

Persistence Whitepaper

V0.1.0 - Tushar Aggarwal

This paper details Persistence’s vision of a global, instant and round-the-clock future of Institutional Open Finance Applications to facilitate more efficient global capital allocation in the debt markets. In this regard, the macroeconomic conditions of the world are discussed which necessitate a product like Persistence. Details are provided on the problems that exist within Traditional and Open Finance and how Persistence addresses them.

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1. Background

As far as debt is concerned, there is a fundamental mismatch between the supply and demand of capital around the world.

The concept of business loans and debt has existed for more than 4000 years. However, apart from recent efforts at digitization and development of alternative forms of lending such as P2P lending, there haven't been too many innovations as far as matching of lenders and borrowers goes.

With the proliferation of Decentralised Finance, capital can be moved in a trustless, borderless, permissionless, instant and round-the-clock manner – allowing for fundamental reimagination of how global capital allocation can work.

1.1 Supply of Capital

Low/Negative Interest rates

With Central banks of most advanced economies holding zero or negative policy rates, \$13 Trillion is held in negative-yielding bonds (as of Q1 2020) - meaning the buyers holding these securities to maturity are guaranteed to make a loss.

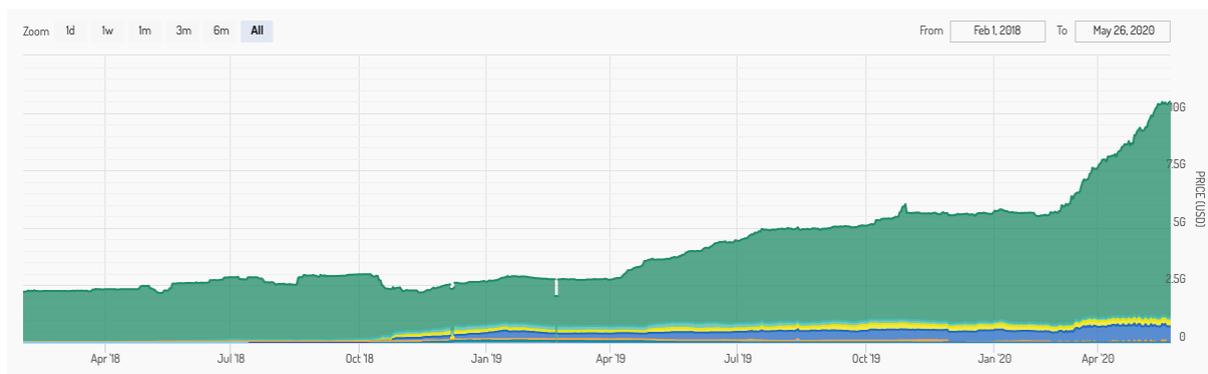
According to the Bank of England economist, Paul Schmelzing, who recently conducted the most extensive analysis of [real interest rates spanning eight centuries](#) from 1311 to 2018, the decline in interest rates in recent times is part of a long term trend spanning centuries, asset classes, political systems and monetary regimes.

The trend confirms an increasing amount of capital finding it progressively difficult to produce yield.

Stablecoins - the growth of borderless and instantly settled capital

Unlike the banking system where it can take 2-3 *business days* to settle cross-border trades, Stablecoins flow freely around the world and provide for more seamless exchange of value at a fraction of the cost of the SWIFT infrastructure.

With the Stablecoin market cap surpassing \$10 Billion in market capitalization and with the impending launch of Facebook Libra and several other high profile Stablecoin projects, there will be an ever increasing supply of borderless and instantly settled capital looking for new ways to generate yield.



The Stablecoin market cap has 4x'ed in from 2018 - early 2020

1.2 Demand of Capital

MSME Trade and Business Financing Gap - Demand of Capital

An estimated 80% of business globally takes place on 30 - 90 days 'billing cycles' - i.e., sellers incentivize buyers to make purchases before the buyers may have the funds to buy. This practice helps to speed up commerce and increase sales.

Sellers typically obtain loans from financial institutions secured by business documents (such as invoices) as collateral - also known as **Asset-Based Lending (ABL)**. *In fact, ABLs can be pooled to form Asset-Backed Securities (ABS) - Mortgage-Backed Securities (MBS) being one type of ABS where the underlying asset is mortgages.*

Large corporates have no trouble getting access to financing from financial institutions. MSMEs, on the other hand, struggle to obtain loans. Stringent capital adequacy requirements implemented on financial institutions post the Global Financial Crisis has severely impacted banks' ability and willingness to lend to MSMEs.

This has resulted in a cumulative Business and Trade Finance gap of 1.5 Trillion with 45% of this gap being in APAC.

2. Introduction

The Persistence mission is to facilitate seamless exchange of value around the world to increase the speed and efficiency of cross-border trade and financing to close the 1.6 Trillion financing gap.

Persistence provides a platform to power Debt Marketplaces that match entities with surplus capital (lenders) to entities that require capital (borrowers).

To achieve this, Persistence leverages few key features of the Blockchain / Cryptocurrency ecosystem:

- **Movement of capital** - in a trustless, borderless, instant and round-the-clock manner
- **Asset tokenization** - tokenizing 'Real-world' Assets such as invoices, letters of credit, bills of lading (representing goods on a ship) using Non-Fungible Tokens (NFTs).
- **Decentralised Exchange** – to facilitate easy trading and exchange of 'Real-world' assets against cryptoassets (Stablecoins)
- **Debt marketplaces** – allowing for use of cryptoassets and Real-world assets as collateral to borrow/lend against

Once a real-world asset has been tokenized into an NFT, it is free to be traded or used as collateral to finance business needs in a quick, easy and global manner.

The need for a solution like Persistence has never been clearer. A sizable and increasing amount of institutional capital and emerging Stablecoins are looking to generate yield. There is an ever increasing need for MSMEs traders and businesses to access financing. Persistence matches the two.

Persistence enables more efficient global capital allocation.

3. The Problem

3.1 Inefficiencies in the Financial Services industry

3.1.1 Long settlement times

Cross-border payments and remittance take 2-3 *business days* to settle via SWIFT. According to a [BCG report commissioned by DTCC](#) (the go to company for clearing and settlement in financial markets), the annual cost of this inefficiency is greater than \$10 Billion.

3.1.2 Lack of transparency and requirement for trust

Centralized exchanges, marketplaces, platforms and even e-wallets do not transparently declare their holdings. There is no way for end users to ascertain 'Proof-of-Solvency' of a platform.

As a result, trust is escrowed in third party independent verifiers like auditors.

However, auditors have repeatedly failed to expose fraudulent activities in both the developed and developing world - [a list of scandals over the last 100 years](#)

Also, there is no clarity whether [USDT is indeed backed by equivalent fiat](#).

3.1.3 Lack of infrastructure and access for MSME investors and businesses

Family offices, SME trading organisations and retail investors, who may have the inclination and relevant risk appetite to engage in SME Business or Trade financing opportunities, may not have access to such opportunities in the first place.

Such high yielding opportunities had been, thus far, reserved for the larger financial institutions.

As for MSMEs, the growth of alternative forms of financing like P2P lending has provided some respite to close down the financing gap. However, P2P lending is heavily localised today limiting the availability of credit.

3.2 What is hindering adoption of DeFi?

3.2.1 Use of only Cryptoassets as collateral

In 'traditional' finance, 'real-world' assets can be used as collateral to obtain short-term financing.

Business documents such as Invoices, Bills of Exchange (like invoices but for international trade) and Bills of Lading (document showing ownership of goods on a ship) are regularly used as collateral to take out loans.

Even while taking out a mortgage, a house or an apartment is placed as collateral for the loan disbursed.

Within the Cryptocurrency ecosystem, one can only borrow Stablecoins by placing other Cryptoassets as collateral (usually to leverage up).

3.2.2 Lack of infrastructure around holding Cryptoassets

SME traders and businesses are nowhere ready to use Cryptoassets on a regular basis:

- Acquisition of Cryptoassets is necessary to be able to pay for [gas](#), which can be highly variable and expensive
- Risk management procedures around multisig and private key management are complex

Regulatory uncertainty around Cryptoassets (including Stablecoins) in certain geographies further complicates the situation.

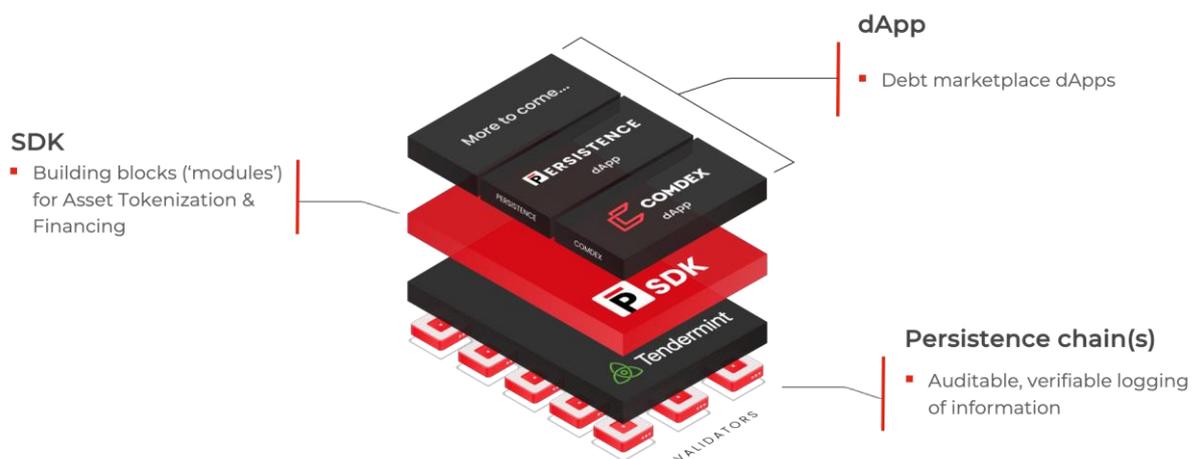
3.2.3 Data Privacy concerns

Lack of strict SLAs around data access, data leaks and malicious activity makes it difficult for institutions to adopt DeFi.

Further, exposure of transactions and application logic publicly leads to obstacles for institutional adoption of Open Finance.

4. The Product

Persistence is an Interoperable Middleware that provides sovereign environments for Decentralised Institutional Finance Applications to be developed and operated. The Persistence architecture and technology stack was created while being cognizant of the above problems and after several iterations of attempting to solve them.



The Persistence technology stack comprises:

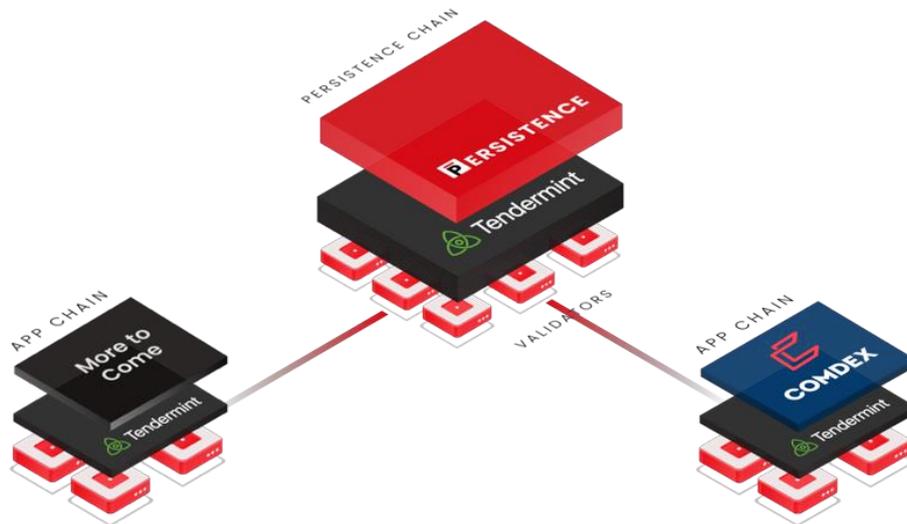
- **Persistence chain(s)** - a network of sovereign business specific 'App-chains' with security provided by the Persistence main-chain and its set of validators
- **Persistence SDK** - a comprehensive suite of plug-and-play modules to spin up new or integrate into existing Exchanges & Marketplaces
- **Persistence dApp(s)** - finance applications focused on institutional and retail stakeholders

4.1 Persistence chain(s)

Persistence is a network of sovereign chains hosting Open Finance dApps (Exchanges & Marketplaces), which facilitate matching of entities with surplus capital (lenders) to entities that require capital (borrowers).

The sovereign nature of the chains allows customizations with respect to speed vs. security as well as address privacy considerations depending on the business requirements.

Additionally, the architecture allows dApps to operate in isolation without being affected by increased transaction loads being experienced by other dApps on the chain - this becomes imperative in providing a smooth end user experience and match the expectations of institutional users.



4.1.1 Persistence main-chain

- Permissionless chain running on delegated-Proof-of-Stake (dPoS) based Byzantine Fault Tolerant (BFT) Tendermint consensus engine
- **Security:** the Persistence main-chain is secured by a distributed set of Validators and the native Persistence token, \$XPRT. Main-chain can secure app-chains via shared security. Alternatively, app-chains can have an independent security mechanism (depending on business needs)
- **Interoperability:** the Persistence main-chain will be interoperable with other chains via the Interchain Communication Protocols¹ ([IBC](#) and [ICMP](#))
- **Governance:** the Persistence main-chain acts as the fundamental venue for the governance of the Persistence Platform (referring to the Persistence main-chain and all of the app-chains in the Persistence ecosystem)
- **Validator incentivization mechanism:** In the absence of tokens with monetary values in some app-chains, the (dis)incentivization for validators operating at the app-chain level takes place at the main-chain level
- **Asset ownership and exchange** - the Persistence main-chain maintains asset ownership (ownership of NFTs) data and facilitates asset ownership exchange for all of the app-chains

4.1.2 Persistence app-chains

- Run application-specific logic
- **Security:** depending on speed, security, privacy requirements and budgetary constraints, chain security can be independent or shared (*app-chains can be secured at the main-chain level via shared security or independently through a subset of*

¹ Note, the Persistence team was the [first team globally to execute an Inter-Blockchain Communication Transaction](#) - an Interchain NFT transfer

validators at main-chain level). Accordingly, there is flexibility in the consensus mechanism ranging from Proof-of-Authority (PoA) to dPoA or dPoS.

- **Governance:** of certain key parameters will take place at the main-chain level through Interchain communication while decisions regarding certain parameters will be taken at the app-chain level (*more details below*)
- **Validator incentivization mechanism:** App-chains, in most cases, will not have a native token (with monetary value or tradable on open markets) to ensure no additional complexity is introduced for the dApp end user. As such validator (dis)incentivization takes place as main-chain level
- **Storage of Asset data (using NFTs)** - NFTs, which are often storage heavy, are stored in app-specific chains so as to not impact performance of other chains.

Note: [Comdex](#) is the first app-chain in the Persistence ecosystem

4.1.3 Interchain communication

The app-chains are connected to the Persistence main-chain using the Interchain Communication Protocols. Within the Persistence ecosystem, Interchain communication serves three primary functions:

- **Interchain NFT transfer**
- **Interchain dis(incentivization)**
- **Interchain (app-chain) governance**

Interchain NFT transfer

The NFT (representing tokenized asset) creation and storage is handled at the app-chain level while the ownership is maintained at the main-chain level. Any ownership transfer transaction at the app-chain level is communicated to the main-chain via Interchain Communication.

Interchain (dis)incentivization

The Persistence Platform (referring to the Persistence main-chain and all of the app-chains in the Persistence ecosystem) is designed to be business friendly. As such, the expectation for the majority of the app-chains is to not have a token with any monetary value or be traded directly in open markets as cryptocurrencies. These app-chains however have distributed third party validators who need to be rewarded and slashed depending on their performance.

This (dis)incentivization takes place using the \$XPRT token at the main-chain level.

In order for the (dis)incentivization to take place using the \$XPRT token, the Persistence main-chain tracks the block headers (through Interchain communication) of each app-chain to track pre-defined performance metrics.

Interchain (app-chain) governance

Decisions regarding certain parameters for the app-chains, impacting the broader Persistence ecosystem, will take place at main-chain level via Interchain Communication.

Examples of decisions at the main-chain level:

- New app-chain addition proposal
- App-chain validator set election
- App-chain validator staking
- App-chain validator unbinding proposal at the end of tenure

dApp specific decisions will take place through the chain's local governance mechanism.

4.1.4 Validators



Leading Validators from around the world securing Persistence Chain(s)

Persistence main-chain is powered by the Tendermint delegated Proof-of-Stake (dPoS) Byzantine Fault Tolerant (BFT) consensus algorithm. It is secured in a permissionless manner by a globally distributed set of validators.

Through shared security, the main-chain can secure app-chains. Alternatively, for certain app-chains processing high value transactions & data and running (d)PoA consensus mechanism, the top validators from the main-chain will be onboarded to secure the app-chain based on the following criteria:

- High Assets under Delegation - to financially enforce good behaviour
- Great reputation - to socially enforce good behaviour
- Architecture - enterprise grade with physical servers and Hardware Security Modules (HSMs)
- Contributions - to community initiatives and open source code
- Service Level Agreements (SLAs) - around performance and data access/leakage

4.2 Persistence SDK

The Persistence Software Development Kit (SDK) is a set of standardized tools or 'modules' that can be used to model Marketplaces for easy exchange of value.

Modules of the SDK can be integrated into existing applications. Alternatively, the modules can be used in different permutations and combinations to spin up entirely new marketplaces.



For more details on the specific Modules, please refer to the [developer documentation](#)

The SDK is ever expanding to cater to new kinds of use-cases and dApps that enter the Persistence ecosystem. However, with already available modules, the end-to-end trade and trade financing journey can be covered:

- Onboarding of organisations and their employees
- Providing relevant access rights to the onboarded employees
- Conducting relevant KYC/AML checks
- Verifiable document fingerprinting
- Tokenization of document representing 'real-world' assets
- Marketplace element to match buyers and sellers including negotiation
- Trade settlement and financing

4.3 Persistence dApp(s)

Open Finance dApps (mostly Exchanges & Marketplaces), focused on matching borrowers (demand of capital) to lenders and investors (supply of capital), are hosted on app-specific chains in the Persistence ecosystem.

Persistence aims to tap into both institutional and crypto-native liquidity at the dApp layer in a two step approach:

Step 1: bring the benefits of Public Blockchain technology to institutional use-cases (tapping into institutional liquidity)

- Allows fundamentally new capital to enter the Blockchain/Cryptocurrency industry

Step 2: bring institutional products to crypto-native stakeholders (tapping into crypto liquidity)

- As Stablecoin market cap grows and the yields become lower, capital in crypto will look for new ways to generate high returns

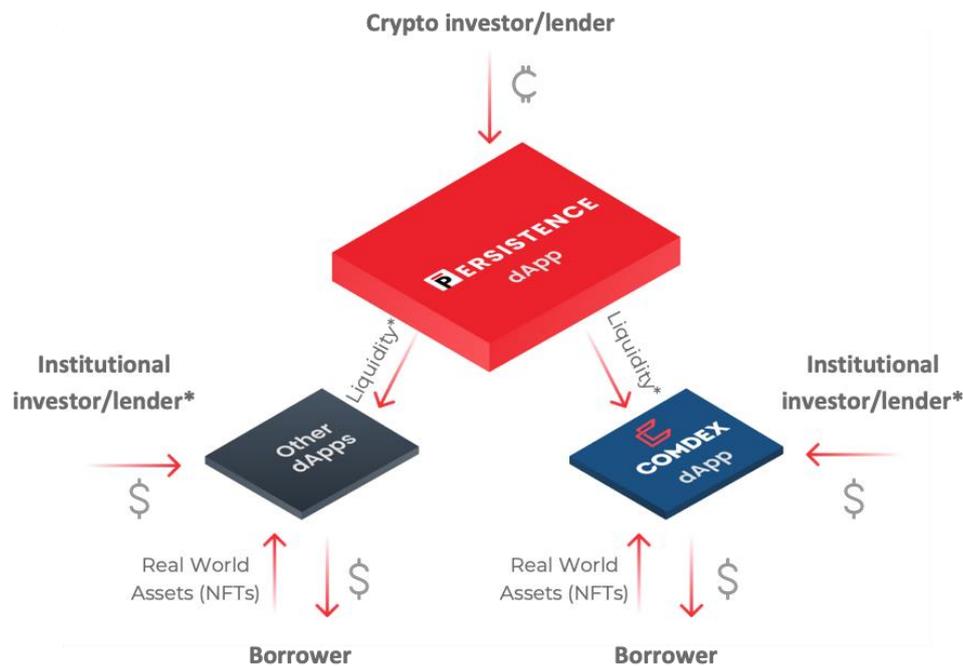
In this regard, the dApp ecosystem of Persistence comprises:

Third party applications -

- Integrated or built from the ground up with Persistence SDK modules
- Run on app-specific chains secured by the Persistence main-chain (and/or its validator set)
- Mostly focused on institutional investors and borrowers (see [Comdex](#) below)
- Real-world assets (such as invoices, letters of credit, bills of lading etc) are tokenized using NFTs
- Institutional investors and lenders use the dApp directly to trade the NFTs and/or finance trades with NFTs as collateral
- Persistence architecture and technology abstracts away all complexities and concerns of using Public Blockchains (such as privacy, regulatory compliance, custody, key management, gas etc.)
- Relevant app-specific API integrations (e.g. KYC, banking for fiat on-off ramp) depending on business needs are implemented
- Persistence team works closely with Family Offices, SMEs, promising startups and third party development shops across Asia to capture use-cases

In-house liquidity aggregation Persistence dApp -

- Runs on the Persistence main-chain (along with bridges to other significant chains)
- Acts as a liquidity aggregator from crypto-native stakeholders for various finance dApps in the Persistence ecosystem
- Tranche based liquidity pools are created to supply financing to dApps
- Tranches are created based on risk, product and other parameters



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Persistence believes in vertical integration to the dApp layer as a mechanism to capture value for the Persistence token (see the [vertical integration of the Ox Protocol](#) to launch the user facing [matcha.xyz](#) product as one of the many examples in the industry).

[Read this paper for more details on the Persistence Token design, utility and value capture](#)

5. The Persistence value-add

Design principles:

- Chain sovereignty (to optimise for speed vs. security; privacy considerations)
- Institutional and DeFi liquidity
- Business usability

Key points to note:

- Privacy preserving by design
- Legal compliance natively built in (SLAs around data privacy/access/leakage, KYC/AML)
- Integrations with regulated fiat on/off ramps capable of handling institutional level volumes with instant settlement across jurisdictions
- Abstraction of complexities around Public Blockchains - gas, custody, key management etc.

Persistence underwent an intense phase of ideation, followed by rigorous development and several iterations before achieving external validation through real-world implementations and traction. Several existing Blockchain platforms were considered before the team decided to build the app-specific Persistence architecture.

While dApps in the Persistence ecosystem benefit from chain sovereignty, the natively interoperable nature of Persistence allows the dApps to tap into DeFi liquidity from multiple chains. At the same time, removal of all complexities of using Public Blockchains enables business usability as the Blockchain industry matures to solve 'real-world' problems.

	DeFi Today	PERSISTENCE Bridging Institutional Gap
Identity	Pseudonymous	Anonymized (but verifiable)
Transaction Details	Public	Anonymized
Legal Compliance	NA	Natively factored in
Settlement	Crypto	Option of Regulated Fiat Gateways
Gas Payments	Crypto	Abstracted for end user
Wallets	Reused	Default burner wallets
Key management	Non-recoverable	Securely recoverable

Persistence was created keeping in mind the very specific requirements of Institutional Open Finance. Some of the core issues that Persistence addresses facilitating institutional adoption:

- **Identity** - institutional end users are skeptical of revealing their identity for multiple reasons including not giving away *alpha* while performing trades. However, identity needs to be verifiable in case of dispute between counterparties or illicit activity
- **Transaction details** - similar to privacy considerations for identity, transaction details need to stay private to prevent leakage of *alpha*
- **Legal compliance** - Service Level Agreements (SLAs) are executed with Validators regarding data privacy, access and leakage. The 'Trader Onboarding' module of the Persistence SDK integrates with various real world third party KYC/AML databases, the results of which are logged on the chain for immutable storage
- **Settlement** - the 'Trade Settlement' module of the Persistence SDK interacts with regional banks and their payment interface to handle fiat on/off ramp transactions. In order to maintain auditability of the deposit and redemption transaction, each transaction is reflected on the chain with the transaction proof hash.

- **Gas payments** - usage of dApps typically requires acquisition of cryptoassets to pay for gas, which can be highly variable and expensive. This causes unnecessary friction for the end user. In Persistence dApps, depending on the business requirements, IOU ('I owe you') tokens with no monetary values are provided to the end user's wallet to allow easy usage of the dApp (this is done to prevent transaction spam). The IOU tokens function as a performance metric for validator (dis)incentivization and are leveraged for monthly billing calculations.
- **Wallets and key management** - default multi-token (FT, NFT, Interchain) burner wallets linked to anonymised identity and not private keys allow for multiple keys to be associated with the wallet and operate it. Each device the user logs into can generate its own key secured by hardware and linked to the identity without a need to export one key across all devices. A key/device, if lost, can be revoked from the identity thereby also allowing for temporary/role-based access to the wallet and recoverability.

6. Bringing it together - the Solution

With a combination of problems being addressed at the chain layer, SDK and dApp layer, the Persistence technology stack is highly customized to tackle inefficiencies and gaps within the Financial Services industry.

Problem	The Solution.
 Long Settlement Times 2-3 business days via SWIFT (annual cost >\$10B)	 Trustless instant settlement Stablecoins with relevant instant fiat on / off ramp gateways
 Lack of Transparency & Requirement for Trust Fraud on Exchange & Marketplace platforms (annual cost >\$42B)	 Validators Create Trustlessness 3rd party validation with (dis)incentivization at play
 Lack of Infrastructure & Access (MSMEs) For both lenders and borrowers	 Plug-and-play Persistence modules Modular SDK makes it quick, easy & cheap to create new or plug into existing marketplaces & exchanges

Persistence addresses some of the problems with Traditional Finance

Problem	The Solution.
 Use of Only Crypto Assets as Collateral 'Real-world' assets cannot be used as collateral	 NFTs to tokenize 'real-world' assets NFTs representing real world assets can be used as collateral to fulfil business financing needs
 Lack of infra & Regulatory uncertainty Custody, key management, highly variable gas fees, inability to hold Cryptoassets	 Removal of all Public Chain complexities Abstraction of key management issues and gas for end user; provision of regulated fiat on / off ramps
 Data Privacy Concerns around data access and privacy - exposure of transactions and application logic	 Institutional SLAs Validators comply with institutional SLAs and run institutional grade architecture

Persistence addresses some of the problems within Decentralised/Open Finance to allow for easier adoption by Institutional Traders, Investors and Financiers

7. Case Study: Comdex

Comdex is a decentralised high seas *physical* commodity trading and trade financing application that covers the end-to-end trade life cycle from onboarding of traders/trading organizations to trade settlement and financing. Comdex is commodity agnostic and can facilitate trading of metals, grains, livestock, energy products etc.

Comdex runs on an app-specific chain secured by a distributed set of Validators running institutional grade architecture. Comdex was built from the ground up using the Persistence SDK modules. Key activities during the trade journey with the value added by the Persistence stack is as follows:

- **Onboarding:** onboarding of trading organizations and traders with relevant compliance checks through API integrations with real world KYC/AML and background check platforms. Trader access rights (in terms of ability to initiate / execute trades, permissioning for types of commodity, size of trade etc.) are granted by the trading organization with all transactions logged on the chain.

Persistence value add: creation of immutable audit trail leads to cost savings in case of internal or external dispute resolution (*note, majority of commodity trading by SME traders happens via synchronous modes of communication where creation of audit trail can be complex*).

- **Asset Tokenization:** document fingerprinting to capture all the unique meta-data pertaining to a document and tokenizing it using the interNFT module.

Persistence value add: creation of document provenance; tokenization for easy trading and usage of assets as collateral to fulfill financing needs.

→ **Decentralised Asset Exchange (DEX):** creation of buy/sell order, negotiation between the maker/taker and creation of binding contract upon agreement. Assets are placed in escrow followed by order execution.

Persistence value add: ease of finding counterparty and increased transparency throughout the trading process.

→ **Trade Settlement:** trustless cross-border instant settlement along with deposit / redemption in fiat through regional fiat gateways.

Persistence value add: Persistence validators create a trustless environment by coming to consensus on real world banking transactions (transmitted to validators through open bank APIs). This ensures 'Proof-of-Solvency', prevention of fractional reserve banking and mitigation of any malicious activity by Comdex platform.

→ **Trade Financing (Borrowing/Lending):** aggregation of institutional and DeFi liquidity to supply financing to traders and businesses. Creation of trader reputation (creditworthiness) to optimise access to financing.

Persistence value add: provide fundamentally new ways to access financing through crypto-native stakeholders. Creation of trader/business reputations over time, to improve ability to obtain financing from existing institutional investors.

The Persistence stack can be expanded to or integrated with other asset-based lending verticals pledging a wide range of cryptoassets, invoices, bills of exchange, accounts receivables and other assets as collateral.