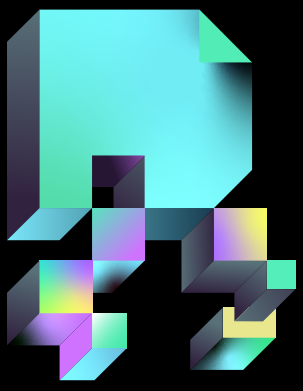


Regulated Blockchain

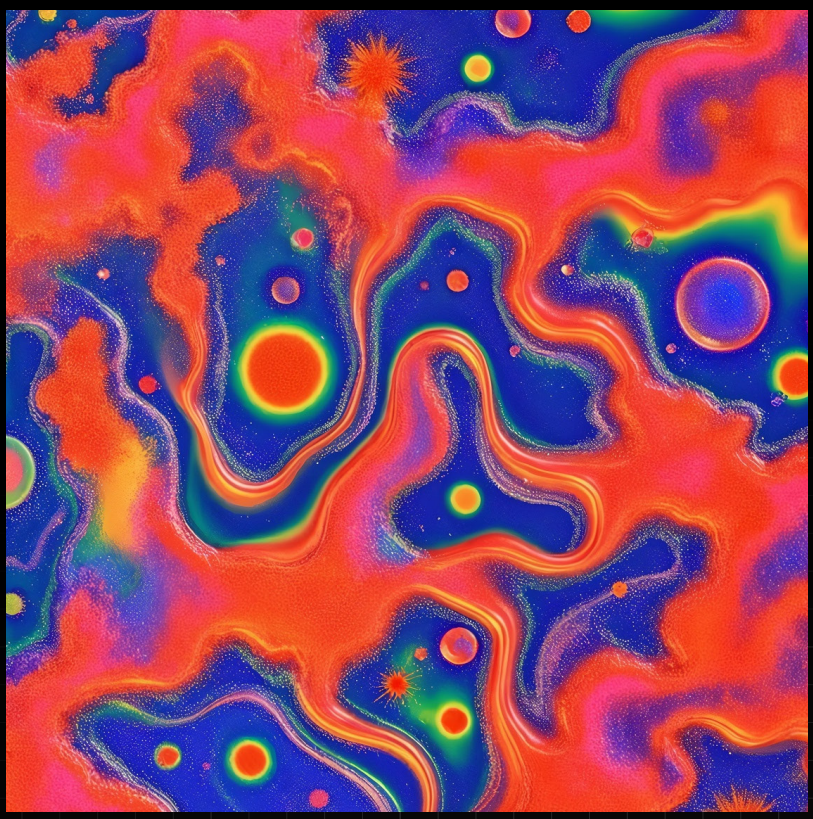
INFRASTRUCTURE FOR REGULATED DEFI

FOUNDATION FOR A GOLDEN AGE IN FINANCE

By Obi Emetarom

Published March 24, 2025

CONTENT



BACKGROUND

THE DAWN OF A GOLDEN AGE IN FINANCIAL SERVICES

In the beginning, there was trade by batter. Then, the invention of physical money gave birth to a profound paradigm shift that gave us the various financial services we still use today, which allow us to spend, save, invest, and borrow. After millennia of using physical money, technology has enabled the invention of a new form of money, which is on track to unlock a whole new financial services paradigm, possibly as profound as the very invention of finance itself.

While physical money gives us a great tool to manually create and consume financial services, the process involves human effort, cost, risk, and friction. More recently, digital money is laying the foundation for us to continue to gain the benefits of financial services without the associated challenges and hassle. During the golden age of financial services, not only will financial services be fast, cheap, frictionless, and infinitely diverse but they will also be safe, and compliant by default while requiring no human effort to produce or consume.

The golden age of finance will be fully digital and based on non-custodial financial assets, with trusted, fully automated processes and accurate financial records, all radically transparent to stakeholders and tamper-proof against manipulation. Interaction with these new financial elements will be through human-level AI agents that manage our finances on our behalf and ensure that not just the Bank but even Banking itself will entirely disappear.

LIMITATIONS OF TRADFI INDUSTRY

After the invention of physical money and over quite a long while, the Banking system as we know it today evolved to manage the delivery of financial services. Regulators and regulations also evolved to ensure that the system served its purpose in the least risky and most optimal way. Yet the following characteristics have remained major weaknesses of the current system.

1. The need for custody which exposes end-users to the risk of fraud and misappropriation of assets

2. The opaqueness of operations and corresponding ineffectiveness of regulation which limits compliance and makes regulation expensive and cumbersome.

3. The high cost of operations, infrastructure, and intermediaries associated with providing services

4. The limited flexibility, variety, and personalization of products being offered to end-users

5. The slowness, friction, and frustration associated with human involvement particularly where there are multiple intermediaries in the value chain

6. A certain level of distrust for the system by various segments of consumers especially those with low income

With these issues, it's no wonder there is still a large population of unbanked and under-banked individuals not just in developing countries but surprisingly also in some of the most advanced countries in the world.

DIGITAL RECORDS AND THE BLOCKCHAIN

Before blockchain technology, digital records were not as trusted as physical records, which was evident in the fact that commercial and government processes would require sighting and archiving physical copies of documents even after digital equivalents had been submitted. Physical documents have historically been trusted a lot more because records stored on physical mediums are created through an irreversible process hence expected to be permanent. In contrast, records stored digitally are represented by reversible (editable) electrical or magnetic states within computer systems.

Blockchain technology has enabled digital records to be stored in a form that is even more permanent than physical records. This is because the Blockchain stores copies of the same records across multiple computer systems in a completely tamper-proof way. The architecture and processes make records on the Blockchain just as immutable as physical records but even less likely to be physically destroyed since there are always multiple copies, as opposed to usually single copies of original physical documents. This development has resulted in a new paradigm where digital records can be even more trusted and reliable than physical equivalents.

> This is because the Blockchain stores copies of the same records across multiple computer systems in a completely tamper-proof way.

DIGITAL MONEY AND DEFI

With the advent of Blockchain and the newfound trust and reliability of digital records, the possibility arose for such records to be used as valid representations of monetary value, which meant that rather than record monetary value on a piece of paper as a physical Banknote, monetary value could now be recorded purely in digital form on the Blockchain (as a digital currency).

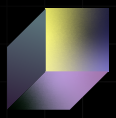
Cryptocurrency was designed to be a type of digital currency that decentralizes custody of money and completely disrupts the very foundation of financial services as we've known it. With cryptocurrency, neither the digital monetary value nor the physical computing and storage devices are held by any single entity. Instead, through secure cryptography, only the beneficial owner of the value has access to, and control over, the value.

Cryptocurrencies eliminate the need for physical cash along with all associated burdens and complexities. Cryptocurrencies also enable the automation and decentralization of financial services. With decentralized financial services or DeFi, computer programs run all financial operations associated with a financial product and apply rules of the financial product directly to users' funds without the need for funds to be held in custody by any organization.

> Cryptocurrency was designed to be a type of digital currency that decentralizes custody of money

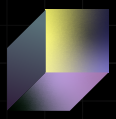
LIMITATIONS WITH CRYPTO AND CRYPTO-BASED DEFI

While cryptocurrency has experienced rapid adoption amongst advanced users, especially within the tech community, the asset class and service category is yet to gain mainstream acceptance. This is primarily due to a lack of compliance and regulatory oversight which has had the following inhibitory consequences;



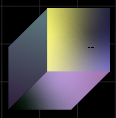
Limited Institutional Participation

Regulated financial institutions around the world have avoided or limited the use of cryptocurrency assets and services due to difficulties enforcing compliance as well as fear of being sanctioned by regulators for non-compliance. Also, most cryptocurrency assets are considered very high risk and so not approved to be held by Banks as part of their investment portfolio. This means that ordinary individuals and organizations can not leverage Bank channels to buy and sell their Favorite cryptocurrency tokens.



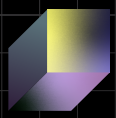
No Consumer Protection

Even in scenarios where there is adoption and usage, lack of regulation means that users are significantly more exposed to potential fraud and other malicious activities without legal recourse. In most cases, the transparency built into the system to mitigate such exposure only benefits significantly advanced users who are sophisticated enough to understand and audit the internal workings of tokens or protocols including the computer programs powering them.



Outright Prohibition

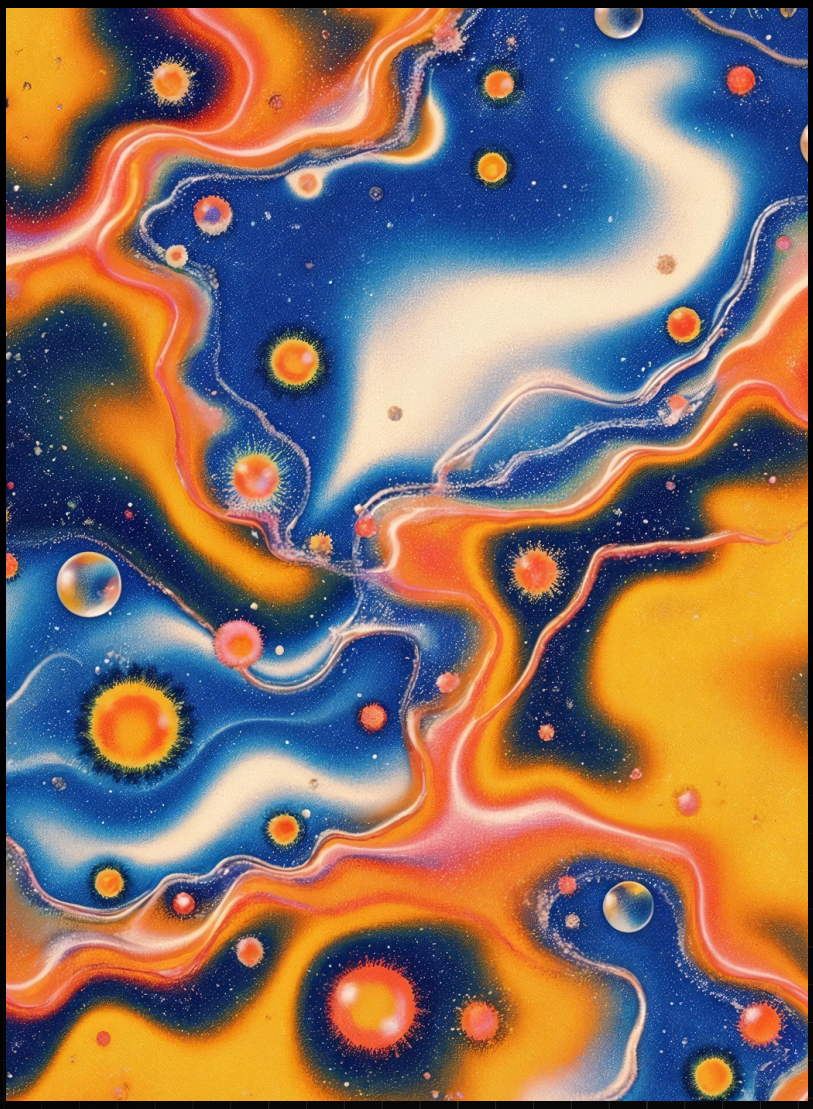
In some countries, the purchase, sale, and/or ownership of cryptocurrencies by individuals and organizations has been outrightly prohibited by relevant authorities due to concerns around money laundering, terrorism financing, and capital flight. In such environments, Cryptocurrency adoption is most limited.



Low Trust Levels

With little to no consumer protection, the majority of potential users across individuals and organizations have developed a strong distrust for cryptocurrencies essentially associating the new asset class with market manipulation, fraud, and cyber-crime. Potential users also generally associate cryptocurrency with money laundry and related criminal activities which further discourages adoption.

SUMMARY TradFi is compliant and regulated but with significant gaps and limitations while Crypto-based financial services potentially address TradFi gaps and deliver superior value however can't gain adoption due to the absence of regulation. Following this analysis, it seems the solution requires combining the best of the first two options into a superior third alternative.



OVERVIEW OF REGULATED BLOCKCHAIN

DESCRIPTION

A Regulated Blockchain is a blockchain with in-built mechanisms and protocols to ensure that the applications, tokens, and records within it are safe, compliant, and subject to regulatory oversight. Regulated Blockchains combine decentralization with regulation to strengthen the value proposition of Blockchains in finance. They offer the benefits of Blockchain-based digital financial services while infusing trust and legitimacy from traditional finance.

Regulated Blockchains enforce regulatory compliance and enable regulatory oversight by applying the same transparency, immutability, and programmability characteristics that have made Blockchain ideal for delivering financial services.

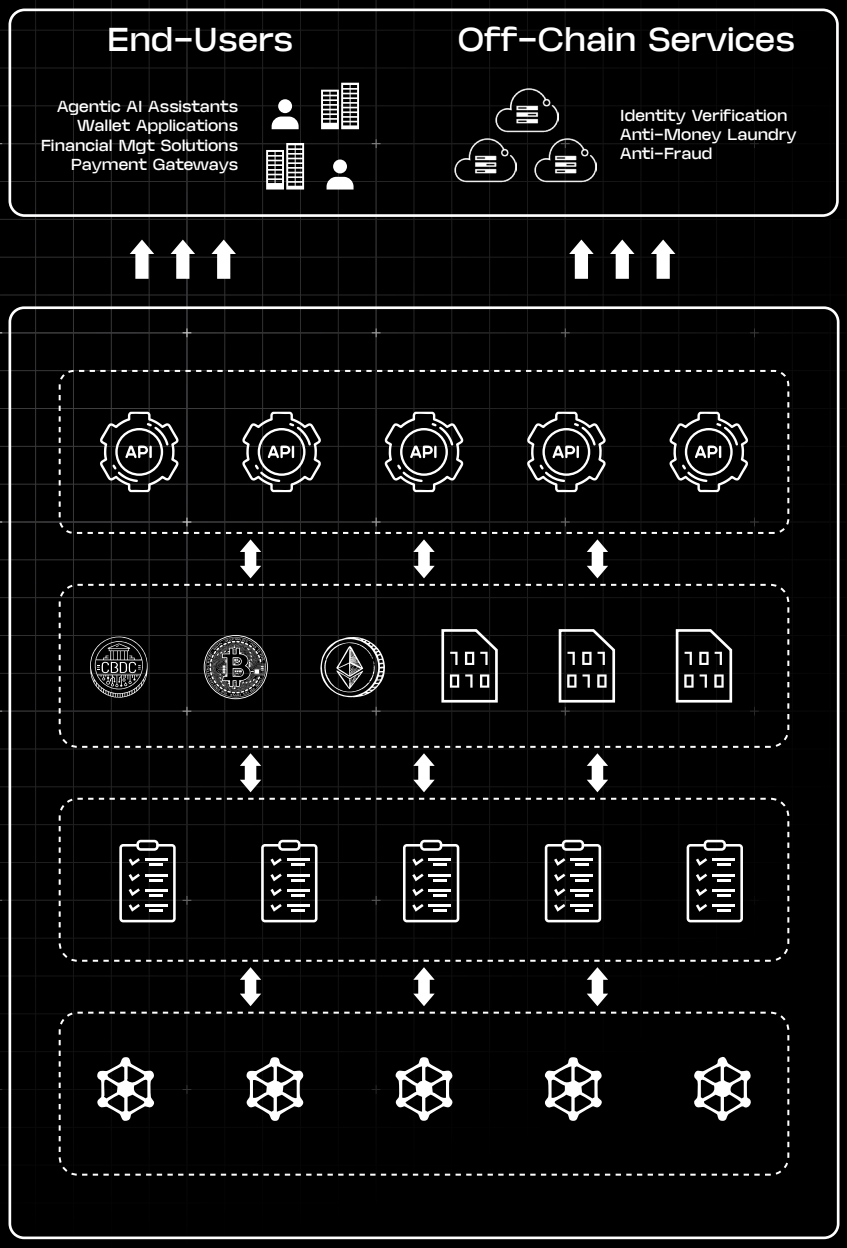
Programmability allows regulatory rules and guidelines to be defined as computer programs that constrain the behavior of other programs underpinning services and instruments on the Blockchain.

Immutability ensures that service providers cannot alter records or processes running on the Blockchain without regulator approval even if they created the records or deployed the processes.

Transparency provides regulators with the ability to monitor all activities on the Blockchain in real time rather than being limited to ineffective periodic audits that allow unscrupulous operators to conceal non-compliant, unethical, and potentially outright illegal activities.

HIGH-LEVEL ARCHITECTURE

Regulated Blockchains comprise four layers of activity (Infrastructure, Regulatory, Product, and External Interface) that work together to deliver value to users.



HIGH-LEVEL ARCHITECTURE

Infrastructure Layer

The infrastructure layer provides the shared ledger and run-time environment as well as privacy and security protocols. In other words, the infrastructure layer enables the three primary characteristics of Blockchain being programmability, immutability, and transparency which are crucial for creating and regulating products.

Regulatory Layer

The Regulatory Layer consists of protocols and programmatic rules that mediate activities of products and instruments to ensure compliance and guarantee the overall safety of end-user assets. The regulatory layer also provides regulators with real-time visibility and allows them to participate substantially in governance.

Product Layer

The product layer comprises smart contracts that implement service functionality and enable token issuance. The product layer houses an ecosystem of Digital Assets and DeFi protocols. The product layer also provides native services and tokens for use by customer-facing applications and protocols.

External Interface Layer

The external interface layer is responsible for accepting inputs from and publishing outputs to external systems. This layer allows users to interact with and derive value from Regulated Blockchains via payment systems, wallets, and business applications as well as AI agents and other embedded finance systems.

OVERVIEW OF CORE PRINCIPLES

Permissioned Participation

Nodes and Service providers on Regulated Blockchains must meet a predefined minimum requirement and be licensed/approved by the regulator in the country and regulatory domain where they operate. This helps ensure the security and privacy of contents on the Blockchain.

OVERVIEW OF CORE PRINCIPLES

Regulated Governance

On Regulated Blockchains, Regulators host validator nodes with real-time access to all information about applications/protocols, tokens, and transactions in their regulatory domain and country. Regulated Blockchains enforce on-chain governance across all tokens and protocols while each regulator is also required to approve the issuance of new tokens as well as the deployment of new services within their regulatory domain. Finally, regulators collectively vote to approve changes to the core infrastructure of Regulated Blockchains.

Self-Custody

Regulated Blockchains eliminate the need for Intermediaries to manage and control digital assets on-behalf of beneficial owners as well as prevent service providers from altering the operations of certified safe and compliant financial products without approval. Each user has sole access and control over their assets on the Blockchain. This approach eliminates counter-party risk and guarantees the safety of end-user funds.

Programmatic Regulation

Regulated Blockchains utilize code and logic within dedicated regulatory smart contracts or embedded via templating into token smart contracts to define and enforce regulatory guidelines. Regulated Blockchains also automatically screen smart contracts during deployment to ensure that each smart contract has the right structure and follows the appropriate template. The automated screening also confirms that smart contracts function in line with pre-defined product descriptions and that they do not contain any potentially malicious logic.

Native CBDC Token

Regulated Blockchains utilize native tokens pegged to the CBDC of a supported country as the base currency for all applications/protocols and gas fees in that country. For cross-border transactions, each applicable regulator may select which currency should serve as global intermediary currency (base currency) during conversion.

Fully Automated Financial Products

Regulated Blockchains require that all operations delivering a financial product are automated using smart contracts and so do not involve human intervention. This approach ensures that operations are transparent, predictable, and controlled. This also means that regulators can verify compliance and safety before deploying a process and rest assured that the process will remain as such for as long as it is in use. From an end-user's point of view, automated financial products eliminate unreliability, friction, and delays typically associated with human involvement.

BENEFITS AND IMPACT

1

Low Cost

By eliminating expensive human labor and intermediaries, financial services on Regulated Blockchains can be delivered at a fraction of the cost incurred in TradFi.

2

Frictionless

Automated operations mean that service delivery is consistent and that all processes run straight through without human errors and mistakes.

3

Instant

Automation ensures that end-users get responses to service requests instantly or almost instantly 24 hours a day and 7 days a week.

4

Interoperable

Regulated blockchains achieve interoperability by bringing together diverse products and instruments from various Blockchains and service providers operating across different geographies into one single but shared computer system.

5

Compliant

Regulated Blockchains enforce compliance more effectively than public chains and TradFi while utilizing far less effort and resources.

6

Safe

Combining self-custody with automation, immutability, and real-time regulator governance eliminates the risk of loss due to misappropriation of funds, fraud, or cyber theft.

OVERVIEW OF USE-CASES

Payment

Domestic Wholesale Payments
This use case allows traditional Banks to effect payments in real-time to beneficiaries in other local Bank.

Domestic Retail Payments
Allows users of digital currencies to send and receive payments to and from other digital currency users or Bank accounts.

Cross Border Payments
Enables the transfer of digital currencies or physical fiat to beneficiaries in other countries.

CBDC On-ramp/Off-ramp
Provides seamless conversion between CBDCs and respective physical fiat money within each country

Banking

Savings
Supports the creation of non-custodial saving products targeted at users of digital currencies.

Lending
Supports the creation of collateralized and uncollateralized DeFi lending products that guarantee lenders zero risk of loss.

Asset Management

Token Issuance
Provides for the issuance of tokens representing all forms of securities and financial assets. Supported token categories include payment tokens, securities tokens, utility tokens, physical asset tokens, and NFTs.

Trading
Enables the creation of decentralized exchanges for trading currencies, securities, and other financial assets.

Investments
Allows digital currency users to participate in multiple investment opportunities and own assets from various asset classes including liquidity tokens, tokenized securities, tokenized physical assets, and crypto.

OVERVIEW OF USE-CASES

Others

Insurance
Provides smart contracts that manage the collection and investment of premiums as well as the processing and payment of claims.

Tax Collection
Tax collection protocols on Regulated Blockchains facilitate real-time deduction of taxes during payment transactions.

Payroll
Provide on-chain logic to compute net salary payments and determine PAYE tax amounts as well as initiate payments to beneficiaries and remit taxes to relevant authorities.

Supply Chain Management
SCM solutions coordinate the flow of goods and raw materials from origin to end-consumers by tracking the availability and location of inventory as well as the status of payments while updating relevant records as production, purchase, and distribution occur.

Accounting
Accounting protocols automate the creation of corresponding accounting entries representing various business activities following accounting rules and regulations in the relevant country.

Land and Property Registry
Securely record, track and easily transfer ownership of land titles while enabling property owners to tokenize their properties and trade them on approved exchanges in a fractional way.

CONCLUSION

During the golden age of finance, the Regulated Blockchain will be the new Bank, on-chain records will represent money in the Bank, smart contracts will represent financial products and AI agents will serve as account managers for customers. Most importantly. all financial instruments and services will be compliant, safe and subject to regulatory oversight.

CORE PRINCIPLES

NETWORK ROLES AND RESPONSIBILITIES

With Regulated Blockchains (just like public Blockchains) there is no single central authority or owner of the network. Instead, each Regulated Blockchains is powered by an ecosystem of stakeholders who perform complementary functions to achieve the purpose of the system. The various roles and responsibilities applicable to Regulated Blockchains are captured below.

Network Developer

The network developer is responsible for building and continuously enhancing the overall architecture and foundational software that enables the effective, secure, and scalable operation of Regulated Blockchains. The network developer is also responsible for expanding network participation by enlisting country-specific network administrators and participating organizations across all countrys.

Network Administrator

Network administrators in each country are responsible for enlisting, onboarding, and supporting participating organizations within one or more regulatory domains in their country.

Validator Node

Validators keep copies of the ledger as well as propose new entries on behalf of end-user applications and verify the correctness and consistency of entries proposed by other validator nodes.

NETWORK ROLES AND RESPONSIBILITIES

Archival Node

Archival nodes keep copies of the ledger and serve as gateways for off-chain applications to access content and functionality on the network.

Regulator

Regulators are responsible for defining the rules that govern various asset and service categories. Regulators are also responsible for screening and approving new products and modifications to existing products. Each country is made up of multiple regulatory domains each of which comprises a group of service categories and service providers with oversight of a specific regulator. Finally, regulators are responsible for monitoring activities on Regulated Blockchains and utilizing the information obtained to refine regulatory guidelines for enhanced effectiveness.

Service Provider

Service providers are application/protocol developers and token issuers who create and deploy financial products on Regulated Blockchains for consumption by end-users.

End-User

End-Users are individuals and organizations that utilize financial products on Regulated Blockchains to address various financial services needs.

SELF-CUSTODY

The concept of self-custody eliminates the need for third parties to hold and manage assets on behalf of their ultimate beneficial owners. Custody introduces risks associated with the potential for such third parties to mismanage assets, become insolvent, or outrightly commit fraud.

Regulated Blockchains take advantage of the fact that all assets are digital and all operations required to manage such assets are automated and tamper-proof. Assets being digital means they do not require physical storage while operations being automated means they do not rely on human discretion so don't need the day-to-day human administration that custodial intermediaries provide.

With self-custody, each beneficial owner of an asset has sole control over the asset while automated processes powered by regulated smart contracts handle administering the assets on their behalf and in line with pre-defined rules and commercial terms. Regulated Blockchains not only enable but enforce self-custody. The intention being to eliminate counterparty risks and protect end-users from losses.

> All assets are digital and all operations required to manage such assets are automated and tamper-proof

REGULATED GOVERNANCE

Governance in Blockchains refers to mechanisms that enable other stakeholders besides promoters of a Blockchain protocol to participate in directing and controlling the evolution of functionality and characteristics of the protocol. Regulated governance in Regulated Blockchains is a form of Blockchain governance that incorporates each respective regulator into the process of approving proposed new functionality or changes to existing functionality that make up digital assets and DeFi products.

Regulated Blockchains provide native but extensible on-chain governance mechanisms implemented by smartcontracts which manage the process of submitting enhancement proposals and ensuring that token holders vote for such proposals to be accepted. Acceptance is determined based on voting rules defined by protocol developers which must satisify the relevant regulator's baseline. Regulated Blockchains ensure that all protocol developers and token issuers implement on-chain governance processes using the native governance mechanism.

Asides from enforcing governance, Regulated Blockchains screen proposed new or modified functionality to ensure that tokens and services deployed remain compliant and safe. Once changes are determined to be compliant, safe and accepted by the governance process, the immutability characteristic of Blockchains ensures that such new functionality will retain those attributes for their entire life span.

Regulated Blockchains leverage integrations with Agentic AI to automate smart contract audits. Agentic AI tools are able to review smart contracts submitted by service providers against 1) predefined templates, 2) approved product descriptions, and 3) other compliance requirements in order to determine the extent of their compliance. Agentic AI tools are also able to verify that smart contracts do not contain additional malicious or redundant logic.

NATIVE CBDC TOKENS

Native tokens in public Blockchains provide a financial instrument that users can utilize in performing permissible activities on chain. Key uses of native tokens on public chains include payment of gas fees, on-ramp, and off-ramp into and out of DeFi protocols, liquidity staking in Proof of Stake protocols, and rewards distribution in Proof of Work protocols.

In Regulated Blockchains, native tokens exist for each supported country and (unlike most public chains where the native token is a utility token), regulated Blockchains utilize payment tokens pegged to digital or physical fiat currencies of each respective country.

By adopting the legal tender of each country as an underpin for each native token, Regulated Blockchains ensure that the token is stable enough to be used for payment and relevant to each respective economy. With this approach, native tokens are not just applicable for gas fees and on/off ramps to third-party DeFi services but also support potential native services within Regulated Blockchains like wholesale payments and currency conversion.

Native tokens are pegged to digital or physical fiat currencies on a one-to-one basis. In the case of CBDCs, Regulated Blockchains establish a non-custodial liquidity pool within the CBDC platform that represents the total of all tokens issued against that CBDC. In the case of physical fiat money, the total amount backing native tokens issued on the Regulated Blockchain is securely held by the relevant country's Central Bank.

> By adopting the legal tender of each country as an underpin for each native token, Regulated Blockchains ensure that the token is stable enough

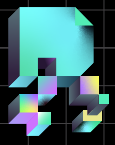
PERMISSIONED PARTICIPATION

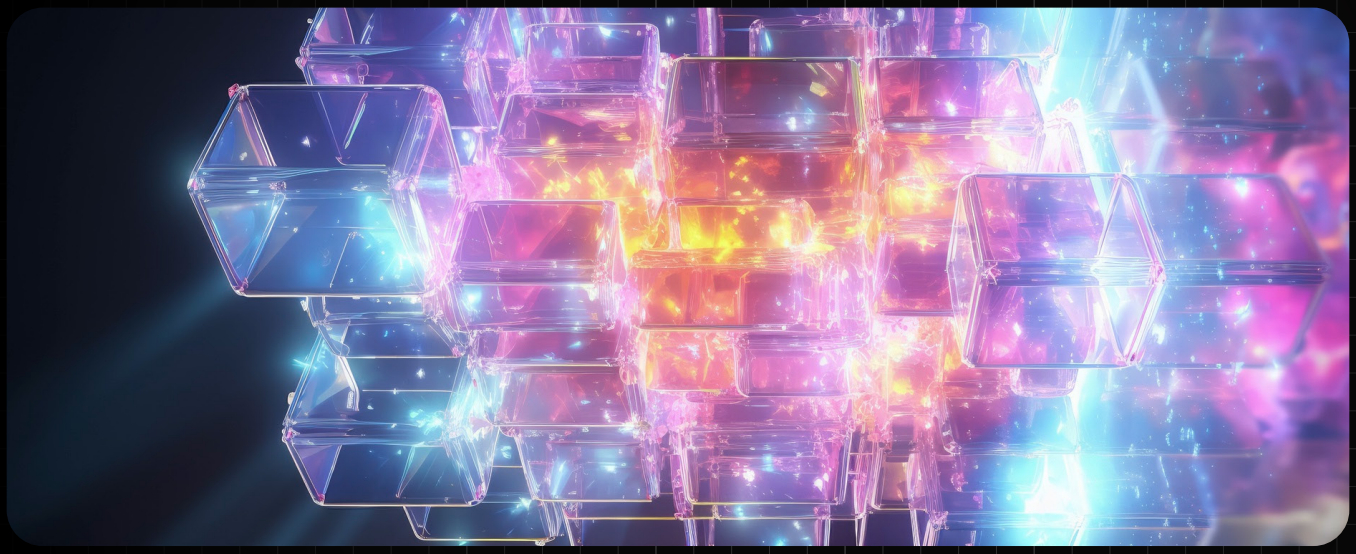
While public Blockchains typically allow anyone to host a node, issue tokens, or deploy applications, participation in Regulated Blockchains (whether as a node or service provider) requires explicit approval by the relevant regulator. Users, on the other hand, do not require permission to access services being rendered on a Regulated Blockchain.

Restricting participation to regulated entities accommodates enough participants for Regulated Blockchains to remain decentralized while constraining participation to enhance security and privacy. Specifically, concerning validator nodes, Regulated Blockchains implement a version of Proof of Authority (PoA) called Proof of Regulation (PoR). With Proof of Regulation, validator nodes are required to be hosted by licensed financial services providers within the DeFi or TradFi space. As such, just like the prospect of losing staked funds discourages misconduct in Proof of Stake (PoS), the prospect of losing a license to operate is expected to be an even more effective deterrent against bad behavior.

To promote decentralization, each service provider is required to host either a validator or an archival node while regulators, network administrators, and network developers are each expected to host a validator node. Finally, to enforce restrictions, Regulated Blockchains operate within a virtual private network which ensures that only authorized computer devices can join the network.

> Users do not require permission to access services being rendered on a Regulated Blockchain.





PROGRAMMATIC REGULATION

Regulated Blockchains utilize the programmability and immutability of Blockchains to enable regulators to 1) define regulatory guidelines as software programs, 2) incorporate these regulatory programs into third-party applications and tokens and 3) verify compliance by automatically screening applications, tokens, and transactions before they are accepted into the Blockchain. This approach automates compliance and regulatory oversight thereby improving effectiveness while reducing human involvement and associated costs.

Regulatory code snippets are incorporated via smart contract templates and conventions which are reviewed for correctness during automated smart contract screening. Automated smart contract screening is essentially a quick way to audit smart contracts during deployment and without human involvement in order to confirm that stipulated templates and conventions have been followed and that no malicious code is included.

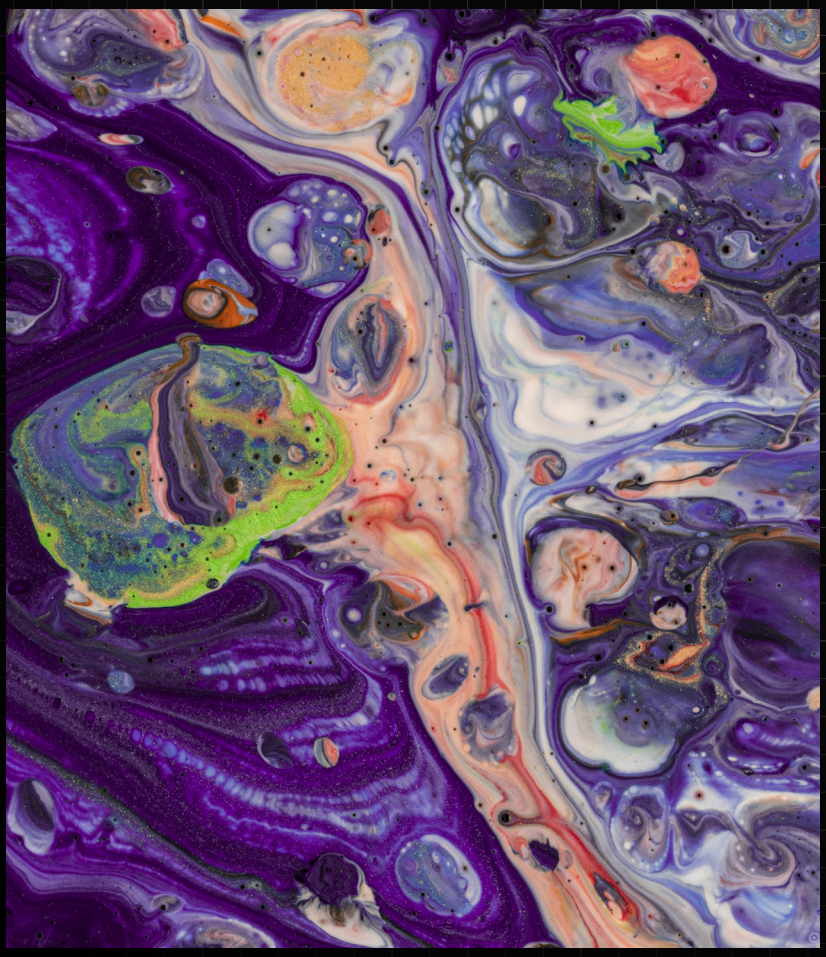
FULLY AUTOMATED PROCESSES

Traditional financial products are underpinned by operations that involve manual activities. These manual processes threaten compliance, reduce transparency, introduce friction, and generate cost. Regulated Blockchains eliminate manual operations by automating processes using smart contracts.

Regulated Blockchains require that all operations powering any financial product are completely automated and that no human intervention is involved. This way, every step of the operation is defined upfront, transparent to stakeholders, and scrutinized accordingly. Also, the immutability of Blockchains ensures that service providers cannot alter a pre-defined and pre-approved process once it's deployed.

Automation enhances value to end-users by improving reliability, eliminating friction, and reducing TaTs for service fulfillment. Automation also eliminates the opportunity for unscrupulous individuals to perpetrate fraud since there is no reason or room for such individuals to interact with processes. Finally, automation eliminates the cost associated with the human labor and manual workflows typically required to deliver traditional financial products.

> Automation enhances value to end-users by improving reliability, eliminating friction, and reducing TaTs for service fulfillment



INFRASTRUCTURE LAYER

INTRODUCTION

The infrastructure layer of Regulated Blockchains is the foundation upon which other layers are built and provides functionality that other layers depend on. The infrastructure layer is essentially the Blockchain framework itself whose programmability, immutability, and transparency allow products, regulatory features, and external interfaces to deliver fit-for-purpose, safe, and compliant financial services. This section describes the various components of the infrastructure layer, some of which function similarly to how they would function in a public chain.

SHARED LEDGER

The shared ledger is a transaction database that is replicated and synchronized across multiple computer systems, institutions, and geographies. The shared ledger also stores compiled versions of programs intended to be run within the Regulated Blockchain. This arrangement extends the same transparency and immutability of transaction records to smart contract code.

Individual computer systems(nodes) store copies of the ledger and communicate any valid changes to other nodes which update their ledgers to match. Network connectivity between nodes allows these changes to take effect nearly instantly while enabling nodes to compare their states at intervals and detect/overwrite unauthorized changes.

Regulated Blockchains can utilize any typical distributed ledger system with the only requirement being that the speed and storage capacity should be sufficient to support the scale of usage expected. Finally, the distributed nature of the ledger provides the transparency and immutability that is so central, not just to Blockchains as a whole, but specifically to the concept and functioning of Regulated Blockchains.

APPLICATION RUN-TIME

The runtime environment is the environment in which Regulated Blockchain programs or applications are executed. It is the hardware and software infrastructure that supports running smart contract code in real time. In Regulated Blockchains and Blockchains in general, the runtime environment is distributed across multiple computer systems just like the distributed ledger. In addition, the runtime environment works hand-in-hand with the distributed ledger to give Blockchains their unique form of programmability.

More specifically, the shared ledger stores the instructions that make up each program running on the Blockchain while the runtime environment executes the instructions retrieved from the shared ledger. Since records on the shared ledger are immutable and the runtime will only execute instructions obtained from the shared ledger, it follows that applications running on the Blockchain are tamper-proof and can be trusted to function the same way for as long as they are in use.

Regulated Blockchains take full advantage of these characteristics in the sense that after vetting applications for compliance and safety, regulators do not need to review the workings of the applications after they are deployed since it's not possible for them to have changed.

NETWORK CONNECTIVITY

Regulated Blockchains are based on virtual private network architectures. This means that only computer systems permitted and provisioned on the network can have access to other computers on the same Regulated Blockchain network. For this, the recommended network topology is a dynamic multipoint VPN which avoids having to explicitly reconfigure every existing node when there is a need to grant a new node access.

Public Blockchains do not require VPNs because connectivity is possible for any computer system that has access to the internet. This makes joining a public Blockchain as a node potentially simpler but excludes the option to control who has access to the network and to the records stored on the network.

For Regulated Blockchains, nodes can utilize the Internet to gain physical access to the network but will need to join the VPN in other to gain logical access. As such, a typical network topology should ensure that both cloud-based nodes and on-premise nodes can participate seamlessly on the VPN.

To manage the process of adding or removing network nodes, regulators assign qualified personnel or rely on designated Network Administrator entities to handle this.

NETWORK NODES

Network nodes are computer systems that host copies of the Regulated Blockchain ledger and runtime environment while synchronizing with other nodes to receive and transmit ledger updates as they occur. Unlike public Blockchains, Regulated Blockchains require that nodes are explicitly permitted to participate in the network. This means that even when the computer system hosting a node has been set up on the VPN, specific permissions have to be granted on the Blockchain to enable such node to communicate and interact with the other permitted nodes on the network. Again, to manage the process of adding or removing participating nodes, regulators assign qualified personnel or rely on designated Network Administrator entities to handle this.

There are two primary types of nodes in Regulated Blockchains, which are validator nodes and archival nodes. Validator nodes store a copy of the ledger and propose new entries to the ledger. Validator nodes also double-check entries proposed by other validator nodes to confirm their consistency with existing records and prevent errors or fraud. Archival nodes only store a copy of the ledger which helps improve security by increasing the number of instances of the ledger that have to be compromised for a bad actor to perpetrate fraud.

CONSENSUS ALGORITHMS

Consensus algorithms are the mechanisms and processes by which validator nodes add new records to the Blockchain in a secure way. The key goal of consensus mechanisms is to minimize the risk that nodes will be inclined or able to manipulate the process of adding new records in other to gain a financial benefit.

Some public chains randomize the process through the Proof of Work (PoW) consensus mechanism which ensures that a single node cannot consistently add new Blocks and hence cannot solely determine the contents of the ledger. Proof of Stake (PoS) on the other hand discourages misconduct by ensuring that a node's likelihood to propose new blocks (hence to determine the contents of the ledger) is proportional to the amount it has staked (and will lose) if found to have attempted or succeeded in falsifying new Blockchain entries.

Regulated Blockchains utilize a version of Proof of Authority called Proof of Regulation which unlike PoW and PoS assumes that validator nodes are run by trusted entities. This is possible because participation in Regulated Blockchains is restricted to entities that have been screened by regulators and licensed or approved to provide financial services to end-users. As an additional layer of protection similar to PoS, Proof of Regulation discourages misconduct by ensuring that nodes found to have falsified records lose their license to operate as a financial service provider thereby losing their entire business and all future income expected therefrom.

SECURITY AND PRIVACY

Blockchains leverage cryptography to ensure that records stored on the ledger are immutable. Specifically, records are grouped into Blocks and the digital signature of each preceding Block is added as a record to the next block whose signature is also added to the next block, and so on. This arrangement ensures that when any record is modified, the digital signature of the Block containing the modified record changes which means the entire block becomes invalid along with all subsequent Blocks in the chain.

Blockchains also leverage consensus protocols to determine what copies of the ledger are valid and continuously replace invalid versions that may have been compromised or corrupted. This process combined with having multiple copies in disparate physical locations guarantees that records on the ledger are extremely difficult (if not impossible) to tamper with.

Regulated Blockchains adopt the exact same approach to achieve immutability which when combined with self-custody, automated processes, and programmatic regulation guarantee that financial services on Regulated Blockchains are safe and compliant.

To ensure privacy, Regulated Blockchains only allow nodes to be hosted by licensed financial services providers who (as a requirement for their license and operations) already comply with guidelines on data privacy. In addition, Regulated Blockchains anonymize records on the ledger so that the identities of users are protected even when third parties have access to the ledger. Regulated Blockchains utilize the kind of anonymization that allows only the creator of any record and their respective regulators to view sensitive user information associated with such record on the ledger.

ECONOMICS

Regulated Blockchains typically have a fixed maximum number of validator nodes which ensure the integrity and consistency of new records being written to the ledger without encumbering the network's speed and scalability. Validator nodes are either commercial or non-commercial. Commercial validators are hosted by network service providers and all earn fees for playing the role of validator. Non-commercial validators are hosted by Network Developers, Network Administrators, and Regulators and do not earn a fee since entities hosting them are compensated in other ways.

For regulators, the validator nodes serve as a gateway to access the network either for monitoring or to deploy regulatory smart contracts. Furthermore, Regulated Blockchains are viewed by regulators as a tool for the effective and efficient regulation of business activities in their specific domains. And since Regulators do not have to pay explicitly to use Regulated Blockchains, the cost they incur to host regulatory validators is considered equivalent to the service fee they would have paid for the value provided by Regulated Blockchains.

Gas fees on Regulated Blockchains are set such that it is profitable for all commercial validators active on the network to run their validator hardware. This means that gas fees vary depending on the ratio of commercial to non-commercial validators and could reduce to absolute zero when there are no commercial validators. This arrangement naturally results in Regulated Blockchains prioritizing non-commercial validators over commercial validators. Since the total number of validators is fixed, Regulated Blockchains require that for every new non-commercial validator joining the network, one commercial validator is decommissioned on a last-in-first-out basis. The benefit of this unique economic model to end-users is the very low and potentially zero effective cost of using the network as compared to public chains.

Aside from validators, network developers and network administrators play major roles in Regulated Blockchains by supporting operations, facilitating expansion, and delivering ongoing enhancements. This dependency requires that entities in these roles are sufficiently incentivized to make the necessary investments. As such, Regulated Blockchains allow network developers and network administrators reserve the exclusive right to provide native services on a commercial basis. In each country and for each applicable regulatory domain, the network developer collaborates with the respective network administrator on a revenue-share basis to provide the required native services. This way, organizations in these roles derive their incentives from income tied to the usage of those services.

PRODUCT LAYER

INTRODUCTION

The Product layer of Regulated Blockchains provides the instruments, features, and operations that constitute the various digital financial products being consumed by end-users. Approved service providers programmatically define these instruments, features, and operations within smart contracts and deploy them to the Regulated Blockchain subject to screening by Regulators. Products deployed by service providers run as DeFi protocols in a fully automated fashion based on these smart contracts while end-users interact with the protocols through off-chain applications operating on the external interface layer.

Token issuers create digital financial instruments that end-users utilize in storing value. These instruments hold value from various sources including payment, debt, equity, and physical assets amongst others. Application developers, on the other hand, create automated processes that utilize these instruments to move and manage value on-behalf of end-users.

The product layer leverages the programmability of Regulated Blockchains and the concept of self-custody to facilitate a diverse ecosystem of DeFi products. For maximum variety and innovation, the product layer also supports service providers working with freelance product managers on a revenue-sharing basis, much like the relationship between social media platforms and content creators.

TOKEN ADMINISTRATION

Regulated Blockchains allow service providers to issue tokens of various types that represent various categories of financial assets. Each token can be purchased directly from the issuer or traded on a decentralized exchange. Token issuers are required to structure their token smart contracts according to regulatory templates pre-defined for respective token types.

Regulated Blockchains allow end-users to hold tokens issued on public chains through the concept of token wrapping. This is achieved by issuing new equivalent tokens on the Regulated Blockchain and collateralizing the new tokens (value for value) using original tokens locked in a smart contract account on the public chain. This mechanism enables the new tokens on the Regulated Blockchain to retain the value and essence of the original tokens on the public chain while achieving compliance and allowing regulatory oversight.

Two broad categories of tokens recognized on Regulated Blockchains are payment Tokens and Security Tokens. Payment Tokens are tokens that are either approved as legal tender for payment or underpinned by instruments that are approved as legal tender for payment. Security tokens are tokens underpinned by financial instruments that represent ownership of legal business entities, future cashflows, physical assets, or digital items.

Tokens deployed on Regulated Blockchains are required to support and enforce basic KYC. Tokens are also linked to countrys hence implement the KYC requirements of the countrys where they reside. For tokens that derive their value from other tokens or financial information on Regulated Blockchains, information about their immediate underlying value must always be available and up to date. This provides users with transparency about the true value of the assets represented by each token and eliminates the risk of investors being defrauded by Ponzi schemes.

Ultimately, Regulated Blockchains will only allow the issuance of tokens that derive their value from other tokens and/or financial information on Regulated Blockchains or from approved decentralized protocols on supported public Blockchains.

PROTOCOL SMART CONTRACTS

Protocol smart contracts are the programs that define features and run operations for financial products on Regulated Blockchains. Just like the case with tokens, protocol smart contracts are required to be structured according to regulatory templates pre-defined for respective product categories.

Protocol smart contracts are built by approved service providers on Regulated Blockchains and screened by respective regulators before they are deployed for end-users to consume through off-chain applications interacting through the external interface layer. Service providers may enlist freelance individuals known as product administrators to develop protocol smart contracts on a revenue share basis.

PRODUCT ADMINISTRATORS

The concept of Product administrators in Regulated Blockchains democratizes financial innovation and product development while ensuring that necessary regulatory requirements are always met. Product administrators are freelance product managers, business analysts, or software engineers who have a strong background in finance, understand customer needs, and can articulate the logic and processes required to deliver compelling financial products.

These product administrators are typically unable to fulfill the requirements to operate as licensed service providers, however, they can create and deploy products under the umbrella of existing licensed service providers and earn a share of revenue every time one of their products is used. This collaboration works in much the same way as the collaboration between content creators and social media platforms.

In this arrangement, regulators and customers hold licensed service providers wholly responsible for products developed by product administrators. As such, service providers earn a share of revenue from such products which can multiply their income streams with little or no additional investment.

NATIVE TOKENS

Regulated Blockchains provide native payment tokens for each supported country. These native payment tokens are pegged to CBDCs or physical fiat currencies and serve as legal tender for payment in each supported country. In each case, the Regulated Blockchain is considered the issuer, and the token issuance process is fully decentralized and automated using smart contracts.

New tokens are minted once CBDC or physical fiat value is received in a dedicated pool account held within the CBDC platform or on the real-time gross settlement system of the relevant Central Bank. Blockchain bridges and internal smart contract calls serve as the mechanism through which this communication is achieved. Periodic reconciliation is also done automatically to ensure that the off-chain and on-chain balances for each token are always equal.

Native payment tokens are used in the following ways;

As base currency for DeFi protocols running on the Regulated Blockchain in that country

As base currency for real-time settlement of physical currency transactions conducted by Banks

As base currency for conversion from one payment token to another

As a payment token for all fees charged on the Regulated Blockchain

NATIVE SERVICES

Native Services consist of functionality built, supported, and continuously enhanced by the Regulated Blockchain's network developer in conjunction with respective network administrators in each regulatory domain. Native services are default network capabilities that serve as input or building blocks when licensed service providers are creating protocols and applications for end-users. All functionalities that interface with off-chain systems are delivered as native services.

Because the utility of a typical native service will cut across multiple protocols, service providers, and countrys and since the investment required to create them is significant, having them centrally built eliminates costly repetitive effort while guaranteeing a minimum standard of quality. Also, because interaction with off-chain components creates vulnerabilities for Blockchains, the centralized delivery of these services enables effective oversight and control. Services in this category are described below;

Wholesale Payment Processing

Enables traditional financial institutions to make and receive payments in real-time on behalf of their account holders across multiple payment channels.

Currency Conversion

Allows money transfer operators to perform real-time currency conversion during the processing of cross-border remittance transactions.

Credit Assessment

Automatically assesses the creditworthiness of loan applicants by analyzing their profile and financial history using trained machine learning models.

AML Transaction Monitoring

Analyizes payment transactions using trained machine learning models to detect and report potential money laundry activities for further investigation.

Retail Payment Authentication

Provides simple and intuitive yet secure means for Regulated Blockchain account holders to authenticate payments originated on third-party applications like PoS systems, websites, and mobile apps.

Token Wrapping

Allows issuers of tokens on public chains and other Regulated Blockchains to transfer value from such tokens into any Regulated Blockchain. Also provides default access for end-users on regulated chains to hold and trade a number of prominent public tokens like Bitcoin and Eth.

Identity Verification

Utilizes access to identity management platforms to confirm that identity information submitted by users are authentic.

Sanction Screening

Screens new users during onboarding to verify that they are not blacklisted for money laundering, terrorism financing, or fraud.

NATIVE SERVICES

Universal Direct Debit

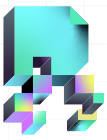
Provides a means to deduct debt owed by a user from any deposit account or financial asset held in their name.

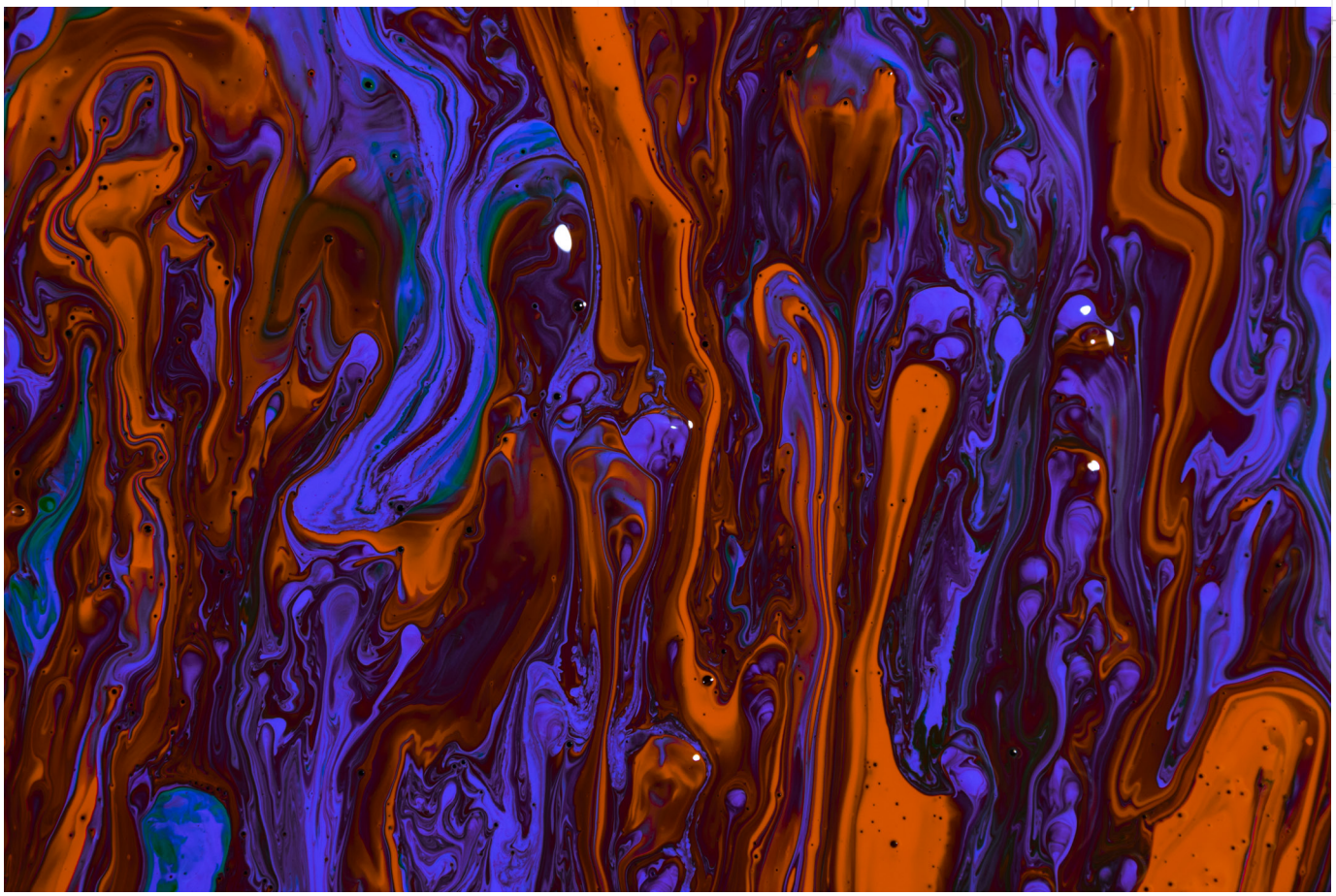
Card Issuance

Enables the creation of physical and virtual payment cards as well as the linking of these cards to end-user accounts on the Blockchain such that Regulated Blockchain users can make payments in all physical outlets and on all websites where supported local and international cards are accepted.

Fraud Detection

Analyzes payment transactions using trained machine learning models to detect and prevent or report potential fraud.





EXTERNAL INTERFACE LAYER

INTRODUCTION

The external interface layer in Regulated Blockchains enables two-way communication with off-chain applications. The external interface layer accepts user requests from end-user applications and emits information as responses to requests or as proactive notifications about activities happening on-chain. Conversely, the external interface layer is also used when protocols and applications on the Regulated Blockchain need to communicate with external information sources to obtain useful input for running their internal processes. This section describes the main components of the external interface layer as well as the off-chain end-user applications that interact with it.

END-USER APPLICATIONS

End users interact with Regulated Blockchains through off-chain applications that 1) interact with the External interface layer of Regulated Blockchains via programmatic interfaces and 2) accept inputs and present information to users via graphic, conversational, or agentic interfaces. The following categories of end-user applications apply;

Payment Applications

These include PoS solutions, mobile payment applications, and web-payment gateways which allow users to instruct payments to individuals or merchants for purchases or other reasons.

Business Applications

These include accounting, billing, payroll, treasury, and trade finance applications which typically instruct payment, access account information, or get notified when transactions occur on an organization's account.

AI Assistants

Manage money on behalf of end-users particularly borrowing, investing, and making routine payments while reporting each user's financial status to them from time to time.

Wallet Applications

Allow end-users to view and administer their tokens on Regulated Blockchains. Wallets also provide end-users with access to various financial products running on Regulated Blockchains.

Embedded Finance Applications

These are applications that enable consumer-facing businesses operating outside the financial sector to provide savings accounts or credit to their customers.

NODE APIS AND EVENT STREAMS

Node APIs allow end-user applications to send requests to smart contracts in the form of transactions. Transactions are submitted to a node (via the API endpoint) which adds the transactions to a block for entry into the ledger. Other validator nodes validate the correctness of the Block and the block is committed to the Blockchain. Once on the Blockchain, the target smart contract function is invoked and the process within the smart contract designed to handle the request is triggered.

The external interface layer also consists of pub/sub event streams for receiving responses or notifications. After a request is sent by an end-user application and a target smart contract function is invoked, a response to the end-user application is sent by the smart contract through the process of emitting an event to which the end-user application subscribes.

In the notification scenario, smart contracts are designed to proactively notify end-user applications when specific activities occur. This is also achieved by relevant smart contracts emitting events for which the end-user applications are subscribed.

> Other validator nodes validate the correctness of the Block and the block is committed to the Blockchain.

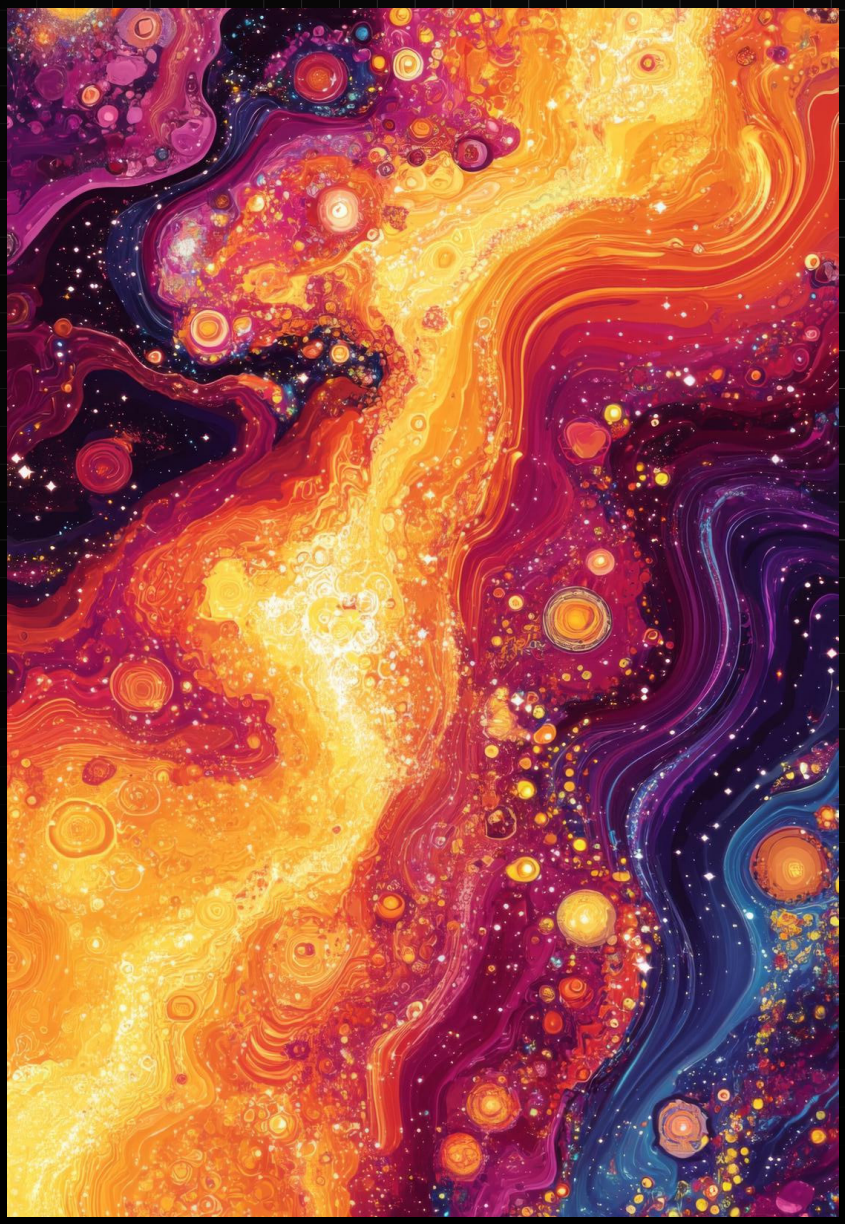
ORACLES

Oracles serve as a gateway for Regulated Blockchains to access external information and resources like computation in a secure and controlled way. Oracles consist of an off-chain middleware that listens for events from the Regulated Blockchain along with an Oracle smart contract that provides an internal function for other smart contracts within the Regulated Blockchain to call. Oracle middleware applications are hosted by authorized Network Administrators in each country.

When external information or computation is required, the requesting smart contract invokes a function exposed by an Oracle smart contract which emits an event to the Oracle middleware containing a call-back address and function. The Oracle middleware detects the event and triggers the specific external API call to access the requested information or run an external process.

Once a response to the request is available, the Oracle middleware sends a transaction containing the response to the corresponding Oracle smart contract which then forwards this response to the requesting smart contract. Regulated Blockchains provide application developers with a generic REST-based Oracle integration and corresponding Oracle smart contract that accepts parameters in JSON form and dynamically generates a rest API call from an Oracle to any specified end-point.

> Oracle middleware applications are hosted by authorized Network Administrators in each country.



REGULATORY LAYER

INTRODUCTION

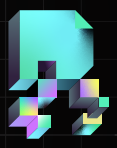
Regulated Blockchains leverage the programmability, immutability, and transparency of Blockchains to implement programmatic regulatory mechanisms that enforce compliance and achieve real-time visibility at lower costs and with less human effort. The three primary mechanisms that constitute programmatic regulation in Regulated Blockchains are Token Templating, Smart Contract Screening, and Transaction Screening. Regulated Blockchains also implement other non-programmatic controls to ensure the effectiveness of programmatic regulatory mechanisms and improve the overall safety and security of the system.

PROGRAMMATIC REGULATION

Programmatic regulation in Regulated Blockchains involves constraining the behavior of protocol and token functionality to enforce compliance and this is done in three ways. First, infusing code snippets that fulfill regulatory requirements into applications and tokens as part of smart contract templates and ensuring that application developers use the specified templates. Second, restricting protocol/application smart contracts from directly interacting with tokens and instead inserting a compliance verification layer in between both. This guarantees that verification of compliance will always be triggered when value needs to move.

The arrangement also ensures that smart contracts contain the logic and functionality they need to fulfill regulatory requirements but also verifies in real-time that these requirements are continuously being met at the point of each transaction. The approach incorporates regulatory logic and functionality without limiting the product innovation and capabilities being built by application developers and token issuers.

Finally, the programmatic regulation principle requires performing a one-off automated “catch-all” code audit just before deployment to identify potential non-compliant or malicious functionality within smart contracts and to prevent them from being deployed into production and causing end-users to lose value.



COMPLIMENTARY REGULATORY CONSTRUCTS

Regulated Blockchains combine the following complimentary principles to establish a new breed of financial services that deliver superior functionality and user experience without compromising compliance and safety.

Fully automated processes
This lays the foundation for programmatic regulation and transparency by eliminating the discretion and obscurity associated with manual processes.

Self-custody
This eliminates third-party access to and control over end-user assets which eliminates the risk of fraud or misappropriation.

Immutability
The inability to modify contents of the chain ensures that compliant and safe processes cannot be modified by their own creators which means end-users can rest assured that financial products confirmed to be safe and compliant will remain that way for as long as they are used.

TOKEN TEMPLATING

Token templating is a way to augment token smart contracts with the logic required to fulfill regulatory requirements by inserting the additional logic into a template that is used by service providers when building token smart contracts. Specific templates are defined for various types of token contracts depending on what additional regulatory logic is applicable in each case. The following specific requirements apply;

The regulatory functions listed below should be catered for in any token contract template.

- Enforcement of account holder registration
- Account holder identity verification
- AML transaction monitoring
- Fraud and AML sanction screening
- Direct function calling inaccessible to protocols and applications
- Prevention of transfers to accounts without KYC
- Support for multiple account types and respective rules for each
- Support for custom logic to be defined by token issuers

SMART CONTRACT SCREENING

Smart contract screening in Regulated Blockchains happens when service providers initiate smart contract deployment by sending a smart contract deployment transaction to a deployment screening API on the testnet along with corresponding documentation and high-level source code. The API receives the deployment screening request and calls a Coding Assistant AI API to run an automatic code audit based on pre-trained or pre-specified checks.

If the response is favorable, the deployment screening API calls the standard Node API for submitting transactions to the Blockchain, and the new smart contract is deployed to the testnet. If the response is unfavorable, the response is transmitted back to the relevant service provider with a detailed description of the issues identified.

The service provider is expected to address the issues identified, attempt deployment again, and continue this iterative process on the testnet until the smart contract passes the automated code review. Following this, the screened smart contract can then be submitted as a proposal to the native on-chain governance process which enables token holders to vote and decide wether to accept or reject the change.

The Smart contract screening process should ensure that each smart contract.

Conforms with any template designated for the service being rendered

Invokes the appropriate regulatory contracts for the service being rendered

Does not contain any logic or code that could potentially be fraudulent or malicious

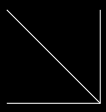
Is compliant with any regulation which may not be enforced at the transaction screening level

Does not contain any logic or code which is not necessary for the service being provided.

Is submitted for approval by token holders through an on-chain voting process managed by the Regulated Blockchain

TRANSACTION SCREENING

Transaction screening is a mechanism that checks the actual status of transaction parameters and other relevant variables against what they are expected to be in order to fulfill regulatory requirements. Where there is a variance, the regulatory smart contract performing the screening prevents the transaction from completing. The following architectural considerations are applicable for successful transaction screening;



Each protocol smart contract is restricted to interacting with token smart contracts only through respective regulatory smart contracts that perform whatever transaction screening is stipulated for the service being provided.

The gateway smart contract serves as an orchestrator restricting access to token balances and ensuring that protocol smart contracts can only access tokens through regulatory smart contracts and so must pass regulatory screening for them to perform their customer-facing function.

Protocol categories are themselves mapped to regulatory smart contracts so that the appropriate transaction screening logic can be applied to each protocol smart contract.

Respective Regulatory smart contracts contain logic that run checks to validate that all necessary conditions have been met by the protocol smart contract before forwarding each transaction to the target token smart contract through a single gateway smart contract.

All token and protocol smart contracts as well as end-user accounts must be mapped to specific countrys and applicable categories/sub-categories within each country.

Each regulatory smart contract has to be permitted on the single gateway smart contract to interact with any token through the gateway smart contract.

The gateway smart contract for each country only allows interaction with permitted regulatory smart contracts and each new regulatory smart contract has to be permitted on the gateway smart contract by the regulator for the regulatory domain within the relevant country.

OTHER REGULATORY OVERSIGHT

To complement the programmatic regulatory layer and ensure required security and consumer protection, Regulated Blockchains are designed to enable Regulators to perform the following additional off-chain governance functions to control participation and operations.

Infrastructure Governancet

Regulators collectively vote to approve infrastructure changes since they are global and affect the entire network. Changes that require a majority vote of regulators on the network include the addition of any new validators, modifications to the Blockchain software itself, changes to VPN topology or parameters, and replacement of the network developer.

Network Member Governance

Regulators also vote collectively to accept new regulators onto the network whereas each regulator overseeing a particular regulatory domain is responsible for appointing a network administrator for that regulatory domain. Regulators also license or approve service providers and where applicable end-user applications operating within their respective regulatory domains.

Native Token Governance

Concerning governance of native tokens, each regulator for a country performs pre-deployment audits of the token smart contract for that country to verify that it contains (1) the logic to fulfill relevant regulatory requirements and (2) the programmatic controls stipulated by the Regulated Blockchain standard. Each central Bank also serves as the sole custodian for all funds collaterizing native tokens whether in the form of physical or digital fiat currencies.

Native Service Governance

With respect to native services, the automated pre-deployment screening of smart contracts also applies in addition to the audit of off-chain logic within Oracles which connect native services to external systems. Regulators for each respective regulatory domain within a country are required to approve all third-party systems that native services within the domain interact with.

USE CASES

INTRODUCTION

This section describes potential use cases of Regulated Blockchains across various types of financial products and instruments. Some of these use cases highlight innovative approaches through which traditional financial services constructs can be represented within the context of digital tokens and DeFi protocols.

WHOLESALE DOMESTIC PAYMENTS

Regulated Blockchains facilitate wholesale payments within respective countries by hosting settlement accounts of participating Banks and other licensed financial institutions and utilizing a native payment token to perform real-time settlement from and to such accounts. Each participating institution (after charging the paying customer's account with the transaction amount) initiates the transaction to the receiving customer within another participating institution through the regulated Blockchain.

The Regulated Blockchain effects settlement and notifies the receiving institution for onward credit into the beneficiaries account. In this scenario, settlement is instant which means merchants and other beneficiaries can receive value immediately as opposed to waiting for one or more days. Regulators also have granular (per transaction) visibility into the settlement process in real-time as compared with traditional RTGS systems where regulators are restricted to viewing high-level net settlement positions at pre-defined intervals.

WHOLESALE CROSS-BORDER PAYMENTS

Similar to the domestic scenario above, Regulated Blockchains facilitate cross-border payments including diaspora remittances and international trade payments leveraging real-time settlement tokens. These real-time settlement tokens for cross-border payments can be native tokens used domestically in the world's strongest economies or dedicated global settlement tokens pegged to universally accepted fiat currencies held securely by credible and regulated financial institutions. Like in the domestic scenario, Regulated Blockchains effect settlement and notify the receiving institution for immediate onward credit into the beneficiary's accounts.

Aside from enabling settlement, as well as facilitating currency conversion and providing integrations for delivering instant value to beneficiaries, Regulated Blockchains also allow Central Banks to define rules that govern cross-border payments in a programmatic way. This approach ensures that the rules are enforced and that the operational cost of maintaining effective oversight is significantly lower than usual.

RETAIL PAYMENTS

Regulated Blockchains enable retail payments for non-custodial accounts held directly on-chain by individuals and organizations. They provide authentication, notification, conversion, and integration to external value stores. For authentication, Regulated Blockchains support OTP, PIN, and Biometric options which allow customers to instruct payments via physical payment terminals, mobile applications, and websites with support for cards, QR codes, and NFC.

Regarding notification, Regulated Blockchains provide a means to update third-party merchant systems like PoS, billing, and accounting applications in real-time when payments have been effected and confirmed. This enables a seamless payment experience, facilitates order fulfillment, and addresses reconciliation challenges.

Finally, through traditional depository institutions and liquidity providers and by integrating third-party stores of value, Regulated Blockchains allow payers to initiate payments in one currency while beneficiaries or merchants receive value in any supported currency of their choice.

ISSUANCE OF PAYMENT TOKENS

Authorized financial institutions can issue tokens collateralized by domestic or foreign fiat currencies. Regulated Blockchains enforce KYC and AML but also provide regulators with real-time visibility as well as allow them to define rules that guide the use of such tokens.

Payment tokens can be categorized as closed or open. Closed payment tokens can only be transferred to the entity on behalf of which they were issued. A typical use case for closed payment tokens is merchant prepayment where customers earn discounts, rewards, or other benefits for making down payments ahead of purchasing products and services. With closed payment tokens, proof of reserves is not required since the issuer is also the acceptor.

Open payment tokens on the other hand can be transferred to any third-party entity and hence require the use of authorized custodians who hold the deposits or other assets backing issued tokens on behalf of the ultimate beneficial owners. Regulated Blockchains also enforce proof of reserves for open payment tokens to ensure that the value of assets Backing each token type is always equal to the value of all tokens issued for that token type.

ISSUANCE OF CBDCS

Central Banks can issue CBDCs directly on Regulated Blockchains by creating token smart contracts and defining relevant rules to guide the usage of the CBDCs. Regulated Blockchains help Central Banks ensure that wallets or accounts holding such CBDCs are compliant with KYC and AML regulations. Regulated Blockchains also provide instant interoperability with other CBDCs as well as universal acceptance across payment channels along with easy conversion to and from physical fiat currencies being held by traditional Banks. Finally, Regulated Blockchains allow CBDCs to be used and widely adopted within Regulated DeFI ecosystems for lending, savings, investment, and trading activities amongst others.

ISSUANCE OF UTILITY TOKENS

Regulated Blockchains support the issuance of tokens whose value is derived based on a demand and supply dynamic linked to their use as an instrument to pay for, invest in, or govern specific on-chain or off-chain services. With such tokens, either the total supply or the mechanism for determining the supply is fixed as part of defining the token smart contract.
Through token templating and pre-deployment screening, regulated Blockchains ensure that safe standards for issuing fixed and variable supply utility tokens are followed strictly to protect users from losses associated with fraudulent token supply logic.

> regulated Blockchains ensure that safe standards for issuing fixed and variable supply utility tokens are followed strictly to protect users

ISSUANCE OF LIQUIDITY TOKENS

Regulated Blockchains support the tokenization of liquidity pools to enable them to trade on decentralized exchanges and expand options for attracting investors. Liquidity pools are pools of funds locked into smart contracts and contributed by various investors for purposes of facilitating specific decentralized financial services like lending, investment, insurance, trading, and savings in exchange for fees. Fees accruing to the pool are shared amongst investors in proportion to how much each investor contributed to the pool.

Regulated Blockchains allow for tokens to be issued and redeemed against units of value from such pools whereby the par value of each unit is always equal to the total value of the pool divided by the number of tokens issued.

With this use case, the value backing tokens is always transparent while the token price can fluctuate within any token exchange depending on demand and supply. Also, such pools can access more capital by issuing additional tokens and selling them on supported exchanges.

TOKENIZATION OF FINANCIAL SECURITIES

Regulated Blockchains allow organizations and governments to tokenize debt, equity, and hybrid instruments thereby reducing the cost of handling as well as accelerating the speed of purchase or trading and allowing unlimited fractionalization without additional operational overhead.

Tokenized securities instruments can leverage the capabilities of the Regulated Blockchain and logic within their token smart contracts to disintermediate engagement with investors and automate administrative activities. For instance, units of shares do not require custodial and record-keeping services of traditional shareholder registries. As such, equity tokens can be issued and yields disbursed directly to each investor. Tokenized financial securities can also leverage accurate and real-time financial records on Regulated Blockchains to more accurately assess the value, risks, and expected returns associated with each instrument.

Examples of securities applicable here are company shares, bonds, treasury bills, equity funds, futures, options, and other derivatives.

TOKENIZATION OF PHYSICAL ASSETS

Regulated Blockchains are able to represent fractional values of physical assets like property and commodities as tokens on the Blockchain. This enables single physical assets to be owned by multiple entities. This process also unlocks liquidity by allowing owners of physical assets to dispose of them without being restricted to a relatively small number of buyers who can afford to finance the entire purchase amount for the asset.

To achieve this, owners of physical assets engage authorized issuers to issue tokens that represent units of value and ownership in the tokenized asset. Each unit of such tokens can be purchased, held, and traded independently of all other units. Asset custodians are appointed by token issuers to maintain legal ownership and custody of the assets on behalf of the ultimate beneficial owners who hold varying units of respective tokens that sum up to the total value of each respective asset. Specific assets in this category include real estate, precious metals, precious stones, and other commodities.

TOKENIZATION OF INTELLECTUAL ASSETS

Regulated blockchains support the issuance of non-fungible tokens to represent intellectual creations captured in digital form. In this use case, the digital makeup of each item is unique and can be incorporated directly into token information or represented as a digital signature along with item descriptions and other relevant records.

Ownership of NFTs is recorded on the Blockchain and can be transferred seamlessly subject to authorization by original owners. This use-case is applicable to digital versions of items like art, music, video footage, and literature amongst others.

TOKENIZATION OF CRYPTO ASSETS

Regulated Blockchains allow authorized service providers to issue tokens pegged (1:1) against tokens issued on public chains subject to approval by regulators in each country. This allows users within regulated Blockchains to hold and trade crypto assets in a way that complies with the respective regulations of each country while giving regulators full oversight over the ownership, exchange, and deployment of these assets.

This use case allows issuers and holders of crypto tokens to transfer the value of those tokens into Regulated Blockchains for use with DeFi protocols deployed within the Regulated Blockchains. The use case also allows users of Regulated Blockchains to transfer value to users of public chains. Approval to support a specific crypto token in any country will depend on such token achieving the minimum level of decentralization and governance required by the regulators in that country.

To implement this use case Regulated Blockchains utilize bridges and liquidity pools to integrate with supported public chains and facilitate the flow of value to and from them.

LENDING

Regulated Blockchains support DeFi protocols that enable both collateralized and uncollateralized lending within the context of CBDCs and regulatory oversight. Lenders create lending liquidity pools by depositing CBDCs or tokenized physical fiat currencies.

Collateralized lending protocols require borrowers to provide collateral in the form of tokens that are traded on supported token exchanges that operate within the respective Regulated Blockchain. The value and volatility of the tokens provided as collateral are automatically determined by the protocol smart contract through exchanges and this informs what collateral-to-loan ratio applies. The protocol smart contract also automatically disburses the loans once all requirements are met and initiates recovery via direct debit when loan repayment is due. Finally, protocol smart contracts automatically liquidate deposited collateral when there is a repayment default.

Uncollaterized lending protocols do not hold traded tokens as collateral but instead need to run credit risk assessments and underwrite the risk of loan default. For credit risk assessments, lending protocols on Regulated Blockchains rely on credible and approved third-party services accessible via Oracle smart contracts.

For underwriting losses, lending protocols on Regulated Blockchains utilize decentralized liquidity pools funded as investments by individuals, organizations, and other protocols such that the return on investment is achieved through fees charged to borrowers for underwriting the risks associated with their loans. The protocol smart contract dynamically adjusts the fees based on the borrower's risk assessment score with the goal of ensuring that proceeds from fees are always more than the value of non-performing loans in any period therefore guaranteeing a net positive margin as reward to investors. In addition, the liquidity staked by investors is required to cover the total value of underperforming loans at all times.

Regulated Blockchains also facilitate lending products tied to supply chain finance and payroll specifically for borrowers using decentralized supply chain management and payroll applications available on the Regulated Blockchain. Some of these lending products supported include distributor and supplier financing, invoice discounting, asset financing, employee loans, and salary advances amongst others.

SAVINGS

Regulated Blockchains enable decentralized savings protocols where smart contracts implement various target savings mechanisms including periodic, inflow-based, and outflow-based savings triggers as determined by users during setup. Amounts to be saved are transferred from the user's account into a liquidity pool from where a smart contract automatically invests the funds in approved low-risk instruments like treasury bills, collateralized lending protocols, and DEXs to generate a yield for savings clients. Upon achievement of set savings targets, the DeFi savings protocol automatically transfers the target amount plus accrued interest back into the user's account.

DeFi savings protocols on Regulated Blockchains are non-custodial so tokens are held directly on the Blockchain without exposure to typical counter-party risks associated with traditional financial institutions that hold deposits and offer custodial savings products.

TRADING

Regulated Blockchains enable the operations of DeFi exchanges or DEXs where smart contracts serve as automated market makers by providing the liquidity required to facilitate smooth trading of assets on the exchange. With this liquidity, the smart contracts are able to automatically buy or sell listed assets on the exchange as and when users need to trade.

The liquidity being utilized by the DEX smart contracts is provided by interested individuals, organizations and protocols and viewed as investments into a DeFi instrument. A trading fee is charged to buyers and sellers which generates the return for investors that provided the liquidity. The price of traded tokens is also set dynamically based on the demand and supply of the tokens as well as input from other exchanges within the Regulated Blockchain and elsewhere.

INVESTMENT

Regulated Blockchains enable DeFi investing protocols to apply hand-crafted or learned investing rules to funds transferred by investors into a DeFi liquidity pool. Funds provided are locked into the smart contract operating the investing protocol and this smart contract in conjunction with fund management AI agents utilizes the funds to buy and hold target assets/tokens from DEXs. Investing protocols also determine when to sell assets in order to take profit or prevent loss.

Investment protocols have the option to issue tokens pegged to the value of the liquidity pool which themselves can be traded on exchanges and be considered investible assets by other DeFi investing protocols.

DeFi investing protocols are also non-custodial which means the assets under management are not held by a traditional asset manager and hence are not subject to the risks of fraud or misappropriation. In addition, investors enjoy complete transparency about the composition and value of the investment fund.

INSURANCE

Regulated Blockchains facilitate decentralized insurance where underwriters fund a liquidity pool to cover paying valid claims while earning the premium paid by insurance policyholders.

Insurance smart contracts dynamically set premiums based on an assessment of the risk associated with each policyholder with the ultimate goal being to ensure that the premium is sufficient first of all to cover payment of claims in the long run but also sufficient to provide a decent return to underwriters who have staked their funds in the liquidity pool.

When claims are made, licensed claim assessors are commissioned automatically by insurance smart contracts to carry out independent investigations into claim-related incidents and provide reports that are accessed via an Oracle. Once claims are validated the smart contracts automatically disburse claim amounts to requesting policyholders.

Insurance smart contracts also invest liquidity from the liquidity pool into relatively low-risk assets like treasury bills, collateralized lending protocols, DEXs, sovereign bonds, and high-grade corporate Bonds while providing the returns earned to underwriters. Just like the case with investment pools, tokens can be issued and pegged against the value of an insurance liquidity pool and these tokens can be traded on exchanges within Regulated Blockchains to unlock additional liquidity.

FINANCIAL ACCOUNTING

Regulated Blockchains enable automated, compliant, and transparent accounting. Accounting smart contracts on regulated Blockchains automatically post accounting entries into the ledger when there is a revenue inflow or expense outflow to or from an organization's wallet. Accounting smart contracts also post entries when digital assets are issued or transferred by the organization. This allows financial statements of organizations including income statements, Balance sheets, and cash flow statements to automatically evolve in real-time as commercial activities occur thereby continuously reflecting the true financial position of each organization.

Institutions can define their charts of accounts on the ledger and pre-configure transaction types with specific accounts to be debited or credited when certain transactions happen. Also, financial accounting regulators are able to programmatically define rules for handling various non-cash transactions including amortization, depreciation, and others.

The programmability of Regulated Blockchains enables automation of accounting entries and definition of accounting rules. This transparency allows investors and other stakeholders to understand the true financial situation of any business entity in real time and make accurate and informed judgments about the value and viability of such an entity. Finally, immutability guarantees the integrity of financial statements generated by Regulated Blockchains by ensuring that figures cannot be doctored once posted.

TAX COLLECTION

Regulated Blockchains allow internal revenue agencies to automate the collection of certain taxes and levies. Rather than relying on organizations to charge, deduct, and remit such taxes, Regulated Blockchains programmatically define applicable taxes and levies associated with each transaction type. During transaction processing, these fees are automatically deducted from the transaction amount by the regulatory smart contract handling transaction screening and then transferred to the relevant government collection account on the Regulated Blockchain. Taxes that are applicable here include VAT, Withholding Tax, and PAYE Tax.

In the case of Withholding Tax, Regulated Blockchains enable a dynamic and much closer matching of Taxes withheld during payment to income earned by an organization. This is possible with organizations using decentralized accounting protocols running within the Regulated Blockchain. The Tax collection smart contracts are able to look up the real-time income of an organization and adjust the amount withheld accordingly.

This approach enforces compliance while optimizing liquidity for both government agencies and Taxpayers. The approach also introduces transparency into the Tax collection process and eliminates corruption.

OTHER COMPLIMENTARY APPLICATIONS

Regulated Blockchains enable technology companies to offer on-chain solutions that integrate with (and complement) DeFi services being rendered on the Regulated Blockchain. Specifically, payroll solution providers can define on-chain logic to compute net salary payments from total employee emoluments and determine PAYE tax amounts as well as initiate payments to beneficiaries and remit taxes to relevant authorities. Such decentralized payroll applications integrate seamlessly with payroll lending protocols on Regulated Blockchains to enable salary earners obtain loans and to support lending protocols by streamlining the loan repayment process.

Supply Chain Management solution providers use Regulated Blockchains to create functionality that tracks the procurement and utilization of raw materials as well as the production, inventory, and distribution of finished goods. Decentralized supply chain management applications integrate seamlessly with supply chain finance protocols on Regulated Blockchains to provide the required visibility and facilitate lending to various stakeholders within the supply chain.

Finally, land and property registries can utilize Regulated Blockchains to securely record, track, and easily transfer ownership of land titles. They can also incorporate smart contracts that enable property owners to tokenize their properties and trade them on approved exchanges in a fractional way. These decentralized registries can be referenced when borrowers need to provide collateral to obtain loans from decentralized lending protocols or when they need to sell their property on an exchange.

CONCLUSION

> This paper envisions a radically different and vastly superior form of financial services...

THE FUTURE OF VALUE

As powerful 4IR technologies including AI, Blockchain, Quantum Computing, Biotech, and Nanotech mature, proliferate, and gain widespread adoption, they promise to radically reshape society into a form completely unrecognizable when compared with the status quo today. This paper envisions a radically different and vastly superior form of financial services achieved through the transformative impact of two out of the above-mentioned 4IR technologies (Blockchain and AI). I believe that combining the power of these new technologies with bold innovation and excellent execution will usher in the golden age of finance discussed in the first section of this paper.

Further out into this vision, the expectation is that a global network of integrated Regulated Blockchains will emerge to serve as what will be considered the Regulated Internet of Value. Just like the current Internet infrastructure facilitates the exchange and utilization of information, the Regulated Internet of value will facilitate the exchange and utilization of value. This means that the regulated Internet of Value will be the core infrastructure not just for financial services but also for all commerce and organizational operations.

IMPACT ON THE ECONOMY

As it becomes the back-bone of finance, commerce and other related activities, the regulated Internet of value will bring unprecedented efficiencies that will significantly accelerate economic growth. First, by tokenizing every asset, the Regulated Internet of value will unlock latent wealth subsummed within illiquid assets and inject unprecedented liquidity into the global economy. This will achieve thesame effect as creating new capital.

Also, by preventing mis-management, fraud and financing of illicit activities, the Regulated Internet of value will prevent capital destruction which will improve the availability of capital for investing in value-creation activities.

Finally, transparency and real-time information will enhance the efficiency of capital allocation. Consequently, the world will have a lot more capital available for investment and this capital will be invested much more effectively into areas with strong growth potential. In other words the world will have more capital to drive growth and more growth for each unit of capital deployed.

CRITICAL DEPENDENCIES

While early and potentially limited versions of Regulated Blockchains are feasible today, the full vision for Regulated Blockchains and the Regulated Internet of Value will require developments and breakthroughs in the scalability of Blockchains and the capabilities of AI. This will require increased availability and reduced cost of computing resources as well as innovative new AI and Consensus algorithms.

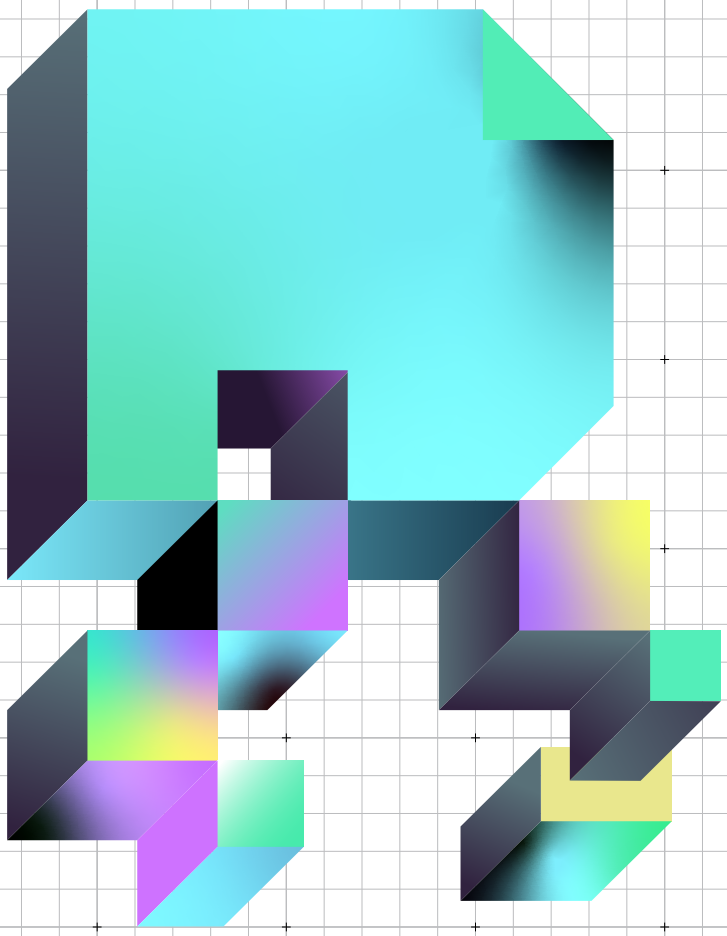
Regulated Blockchain adoption will also require the continued proliferation of CBDCs across the globe. This proliferation gradually converts physical fiat money into its digital equivalent which can be considered the lifeblood of Regulated Blockchains and the baseline regulated digital assets upon which all other regulated digital assets rely.

Finally, Regulated Blockchains will require the proactive involvement of central Banks and securities regulators around the world as well as key adjustments to existing regulatory frameworks and policies. New regulatory frameworks should augment what exists today as Regulated Blockchains and the Regulated DeFi services they deliver are designed to co-exist with traditional financial services.

FINAL THOUGHTS

This paper is intended to inspire potential network developers including Web3 startups, established tech companies, and financial institution consortiums to set up early versions of Regulated Blockchains as proofs-of-concept. The expectation is that early movers will be positioned for significant commercial success as the world's assets worth over 1 Quadrillion dollars convert from their current inefficient form into fully digital and decentralized equivalents managed by Regulated Blockchains.

In conclusion, this white paper serves to provoke thought and stimulate conversations in this direction with the hope that subsequent work will be done by other contributors to further expand and fine-tune the idea.



Regulated Blockchain

REGULATED BLOCKCHAIN WHITEPAPER
Glossary of Terms

A

AI Assistants – Digital agents that manage financial operations on behalf of users by executing transactions, analyzing financial data, and providing recommendations.

AML (Anti-Money Laundering) – A set of regulations and processes aimed at preventing financial crimes such as money laundering and terrorist financing.

Archival Node – A node on a regulated blockchain that stores copies of the ledger and provides access to off-chain applications.

B

Blockchain – A decentralized, tamper-proof digital ledger that records transactions across multiple nodes.

Bridge – A mechanism that facilitates the transfer of value and information between different blockchains.

C

CBDC (Central Bank Digital Currency) – A digital form of a country's national currency issued and regulated by its central bank.

Collateralized Lending – A type of lending where borrowers provide digital assets as security against a loan.

Consensus Mechanism – The process by which blockchain nodes agree on the validity of transactions, ensuring a single source of truth.

D

DeFi (Decentralized Finance) – A financial system that operates without intermediaries, relying on blockchain technology and smart contracts.

DEX (Decentralized Exchange) – A platform that enables users to trade digital assets without intermediaries.

Digital Asset – Any asset stored digitally on a blockchain, including cryptocurrencies, tokenized securities, and NFTs.

E

End-User – Individuals or organizations that use financial products and services built on regulated blockchains.

External Interface Layer – The layer in a regulated blockchain that facilitates interaction with off-chain applications, including payment gateways and AI assistants.

F

Fiat Currency – Government-issued currency that is not backed by a physical commodity but is recognized as legal tender.

G

Gas Fees – Transaction fees paid to validators on a blockchain network to process and record transactions.

Governance (On-Chain) – The decision-making process within a blockchain network where stakeholders vote on proposed changes.

I

Immutability – A fundamental property of blockchain technology that ensures records cannot be altered or deleted once recorded.

Institutional Participation – The involvement of banks and financial institutions in blockchain-based financial services.

Interoperability – The ability of different blockchain networks to communicate and share data seamlessly.

L

Lending Protocol – A decentralized financial service that facilitates borrowing and lending of digital assets without intermediaries.

Liquidity Pool – A smart contract-based pool of funds contributed by investors to facilitate trading, lending, and other financial services.

M

Multi-Signature (Multisig) – A security mechanism requiring multiple approvals before a transaction can be executed.

N

Native Token – A digital asset created within a blockchain network that serves as the primary medium for transactions and network fees.

Node – A computer that participates in a blockchain network by validating transactions and maintaining the ledger.

O

Oracle – A system that connects blockchains with external data sources, enabling smart contracts to interact with real-world information.

P

Payment Token – A digital asset used for transactions and payments within a blockchain ecosystem.

Permissioned Blockchain – A blockchain that restricts participation to approved entities, ensuring regulatory compliance and security.

Programmability – The ability to define and enforce financial rules using smart contracts on a blockchain.

Proof of Regulation (PoR) – A consensus mechanism used in regulated blockchains where only licensed financial institutions can operate validator nodes.

R

Regulated Blockchain – A blockchain with built-in compliance mechanisms that ensure financial services remain transparent, safe, and subject to oversight.

Regulatory Layer – The blockchain component that enforces compliance rules and enables real-time regulatory oversight.

S

Sanction Screening – A compliance process that checks users against global blacklists to prevent financial crimes.

Self-Custody – A system where users maintain sole control over their digital assets, eliminating the need for third-party intermediaries.

Smart Contract – A self-executing contract with predefined rules stored on a blockchain.

Supply Chain Tokenization – The process of representing physical goods and logistics data on a blockchain to enhance transparency and efficiency.

T

Tokenization – The process of converting real-world assets into digital tokens that can be stored, transferred, and traded on a blockchain.

Transaction Screening – The automated process of verifying blockchain transactions for compliance with regulatory standards.

V

Validator Node – A node responsible for verifying and validating transactions before they are added to the blockchain.

Virtual Private Network (VPN) – A network security protocol used in regulated blockchains to restrict access to authorized participants only.