality, low-costs, and verification solutions provided on-chain alternatives.

Public layer deposit token infrastructure allows banks from participating nations to establish open trade corridors with partner nations and vastly accelerate trade finance and commercial operations. In conjunction with standard on-chain tooling, verification tools provide time-stamps

for fund receipts and streamline previously complex transfer processes. Cost and time savings are to be reaped not only by banks themselves, but commercial enterprise and entire national economies.

Humanitarian Aid Delivery:

In the humanitarian aid vertical, latency, high transaction costs, and a lack of transparency impede efficacy and often lead to suboptimal aid delivery. Delays and errors are most common in the last mile of delivery, where undeveloped infrastructure presents critical challenges.

Deposit tokens enable instant, borderless transactions without unnecessary intermediaries and fees. Transparent on-chain tooling and identity solutions are compatible with deposit tokens, and ensure that aid reaches its intended recipients, which are almost always members of the lowest income demographic whose participation in the global economy stands to have the greatest impact.

III - Fluent Finance

Fluent Technology Stack

Fluent is composed of various entities and systems that work together to bridge the traditional financial system with the public blockchain market. The diagram below depicts three distinct application boundaries in the Fluent ecosystem.

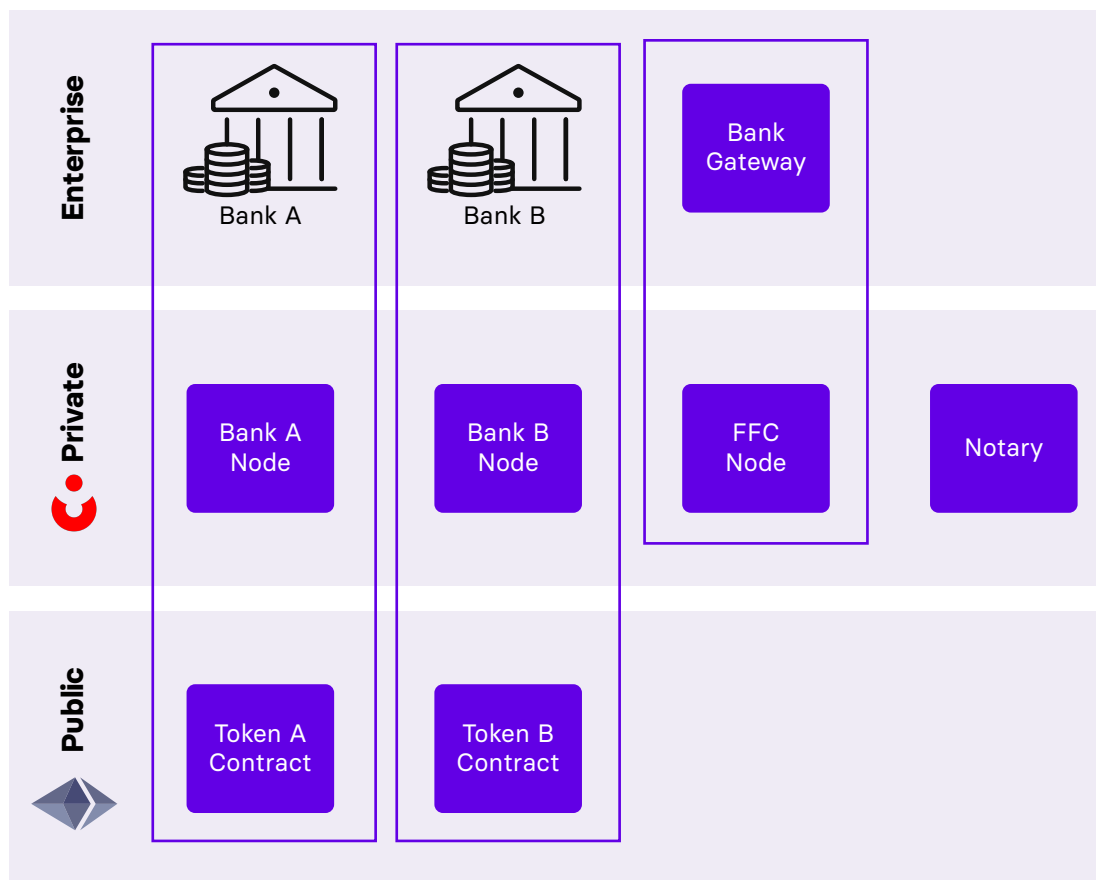


Figure 1: Three layers across the Fluent application stack

Enterprise Layer

The enterprise layer is made up of a gateway that provides a secure bridge from core banking systems to the permissioned ledger, Corda Network. The gateway helps to normalize data structure while orchestrating and aggregating services targeted at decoupling dependencies in release of the core banking systems and the private network.

Private Network

The private network (F-Net) is built on the Corda distributed ledger. Corda provides the Federation with guarantees of participant-approved, transparent transactions with finality over sparsely-replicated data. Transactions occur through secure communication channels between nodes linked to well-known legal identities, and each Federation Member is required to operate a Corda node to join the F-Net and participate in mandatory Federation functions.

The core functions provided by the F-Net create a robust private settlement and payment system while facilitating the on-chain minting and burning of deposit tokens. The F-Net also receives information via third-party oracles for posted transactions with Federation Member collateral accounts. The following sections delineate these functions in greater detail.

Public Network

The initial offering of smart contracts will be deployed to EVM-compatible networks. The smart contracts provide several on-chain functions which can be invoked to expand, reduce, and distribute tokens. These functions include:

- Minting and burning
- Signature verification
- Allow and deny list
- Address assigned roles
- Reply attack prevention
- Event logs

Network Design

F-Net is a collection of Corda nodes with a vetted, unique identity that share a common trust root from which all certificates and signatures are ultimately derived. F-Net security design relies heavily on the use of public key infrastructure. The platform assumes that a certificate authority will manage the node on-boarding and permissioning processes. FFC will act as the business network operator and certificate authority for F-Net.

F-Net comprises nodes run by each Federation Member and an FFC node. The FFC must provide a signature over any mint request once a deposit has been verified. The user then includes this signature in the mint function on the public layer. This mechanism is further detailed in the [Trail of Signatures](#) section.

The ecosystem accesses the Corda nodes through standard, secured web services. Communication is encrypted using TLS/SSL. These web servers securely connect to the Corda node using an RPC client. All HTTP communications are encrypted using TLS.

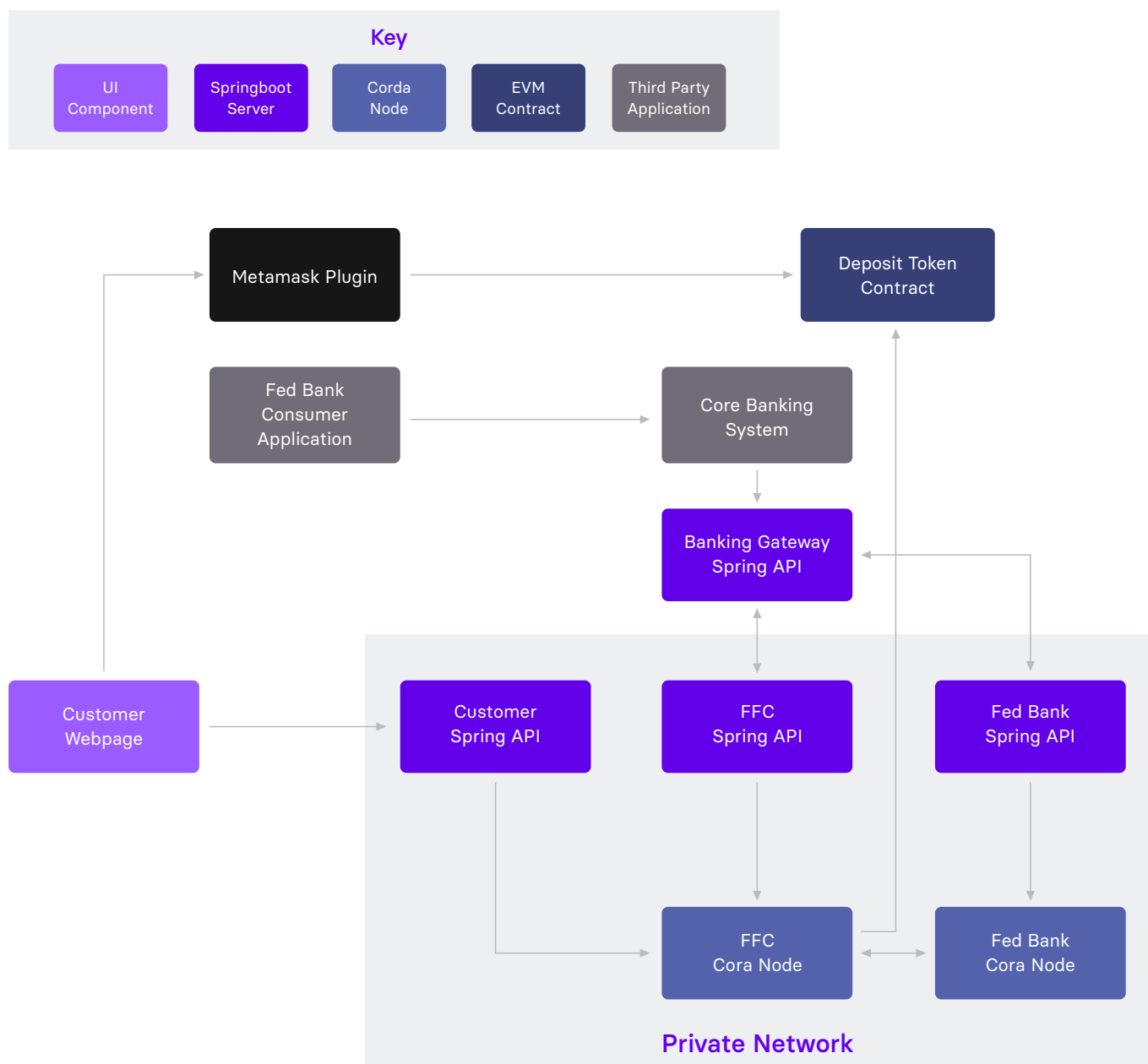


Figure 2: Component architecture diagram

Minting and Redemption

The issuance and redemption flows on F-Net are vital components that enable the minting and burning of deposit tokens on the public blockchain.

Trail of Signatures

The idea is such that any action approved by all relevant parties is executable on-chain. Integration with different blockchains can be difficult as these platforms vary in terms of technology used and flows that need to integrate. We navigate this issue by moving more of the logic to the private layer which sends a signed hash to the public layer that checks a set of policies before executing the action – either a mint or burn.

Minting Process

The following process is orchestrated by a complimentary set of controls enforced by smart contracts on F-Net, as well as the controls enforced by public contracts:

1. A user initiates a minting request by depositing fiat currency into a reserve account held at a Federation Member Bank.
2. The enterprise gateway sees the deposit, and the Federation Member node initiates a minting the request for F-Net dollars by assigning a “Requested” status. This mint request has a unique identifier generated in the private layer.
3. The deposit is then verified via the gateway integration, which then assigns F-Net dollars a “Verified” status.
4. The FFC node has a service that picks up and countersigns the mint request, returning a mint receipt hash, the signature over that hash, and a timestamp.
5. The user receives an email notification that the mint request has been signed for by the FFC, and they can confirm the mint via the consumer webpage.
6. The deposit tokens are then transferred to the wallet address linked with the bank account of the user who made the deposit in Step 1.

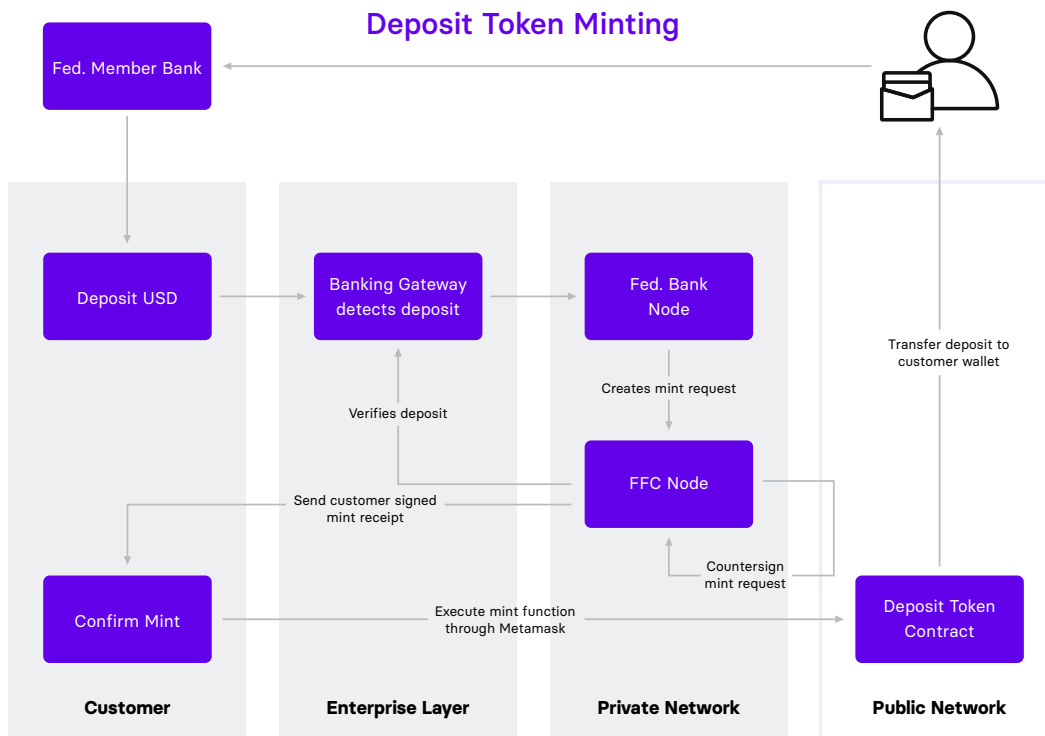


Figure 5: Redemption process

Given the transaction volume the system expects, the approval and rejection process can be configured to only require manual intervention above a threshold notional amount.

Bank-to-Bank Settlement

To ensure real-time settlement, every bank within the Fluent network must maintain both Nostro and Vostro accounts with every other participating bank. This infrastructure enables a customer of Bank A to transfer deposit tokens to a customer of Bank B. The recipient at Bank B can then immediately redeem these tokens, where the corresponding funds are debited from Bank A's Nostro account held at Bank B.

In a model where numerous banks issue, transfer, and redeem deposit tokens across borders, it is relatively simple to integrate an on-chain netting mechanism. Such a mechanism optimizes efficiency by significantly reducing the number of inter-bank transfers necessary for effective liquidity management.

USPlus Pilot

The Fluent Protocol framework was piloted by deploying the USPlus stablecoin, which assures a provable one-to-one correspondence between USPlus tokens and fiat currency held in custody at a federation of regulated financial institutions, which themselves provide primary issuance and redemption between the stablecoin and fiat.

Customer Onboarding

All users must complete a streamlined Know Your Customer (KYC) process with Fluent prior to minting or redeeming PLUS tokens. This onboarding procedure consists of a two-step verification process that includes registering a verified email address and establishing proven ownership of the digital wallet intended for linkage with the user's bank account. After successfully verifying the wallet and submitting the requisite personally identifiable information (PII), customers gain the ability to link their verified digital wallet to their preferred bank account, which can then be used for both minting and redeeming PLUS tokens.

Multi-Currency

Fluent offers a robust multi-currency capability, accommodating a wide range of both fiat and digitally-native PLUS currencies. When a user opts to connect their bank account to the Fluent wallet, they are automatically guided to deal only with currencies that their banking institution explicitly supports. This consistency ensures a seamless and frictionless experience, avoiding complications that can arise from incompatible currency operations. These parameters have been implemented using on- and off-shore bank reserve accounts in Customers Bank and Deltec.

Moreover, Fluent has implemented a dedicated reserve account system, wherein each account is tailored to handle a specific type of currency. This strategic architecture eliminates any foreign exchange risks for Fluent, as each reserve account solely manages transactions in its designated currency. By doing so, Fluent ensures a stable and risk-averse environment for currency minting and redemption, reinforcing the reliability and safety of Fluent's technologies.

Multiple Public Networks

The inaugural launch of smart contracts has been executed on networks compatible with the Ethereum Virtual Machine (EVM). Specifically, the USPlus token has been successfully deployed across the XDC, Ethereum, Arbitrum, and Celo blockchains. Trading pairs involving USPlus are readily available on the Uniswap decentralized exchange.

Compliance Integrated

PLUS infrastructure has a direct integration through the private network with Chainalysis, a recognized leader in on-chain analytics. This integration enables the generation and monitoring of a

risk score associated with a user's wallet during the onboarding process, as well as with each subsequent issuance and redemption. The risk score allows Fluent to identify high-risk activity and prevent cryptocurrency transactions involving addresses identified on OFAC's sanction list, freeze deposits from hacks, or ransomware.

Real-time Public Reserve Reporting

By enabling read-only access to the balances API on the banking gateway integration, Fluent provides real time reserve reporting that is available on Fluent's [public dashboard](#).

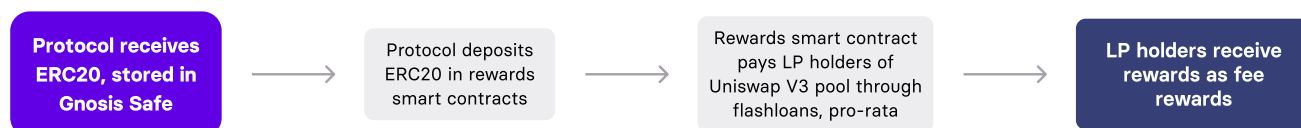
General Ledger Accounting

The Treasury and General Ledger component within the enterprise layer of FFC records all financial transactions across the Fluent stack and facilitates audits for Nostro accounts and F-Net operations. The Treasury and General Ledger component also integrates with SAP to manage liquidity and risk. Running on SAP S/4HANA, the SAP Application Stack ensures that operational and investment reserve entries align with F-Net activities and public network balances.

SAP S/4HANA Finance collects data from Nostro Bank statements, F-Net events, and the Treasury and Risk Management module. It also records transactions in suspense accounts that balance out at the close of each business day. Every transaction within these accounts is tagged with a unique identifier from the originating F-Net mint and burn request, maintaining financial accuracy and transparency.

Fluent in DeFi: Yield Generation on Deposit Tokens

Flow Rewards Smart Contract Technical Overview



Just like other digital native media that are stored, exchanged, and transferred on public blockchains, Fluent's deposit tokens can generate yields for their holders via decentralized financial applications. Fluent is already utilizing Flow Rewards' smart contracts in conjunction with our pilot product, USPlus, to offer yield-bearing opportunities to liquidity providers on the Uniswap decentralized exchange (DEX).

USPlus' reserves are managed by regulated financial institutions that generate stable, periodic returns from money markets. Fluent employs Flow Rewards' smart contracts to facilitate the distribution of these money market returns to liquidity providers contributing to the USDT/USPlus and cUSD/USPlus pools on Uniswap. In addition to the fee allocations they earn from DEX transactions, USPlus holders generate fixed-income yields directly from their USPlus holdings, while retaining full custody of their assets on low-volatility, stablecoin-paired pools.

Resources

fluent.finance

