November 2018

STACS

THE SECURITIES TRADING ASSET CLASSIFICATION SETTLEMENT (STACS) PROTOCOL WHITEPAPER v1.0

A HOLISTIC INTEGRATED SYSTEM FOR THE ISSUANCE, TRADING, CLEARING AND SETTLEMENT OF ANY DIGITAL SECURITY AND ASSET ON THE BLOCKCHAIN

GSX GROUP

The Gibraltar Stock Exchange Group

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1 Abstract

In its simplest form, progress is a development towards an improved or more advanced condition. Progress has always been fuelled by human ingenuity since the beginning of times. Cave dwellers learned to tame fire, the Phoenician civilisation mastered the art of commerce, British engineers in the 19th century admirably reimagined logistics through ever-expanding railway networks and lately the advent of the internet repositioned human communication and knowledge at global scale. Human history is paved with cutting edge technological breakthroughs.

In 2009, Satoshi Nakamoto wrote the Bitcoin whitepaper. The genius came from creating a system of economic incentives, based on cryptography, to drive a purely peer-to-peer version of digital currency that would allow online payments to be sent directly from one party to another without going through a financial institution. The initiative attracted unprecedented levels of attention and investment to build from scratch a brand new digital ecosystem. 10 years later, a new chapter is about to be unveiled. Robust infrastructures and appropriate regulations are on their way to drive major adoption, primarily within the financial sector. This particular technology will uplift the global economy as a whole and greatly benefit humankind evolution and wealth creation. Exciting times.

The emergence of Blockchain Distributed Ledger Technology (DLT) and the Blockchain promise to transform securities markets forever. The efficiency, transparency and subsequent liquidity of these technological innovations will produce and undoubtedly transform practices and protocols for improved trading, faster clearing and more secure custody, of securities and their digital equivalents.

We, at the GSX Group, aim to be at the forefront of this capital markets revolution by demonstrating leadership and raising industry standards to effectively bridge the gap between traditional finance and crypto markets.

Since the very beginnings, the GSX Group has gained extensive and practical experience and has positioned itself as an authority from operating multiple regulated financial services subsidiaries which includes: the EU-regulated Gibraltar Stock Exchange (GSX), Blockchain-based firms; like the Gibraltar Financial Services Commission (GFSC) regulated DLT Provider Gibraltar Blockchain Exchange (GBX), and also commercial firms such as the GFSC regulated Juno Services. The GSX Group has formed a comprehensive technology solution offering which bridges traditional finance, commercial markets and Blockchain, while integrating the ever-growing regulatory requirement component. Through the GSX Group technology subsidiary, Hashstacs Inc., we have developed the Securities Trading Asset Classification Settlement (STACS) Protocol, and its related suite of services. With a first-mover advantage for its users, STACS is GSX Group proprietary technology to enhance liquidity and capital exposure. The first version of live implementation is expected by Q1 2019.

Figure 1 - GSX Group Structure

STACS is a unique hybrid structure of permissioned/ global Blockchain, tailored especially for the finance industry. Through such a hybrid model, we aim to support multiple financial institutions, whom we call Verified Partners (VPs), in their digital transformation through providing them the Native STACS, permissioned offering, while allowing them to scale globally to a global pool of cleared and eligible investors through the public Global STACS. With the hybrid model, we combine the performance advantages of the permissioned Blockchain and the public consensus of the public Blockchain, and achieve higher transaction throughput than other public Blockchains, to satisfy the technological needs of the institutions.

The use of the STACS Standard smart contract technology allows us to support the requirements of the financial ecosystem in the issuance, trading, clearing and settling of a plethora of digital assets. With the rare combination of regulatory experience and deep technology resources, GSX Group will enforce rules on the STACS Protocol, to ensure it remains compliant with the strict KYC/AML and regulatory reporting standards of the global financial ecosystem.

We stand on the brink of the next seismic change in technology. Whereas the internet allowed us to exchange data – DLT allows us to exchange assets. Distributed ledger technology has developed sufficiently to facilitate this industry change and we predict that the way capital markets operate is set to change forever. The STACS protocol has been built specifically for tokenised securities and has been designed with adoption as our objective – inclusive, global, transformational and with no license fee.

For those who share our vision, we welcome you to the STACS platform.

2 Background

2.1 Introduction

The GSX Group has sought to build a digital eco-system to exploit what it sees as the new capital markets revolution – the tokenization of economies – adoption by and convergence between the issuer and the investor.

To date issuance of digital assets has been primarily by start-up fintech companies and has taken the form of either 'medium of exchange digital assets' or 'utility tokens'. These tokens have been historically funded or purchased by the crypto community. 'Tokenised securities' is a new phenomenon and have yet to reach mainstream. This is set to change.

We envisage that over the next ten-year cycle, issuance will be adopted by the entire community, ranging from start-ups through to governments utilizing all types of digital assets discussed above. In addition, we see not only institutional buyers joining the investment in all types of digital assets, but interestingly, the crypto community starting to invest in tokenised securities.

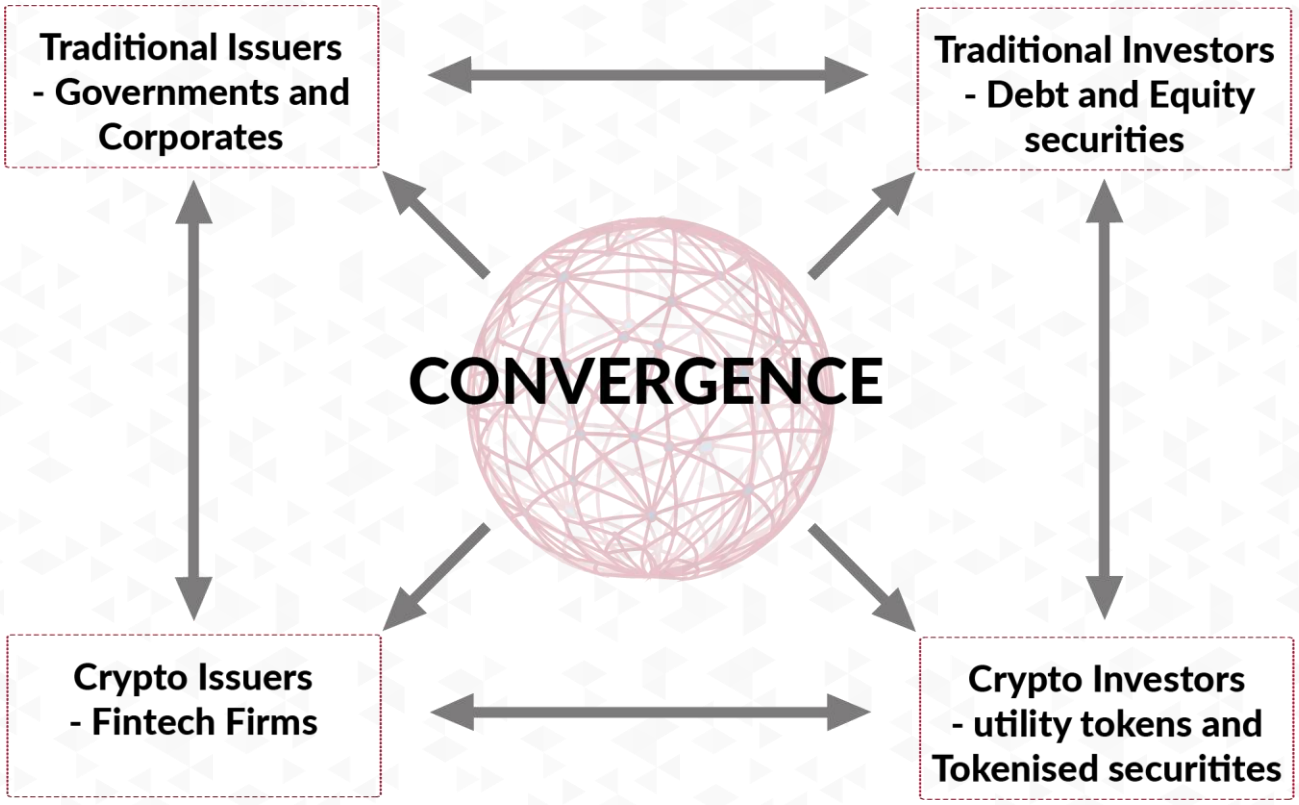


Figure 2 - Convergence in the Finance Industries

The pace of technological advancement is accelerating at an extraordinary rate. Yet, finance and capital markets, which must operate within a restrictive regulatory environment, have been relatively resistant to adapt to this phenomenon. The adaption that has occurred, co---exists with remarkably antiquated systems and protocols. These systems and protocols, holdovers from a time when people had to move physical paper to complete a transaction, are surprisingly resilient. A stock trade may take a fraction of a second, but clearing and settling that trade lags significantly. Banks trading securities still often require a fax confirmation. Technology will inevitably disrupt what remains of these legacy systems and protocols. The creation of financial assets, recognition of ownership, and transfer among counterparties define the capital markets. The

financial system is on the verge of epic change in the architecture, technology, and protocols regarding each of these features of capital markets.

Distributed Ledger Technology (DLT) and the Blockchain technology that underpins it creates verifiable, auditable consensus around any financial asset across ledgers in near real time and enables value to be transferred ubiquitously, at low cost, in real time and in a trustless environment. Blockchain technologies herald a revolution in the structure and operations of financial markets, especially those subject to highly bureaucratic processes with relatively poor intermediation. Improving efficiency in these operations is a constant challenge and an enormous opportunity.

DLT represents a breakthrough because it allows a large number of computers to keep and update identical records of information without referencing or relying upon a master copy of the data. It disintermediates the incumbent powers in financial services and other industries. It is strikingly simple - a new protocol that allows transactions to be both anonymous and secure through the maintenance of a tamper---proof public ledger.

2.2 The Advent Of Tokenised Securities

Since 2009, the Blockchain technology has significantly evolved and each step undertaken is logically paving the upcoming radical innovation. We identified 5 major revolutions:

1st: Distributed Ledger Technology (DLT):

This refers to the technological infrastructure and protocols that allows simultaneous access, validation and record updating in an immutable manner across a network spread across multiple entities or locations. DLT is an umbrella term used to describe technologies which distribute records or information (the kind you might find on accounting ledgers) among all those using it, either privately or publicly. Blockchain is a type of DLT, a subcategory of a broader definition, much like how the word ‘car’ falls under the umbrella term ‘vehicles’.

2nd: Smart Contract

A smart contract is a computer protocol intended to digitally facilitate, verify, or enforce the negotiation or performance of a contract. Smart contracts allow the performance of credible transactions without third parties. These transactions are track-able and transparent. Blockchain is ideal for storing smart contracts because of the technology's security and immutability. Smart contract data is encrypted on a shared ledger, making it impossible to lose the information stored in the blocks.

3rd: Tokenisation

Tokenisation is the process of replacing sensitive data with unique identification symbols that retain all the essential information about the data without compromising its security. Tokenisation encrypts information to allow more security, efficiency and trust to the system. The interlinked token is fundamentally a claim for a service or IOU. It is a contract and represents rights and obligations. Once a token is issued, it represents value.

4th: Token Sales

A token offering is a type of crowdfunding using cryptocurrencies. A quantity of cryptocurrency is sold in the form of tokens to contributors (speculators or investors), in exchange for legal tender or other cryptocurrencies such as Bitcoin or Ethereum. The tokens sold are promoted as future functional units of currency if or when the token sale funding goal is met and the project launches.

5th: Tokenised Securities (TDRs)™, Securitised tokens (Reverse ICO) & STO’s

The 5th revolution will most likely drive major global adoption across securities. A security is a fungible, negotiable financial instrument that holds some type of monetary value. It represents an ownership position in a publicly-traded corporation (via stock), a creditor relationship with a governmental body or a corporation (represented by owning that entity's bond), or rights to ownership as represented by an option.

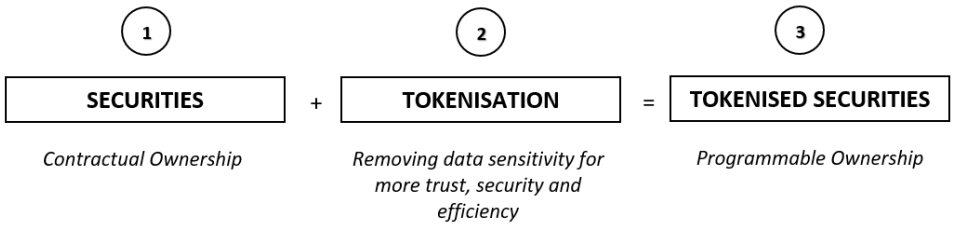
Securities navigated across 3 main cycles. The Analogue age up to the late 80's where people traded paper shares for Cash. Then came the Electronic age symbolised by the rise of information technology. Paper shares were exchanged for cash and it was conducted in a more efficient manner. Papers were also stored in custody banks. We are now entering the Digital age: transitioning the model from a mass-market model to customer centric. The introduction of platforming, DLT and Tokenisation generates limitless benefits.

	Analog Era	Electronic Era	Digital Era
Cost of Transactions	++	+	-
Potential Investor Base	Local	Regional	Global Market Place
Liquidity	Very little Liquidity	Improved liquidity	True Global Liquidity
Type of Ownership	Physical Only	Hybrid (*Physical / Electronic*)	Digital
Free Market Exposure	None	None	Global Free Market
Deal Mechanism Execution	Manual	Semi-Automatic	Fully Automatic
Speed of Deal	Manual Transaction Settlement	Semi-Automatic	Instantaneous

Figure 3 - Securities Life Cycles

In simple terms, Tokenised Securities can be seen as programmable ownership. By bridging legacy finance and the Blockchain world, Security Tokens, Tokenized Securities or Investment Tokens are financial securities. They are investments with anticipation of future profits: dividends, revenue share & price appreciation. The second generation of tokens can provide an array of financial rights to an equity investor such as dividends, profit share rights, voting rights, buy-back rights etc...). These rights are written and hardcoded into a smart contract and the tokens will be traded on a regulated Blockchain exchange.

In summary:



Taxonomic Classification of Tokens:

- Initial Coin Offering (**ICO**): Start-up crowdfunding / ecosystem powered by utility Token (Unregulated)
- Initial Convertible Coin Offering (**ICCO**): if the business successful: conversion to equity (Regulated)
- Tokenised Securities Depositary Receipts (**TDRs**)**™** Securitising an existing asset (Regulated)
- Securitised Tokens (**Reverse ICO**): Tokenising an existing business (Regulated)
- Security Token Offering (**STO**): Securitising a new asset on the Blockchain (Regulated)

Tokenised Securities Benefits (TDRs™ & STO):

#	CORE BENEFITS	APPLICATIONS	FEATURES
1	*Liquidity*	Improved liquidity	*Democratising illiquid assets*
2	*Low Cost*	Lower cost of transactions	*Removing the middleman*
3	*Availability*	Fractional ownership	*e.g. Stradivarius violin, the Shard,…*
4	*Faster*	Faster trade execution & settlement	*Fewer intermediaries*
5	*Secure*	Greater security	*Less potential manipulation*
6	*Accessibility*	Global free market exposure	*24/7 global pool of capital*
7	*Cost effective*	Lower issuance fee	*Tokenisation-as-a-Service*
8	*Auditable*	Easy to track	*Via DLT*
9	*Variety*	Applicable to all asset class	*Equity, Debt, Oil, Gold, Fine Art…*
10	*Compliant*	Compliance built-in	*Asset interoperability: frictionless*
11	*Regulated*	Adapted to local & global regulation	*Accountability and credibility*
12	*Innovative*	New financing models	*Never possible before*

Securitised Tokens (Reverse-ICO) Benefits:

In addition, to the Tokenised Securities benefits:

#	CORE BENEFITS	APPLICATIONS	FEATURES
13	*Enhanced Value Proposition*	Established business	*Existing customer-base*
14	*Trustworthy*	Existing Infrastructure	*Proven A team*
15	*Significantly Reduced Risks*	Established company	*Very low failure risk*
15	*Bankable investment*	Proven Track Record	*Measurable performance*

Tokenised Securities carry a myriad of advantages. Issuers will need to respect a number of key steps as intermediaries will be eliminated. Issuers will have to ensure the token consistency at legal, compliance and technological levels, underwrite their own deal and prepare their own marketing materials to solicit investor interest.

Security Tokens is a tool of investment diversification. The move from securities to digital assets is a shift from illiquid-single-owned to liquid-multi-owners. Capital appreciation will unlock liquidity premiums, geographical arbitrage and attract a much wider investor audience. Investor will be able to build portfolios of digital securities of illiquid assets, constitute small amounts of fractional ownership in a variety of assets and create new financial products & opportunities. We could also expect that issuance of digital shares via STO's will bypass Venture Capital funds and raise capital faster, cheaper and more securely.

2.3 GSX Group & Hashstacs Inc.

In Q4 2018, the GSX Group created a technology subsidiary, having agreed terms to enter into a joint venture with Hong Kong public-listed company Chong Sing Fintech Holdings Limited, and Blockchain development company Prime Fintech Co. Ltd to establish "Hashstacs Inc."

Through this technology subsidiary, the GSX Group is able to leverage on an experienced Blockchain development team that has previously had successful implementations of enterprise Blockchains in the fields of finance industry, logistics and supply chain, asset-backed securities industry, data assets, loyalty points, accreditation, and have enabled multiple enterprises to adopt the Blockchain within their businesses.

Through Hashstacs, the GSX Group will offer the Securities Trading Asset Classification Settlement (STACS) Protocol and the STACS Ecosystem of related products and services. The STACS Protocol Ecosystem will be the next generation of trading platforms, powered by the latest Blockchain technologies, serving the global demand for digital securities.

3 Legacy Problems Encountered By Securities

Today, traditional Securities suffer from a number of inefficiencies. Before 1994, financial markets operated on a "T+5" settlement cycle. The SEC reduced the settlement cycle from five business days to three business days, which in turn lessened the amount of money needed to be collected at any one time and strengthened the financial markets for times of stress. At the time, these were major advancements. A quarter of century later T+3 and high latency still prevails.

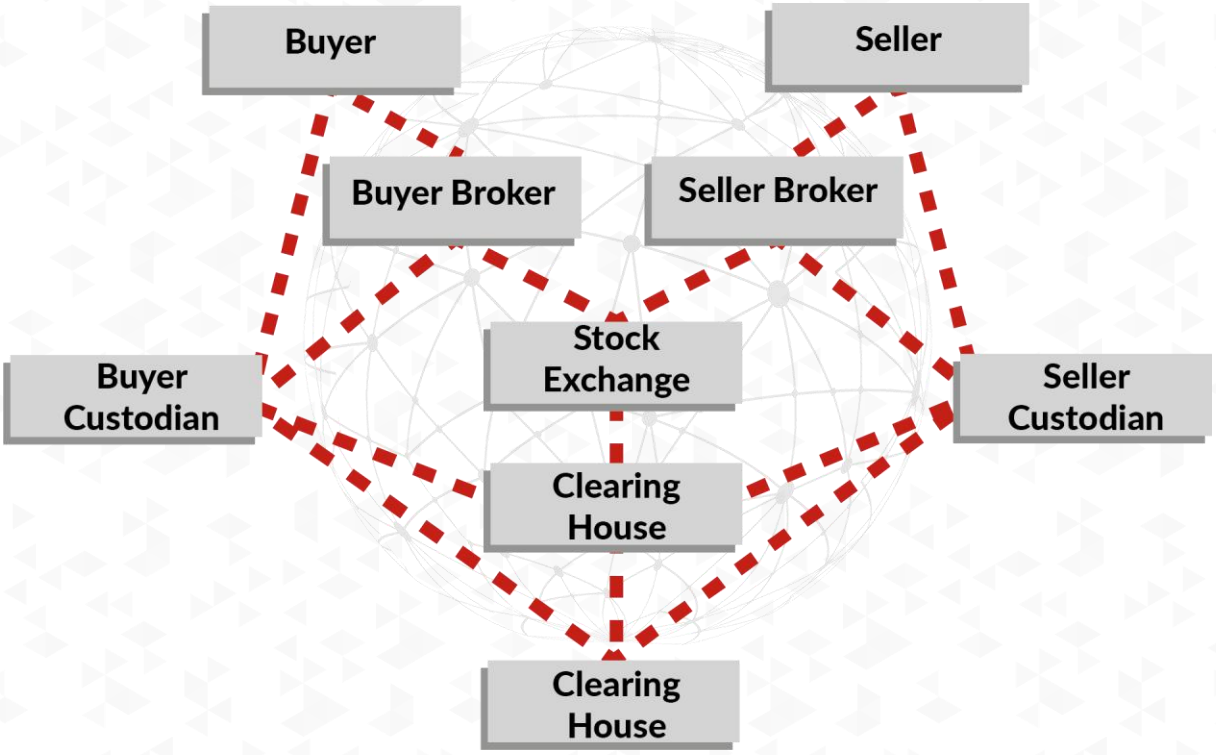


Figure 4 – Traditional Securities Trading Process

A typical trade, clearance and settlement of a single traded security will involve multiple parties. The buyer or seller will not be able to access the institutional bourse directly, and will have to approach a broker who specializes in getting the best deal on the exchange for their client.

However, as the Broker on both sides of the deal does not know if their client has the money or the shares to execute the trade, they will now have to engage a third party, the Central Counterparty Clearing House. The Clearing House acts as the counterparty to both the buyer and the seller and absorbs the counterparty risk. If one party defaults on the agreement, the Clearing House will then guarantee the trade on behalf of the defaulting party by purchasing the shares from the non-defaulting seller or selling (after the Clearing House itself purchases shares to sell from the open market) the share to the non-defaulting buyer.

Yet another party is also involved when the custodian comes into play. The custodian looks after and safekeeps the share certificate on behalf of the individual owners, as a paper cert can be damaged or lost easily and a digital cert prone to hacking malware.

Hence, securities trading, clearance and settlement implicates high costs along the chain due to the number of intermediaries, market frictions, and significant time to market. Moreover, financial markets around the world operate in silos and consequently provide limited market exposure, further fragmenting the global market network. For the last 10 years, public markets registered a 50% decrease in volume for Initial Public Offerings. As a result, Private markets became a lot more attractive but remain very illiquid. Asset values are locked up which limits the scope of opportunities.

Meanwhile, digital securities also face a number of challenges. First and foremost, crypto assets and digital assets are currently unregulated so there are no recognized standards the entire ecosystem can use. Lack of regulation implies market abuse and manipulation that creates inevitably market uncertainty. There is also a lack of global leadership and a harmonized global solution for participants to rely on.

In the current context of highly volatile markets, institutional investor's confidence has been eroded and the reputational risk heightened. Little participation from institutional investors implicates that with very few regulated security token exchanges are currently in operation with limited or absent liquidity. Similar to traditional securities, the trading landscape is fragmented with no global market network. In addition, current DLT solutions are incomplete and are unable to cover all the functions that a healthy financial ecosystem requires. At present time, there is no single Blockchain that is fit-for-purpose for global capital markets and regulated financial institutions.

Tokenised Securities and the STACS Protocol pledge to solve all the above issues.

4 The STACS Protocol

4.1 Value Proposition

Whereas the top Exchanges today will undoubtedly change their business models over the next 24 months, the GSX Group will answer this need today, by implementing a Blockchain solution in the form of the STACS Protocol.

The STACS Protocol has the goal to radically transform the capital markets with Distributed Ledger Technology and by the same token show leadership in the space. It is aiming to address Capital Markets inefficiencies by unlocking the tremendous potential of Tokenised Securities and Digital Assets.

The STACS Protocol is a unique public/permissioned hybrid global Blockchain to issue, trade, clear and settle Digital Securities. It will endeavour to enforce the best standards accepted by regulators in an open, transparent and inclusive environment. The STACS Protocol is an international effort designed for all stock exchanges, investment banks, broker/dealers, custody providers and qualified financial institutions to join for free as “Verified Partners” (VPs), while providing advantages to both issuers and investors globally. The STACS Protocol approach is collaborative, not competitive. We also welcome all third-party technology providers to build specialised apps on top of the STACS Protocol, to offer services to all participants in our STACS Ecosystem.

The Protocol will encompass functions including but not limited to: eligibility, transferability restrictions, clearing, various asset type tokenisation, custody, AML/KYC, regulatory reporting, full disclosures and transparency, external APIs, decentralised trading, with high throughput and scalability; and is now open for Verified Partners to continue with collaborative work.

Figure 5 – Potential Benefits of DLT applied to Capital Markets

The STACS Protocol and its related solutions will provide a secure and controlled environment for the issuance, trading, and holding of tokenised securities for market participants who have passed AML/KYC compliance. The STACS will function as a transparent auditable ledger such that participants will be registered holders of the tokenized securities at every stage of the trading process. This is by virtue of utilizing the record-keeping functionality of DLT for the benefit of the exchanges, issuers, investors and regulators alike.

4.2 Benefits For Various Stakeholders

Verified Partners (VPs)	Investors
No joining / License Fee	New investment opportunities
Provide Enhanced Services to clients	Global reach of secondary liquidity
Immediate Execution & Settlement	Immediate Execution & Settlement
Lower Transaction Fees	Lower Transaction Fees
Utilise a complete Blockchain solution	Accessibility via Fractional ownership
All data points Auditable & Transparent	**Regulators**
Earn STACS Rewards (staking nodes)	Proactive Automated Regulatory Reporting
Member of a Global Regulated VPs Network	All records Auditable & Available in seconds

Issuers	Technology providers
Issue via a Global Regulated VPs Network	No joining / License Fee
Global Liquidity Pool of Whitelisted Investors	Build apps/platforms on top of STACS
Any asset class supported	Take advantage of the nascent STO market
Issuance: Reduced complexity, costs & time	Monetise across the Global Network
24/7 Global Marketplace	Collaborative approach with developers

5 STACS Ecosystem

5.1 STACS Protocol Ecosystem offerings:

- Native STACS
- Global STACS
- STACS Dollar
- STACS Wallet
- STACS Standard
- STACS Browser
- STACS Market
- STACS Platform
- STACS Token
- Other third-party services

STACS Protocol is a hybrid Blockchain system containing Native STACS and Global STACS to support the issuance, trading, and transfer of digital securities and assets, with real business use cases. Currently, there is no available public Blockchain that is capable of satisfying the needs of the finance industry. Also, while there are already private Blockchains being used within some institutions, they do not fulfil the purpose of public consensus and are not operable with other systems outside their own institution. We aim to solve this by bringing the hybrid of the Native and Global STACS to market, combining the performance advantages of the permissioned Blockchain and the global consensus of the public Blockchain.

STACS Protocol is a scalable ledger network layer that seamlessly stacks on top of existing financial institutions and enables the tokenisation of the complete financial industry with zero inertia. With hybrid architecture consisting of a permissioned and public blockchain, STACS maintains enterprise autonomy while utilising revolutionary blockchain technology to create tangible and accelerated digitised financial services adhering to the strictest regulatory standards.

5.1.1 Native STACS

Native STACS is a permissioned Blockchain system. It is made available for free, with no license fee, to all regulated financial institutions who agree to be a STACS Verified Partner (VP). VPs may include but are not limited to: stock exchanges, alternative financing platforms, investment banks, broker/dealers, banks, corporate finance advisors, etc. It is simple to deploy as an additional stack on top of the VPs' existing systems and platforms.

Native STACS may be deployed as a Blockchain for an institution only, or it may be part of a network of institutions, or a region of institutions. Every individual node contains full function realisation from business logic interface to Blockchain underlying logics, and guarantees the consistency of data through consensus nodes; the natural segmentation between nodes realises the segmentation of data privacy and accounting system of users; consensus algorithm researched by Native STACS realises higher than 10 thousand-level TPS with millisecond-level delay, which enables Native STACS to be a trustable Blockchain system satisfying the real business performance requirements of customers in the finance industries and; provide general functions existing in other Blockchain platforms like wallet and token circulation.

Native STACS, according to the business needs of the VPs, can exist separately or realise interactions between different Native STACS networks via functions provided by Global STACS. Native STACS can also send partial or all data to Global STACS to realise data witnessing and public attestation. As the STACS code will be open-source and public, there will be no license fees and VPs are free to deploy Native STACS. Hashstacs Inc will also assist VPs to deploy Native STACS efficiently, or provide a customised version based on VPs' needs, for a fee. VPs may also choose to connect directly to Global STACS via APIs and own a Global node, without using the Native STACS if they wish to, although the Native/Global STACS deployment will enable the VP to have the full STACS standard Blockchain solution.

5.1.2 Global STACS

Global STACS is an open public chain system, which supports functions public Blockchain (e.g. Bitcoin) currently provides, like transaction verification consensus, token circulation and P2P network. In the meanwhile, Global STACS supports interactions between different businesses of different Native STACS. Full API documentation and STACS source code will also be made fully open and available, so that any interested institution can simply add the STACS Protocol as an additional stack on top of their existing platform seamlessly, without replacing their existing technology. Both types of Global STACS nodes (Supernodes and Global Nodes) are available to own, to be able to take part in transaction verification consensus and to share in the transaction fees from consensus.

Through the hybrid structure of Native STACS and Global STACS, a new innovative solution is provided to overcome the low performance in public chain and partial consensus in private Blockchains. Institutions can now use Native STACS to maintain high performance standards and ensure data privacy, while still achieving public consensus and data attestation with the Global STACS, and also connecting to Global STACS enables trading interactions between different businesses of different Native STACS.

5.1.3 STACS Dollar

The historical volatility of cryptocurrencies makes them inappropriate as a medium of exchange to trade traditional securities. However, in order to trade and settle securities utilizing STACS, a cryptocurrency is required. We have proposed the creation of a fiat-pegged stable coin (the STACS Dollar) which will act as an appropriate medium.

The STACS Dollar will be the native crypto token on the STACS Protocol, maintained by a one-to-one backing of fiat money reserve outside the Blockchain, issued by a special Depository authorised by a top trust entity in the system. Details of this structure will be made available in its own separate paper. This special fiat-pegged stablecoin is the foundational currency in the STACS Protocol. It is used for transaction fee collection from every Blockchain transaction, and it can also be used as the trading currency for the securities and assets tokens.

5.1.4 STACS Wallet

We also provide a professional STACS Wallet app to guarantee the convenience and access of personal users to their assets. The STACS Wallet has the following iterations available:

- STACS Personal Wallet

With the free STACS Personal Wallet, users can manage their own private keys and digital assets on the STACS Protocol. This is done through a mobile app. STACS will also work with recognised custody partners to provide professional custody of assets to its users, and this will become an additional option for users who prefer to store their assets and private keys with such institutions. While the STACS Personal Wallet is free to use, it is required that users are cleared by respective VPs in order to be able to access tokens issued by such VPs, as smart contract restrictions are programmed onto the user's wallet address according to the eligibility and restrictions of the securities or asset tokens.

- STACS Enterprise Wallet

Hashstacs Inc. has also developed an advanced Enterprise Wallet, that is available for a one-time fee. This will be deployed as a secure hardware solution, which supports cold storage, multi-signature facilities. The STACS Enterprise Wallet is suitable for any institution which is interested in storing its own keys and assets independently and securely, and supports not only the STACS Protocol, but also assets on other chains like Bitcoin, Ethereum, Litecoin, Bitcoin Cash and Ethereum Classic. The STACS Enterprise Wallet can also be deployed as part of a crypto-service that the institution may provide, for example an Exchange, and it can also be configured as part of a larger system that may include a trading platform, hot wallet and other security configurations.

Both the STACS Personal Wallet and STACS Enterprise Wallet will continually be supported and further developed by our Hashstacs team, to provide user support and continual upgrades.

5.1.5 STACS Standard

Securities tokens issuance are supported by the STACS Standard, which is a set of Smart Contract standards that STACS uses to enforce the eligibility and transferability of the securities and assets that the tokens represent. STACS Smart Contract technologies are used to program and classify characteristics of the underlying security/asset, allocate repayments and rights, and enforce eligibility restrictions while keeping in compliance with regulatory standards. More details of the STACS Standard is shared in Section 5.5

5.1.6 STACS Browser

All information in the STACS Protocol are available through the STACS Browser. The STACS Browser is available to both the Native STACS and Global STACS. Native STACS browser will be for the related VPs to view the information recorded within the Native STACS, while the Global STACS browser is available for the public to view information about the Global STACS, like block history, transaction details etc.

5.1.7 STACS Market

On top of the Global STACS browser, we will also create the STACS Market. It is a global online Marketplace where asset tokens and tokenised securities will be issued through the nominated VP(s). While some of these tokens will have their primary issuance done within the VP's platform (centralised offering), there may be some primary offerings that choose to offer their primary sales on the STACS Market (decentralised offering). This will be made possible through the use of smart contracts technology and eligibility restrictions. Once eligible users get their security tokens, besides trading it in the respective VP's trading platforms, they may also choose to transfer it to someone else on the STACS Protocol, as long as the recipient is eligible to receive the said tokens too. They will be able to find interested buyers/sellers on a peer-to-peer basis within the STACS Market as it will host an information portal where buyers and sellers can list their interest. Hence this enables secondary, decentralised trading, and brings an additional layer of global and fractional liquidity to any asset that may have been previously illiquid.

At any time, VPs, that may include exchanges, brokers, banks etc, are able to track the identity of the holders of the securities tokens, in accordance with the global securities regulations.

5.1.8 STACS Platform

For VPs who wish to add a layer of trading platform, we will offer a white label of the STACS Platform. This is the trading platform currently being used by GSX Group's proprietary GBX and is being customised to fit GSX needs. It delivers robust trading and comprehensive regulatory reporting capabilities to match the highest standards of securities regulations.

5.1.9 STACS Token

The entire STACS Ecosystem will be powered by its own utility token, the STACS Token. It provides access to VPs to use the STACS Protocol. While there is no license fee to use the STACS Protocol, VPs have to stake a minimum number of STACS Tokens to be able to host nodes and access either the Native or Global STACS. Full details of the STACS Token utility will be expanded in Section 9 of this paper.

5.1.10 Other Third-Party Services

The STACS Protocol is also open to all other exchanges, wallet providers and third-party technology

providers. Wallet apps and API documentation will be made fully public, and we will support such integrations with developer support. Hence, we foresee a collaborative ecosystem being further built out and complete with many other third-party specialists. This may include derivative trading platforms, trading apps, other stablecoins, specialised KYC/AML systems and service providers, custody solutions etc…, all built on top of STACS default offering consisting of the STACS Protocol, STACS Wallet, STACS Dollar, STACS Browser, STACS Smart Contracts, STACS Market and STACS Platform.

5.2 STACS Protocol Ecosystem Workflow Overview

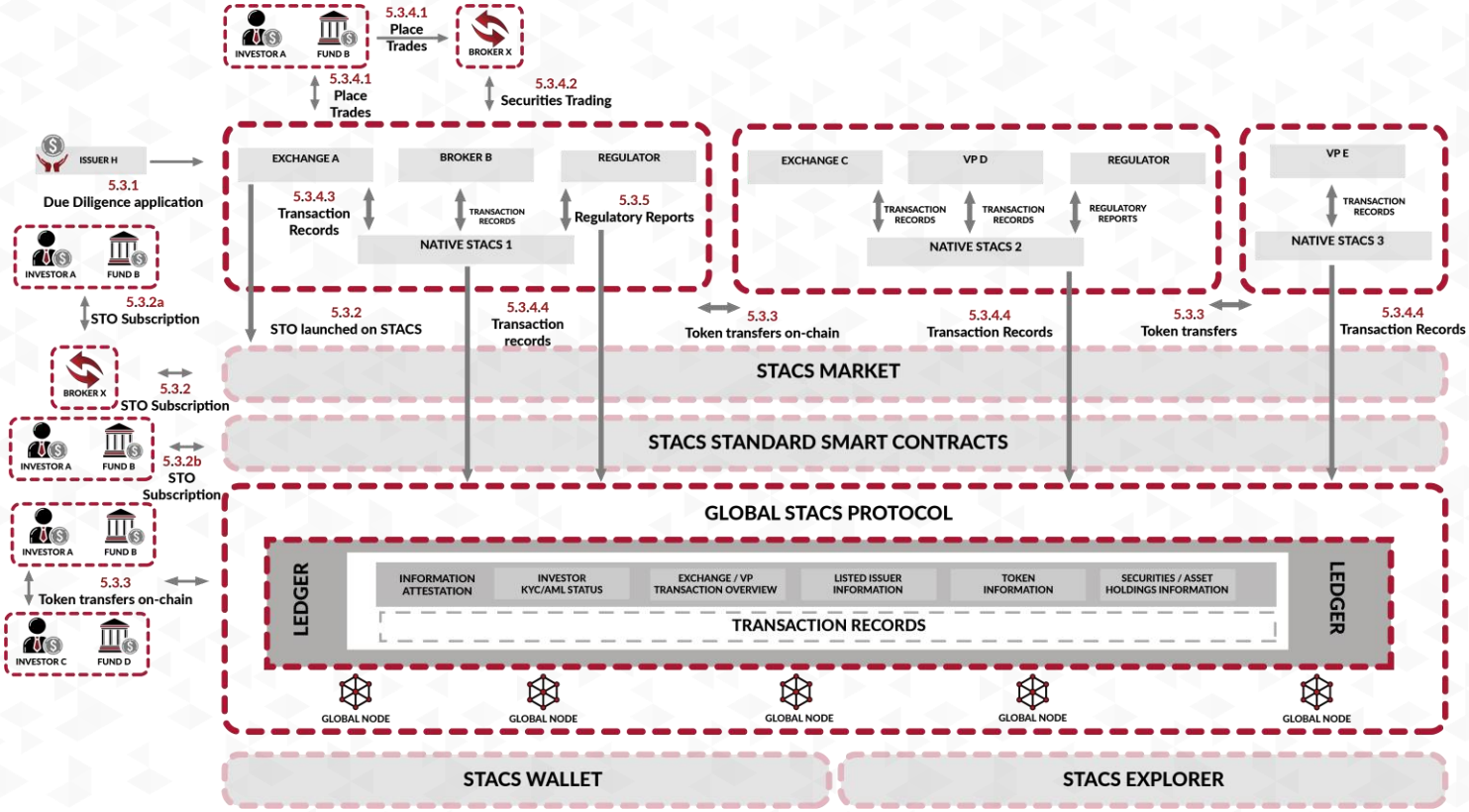


Figure 6 – STACS Protocol Ecosystem

Users include:

5.2.1 Investors/Participants

Investor A, Fund B, Investor C and Fund D are investors in this use case. Investors can be personal, corporate or accredited. They have completed their KYC and AML clearance in one or more of the VP's systems, and their wallets have been tagged with these information. The on-chain information stored only consists of eligibility information. Personal information will never be stored on-chain

5.2.2 Verified Partners (VPs)

Exchange A, Broker B, Exchange C, VP D, VP E are the VPs in this case. Exchange A, Broker B are in the same Native STACS 1, Exchange C, VP D are in Native STACS 2 and VP E is on its own Native STACS 3, as Native STACS are available for a network of VPs or as a standalone option for any VP. VPs are regulated financial institutions and include but are not limited to: stock exchanges, alternative financing platforms, investment banks, broker/dealers, corporate finance advisors, custody providers, hedge funds etc.

5.2.3 Issuer

Issuer H, is an issuer of a security token or asset token. The issuance may be a form of equity, bond, structured product, asset-backed security etc.

5.3 STACS Protocol Ecosystem Workflow Description

5.3.1 Primary issuance

Issuer H wants to issue a STO. It applies to a VP, Exchange A, that is approved by STACS to approve listings. Approving VPs may be an exchange, an alternative financing platform or simply any institution that has the legal authority to approve deals to market. The VP does its due diligence process, which may also involve an investment bank or corporate finance advisor, depending on the nature of the deal. After H is approved, the relevant STO Token characteristics are programmed into STACS Smart Contracts Standard and published on the Global STACS and essential information is viewable on the STACS Browser and STACS Market.

5.3.2 Issuer's STO Ready For Subscription

a) Investor A and Fund B, are eligible for this STO by having been cleared by Exchange A and Broker B in their own platforms. Investor A and Fund B STACS Wallets store their eligibility conditions, and based on the STACS smart contracts, will be eligible to participate in H's STO.

Investor A and Fund B, participates in the H STO through Broker B, which organises the STO centralised in its own trading platform, and

The corresponding information is recorded from Native STACS 1 onto the Global STACS by Broker B

b) Alternatively, the S STO may be organised in a decentralised manner on the STACS Market. In this case, Investor A and Fund B, participates in the STO directly on-chain on the STACS Market, via the use of the STACS smart contracts which have already programmed the characteristics of the H STO token.

In both alternative scenarios of 5.3.2a and 5.3.2b, Investor A and Fund B may be subscribing to the STO with the option of using STACS Dollar, STACS Token, or other cryptocurrencies or other stablecoins, as prescribed by Issuer H and Exchange A/Broker B.

5.3.3 Secondary Token Trading/Transfers (Decentralised)

Investor A and Fund B have received their securities tokens H. They can now transfer it from their own wallets to Investor C and Fund D, directly through their STACS Wallet on the STACS Protocol. This is a transfer on the chain, and is executed as long as Investor C/Fund D's wallet addresses have also been cleared by their respective VPs to be able to accept H tokens. This is because STACS smart contracts will check and limit every transaction to support only eligible transfers.

On the institutional level, VPs on Native STACS 1, may also send tokens to VPs on Native STACS 2, or to any other Native STACS through the Global STACS, as long as the recipient VPs are also eligible to receive these tokens. This supports on-chain inter-regional settling and trading. We expect this to significantly cut down on settlement times, costs and also increase global liquidity options.

5.3.4 Secondary Token Trading (Centralised)

5.3.4.1) Investor A and Fund B places trades in their trading accounts in Broker B or Exchange A, which are on Native STACS 1.

5.3.4.2) Alternatively, they may place trades in their trading accounts in Broker X, which is not on STACS, but Broker X may clear trades with Exchange A which is on Native STACS 1.

5.3.4.3) Such securities trading transactions take place in centralised trading platforms, but the transaction records may be recorded on the Native STACS by the VPs. With the hybrid model of STACS, the VPs are able to store detailed line-by-line transaction records within the Native STACS.

Broker trades can also be read by Exchanges within the same Native STACS. This will empower an entire ecosystem of a Stock Exchange and its Broker/dealers to be on the same Native STACS, and enable them to digitise the trade cycle with the benefits of Native STACS transaction consensus, high throughput, faster settlement.

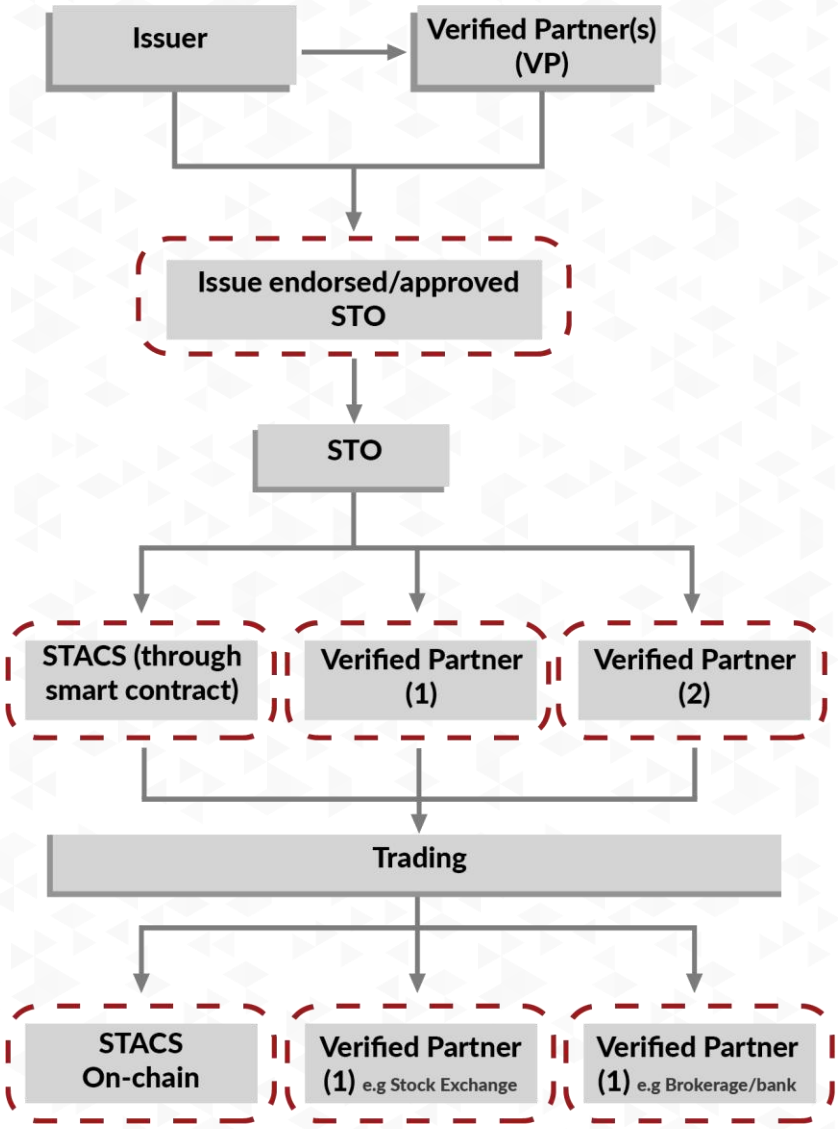
5.4.3.4) While all detailed transaction records are within the VP's own systems and Native STACS, the VPs may choose to upload a hash of a consolidated transaction record onto the Global STACS. This is for data privacy concerns. For example, Native STACS 1 may be configured to upload a consolidated transaction summary hash for every last 10 minutes onto Global STACS. This creates an immutable, attested data hash which is auditable and can be used to verify the integrity of the Native STACS data, when performing audits on the VPs. This structure also allows personal information to be preserved, as users only have their eligibility data on the chain, while personal information all remains within the VP systems which the user has consented to complete a KYC process. Therefore, every wallet address will only store the eligibility information of the user, without storing any other personal information (details in section 5.5)

5.3.5 Regulatory reports

At any time, regulators are able to access Native and Global STACS, to be able to retrieve reports that are already prepared according to regulatory requirements. Based on GSX experience of operating a MiFID II compliant stock exchange, we have designed STACS to be able to generate compliant reports as needed, and with the immutable nature of STACS, and the use of smart contracts to enforce restrictions, it is meant to provide greater assurance and protection against fraud.

All token transfers information that are on-chain, and token issuers information, are also available on STACS Browser. This includes user holdings of securities and token assets. All compliance events, trade execution, and counterparty activities are recorded in a transparent, verifiable, and auditable system, making auditing simpler, more verifiable and efficient.

5.4 STO use case in the STACS Protocol Ecosystem



1. issuer contacts one (few) of the Verified Partners on the STACS. Together they will issues a VP endorsed Security Token.

2. issuer can conduct their security token offering (primary sale) either on the STACS network or multiple verified partners' venues.

3. Secondary trading of the token can be hosted in multiple verified partners' venue or without an intermediary known as otc trading on the STACS chain.

Figure 7 – STO Use case in STACS Protocol

5.5 Wallet Workflows In STACS Protocol Ecosystem

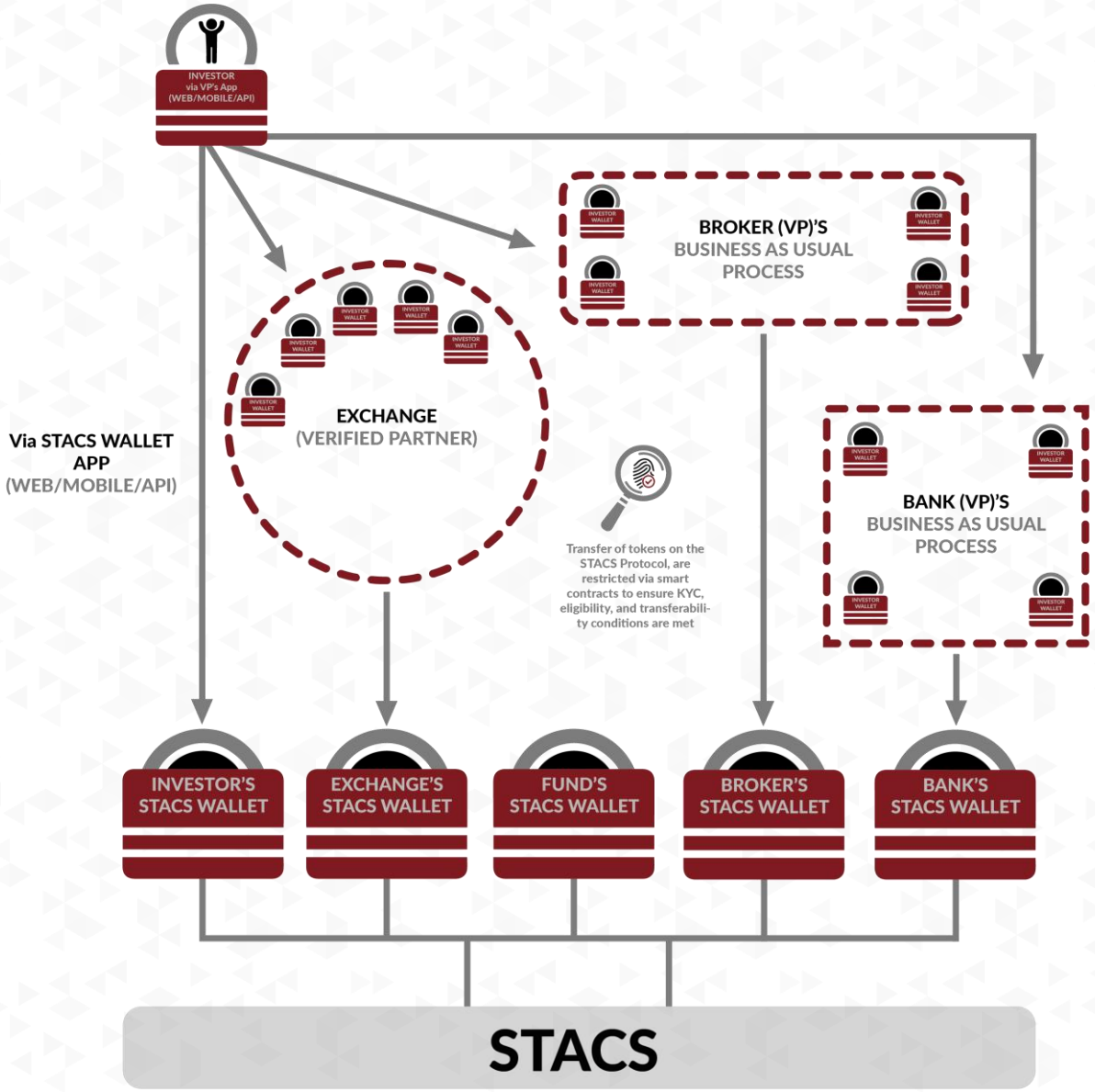


Figure 8 – STACS Wallet workflows

Investors get access to STACS via 2 ways, through any of the VPs or via the STACS Wallet app.

If Investors download the STACS Wallet app, they will be allowed to use the public version of the app which supports various public cryptocurrencies like Bitcoin, Ethereum and many others. However, if they wish to participate in STOs or hold securities or assets tokens, they will have to get an account opened and KYC/AML cleared at the VPs on the STACS Protocol. These VPs may be exchanges, banks, broker/dealers, alternative financing platforms etc. Once the KYC/AML and account opening process has been completed, the VP will push the eligibility information into the STACS Protocol onto the Investor's wallet address.

The wallet addresses on STACS will store the following eligibility information:

- Nationality
- Residency
- Accreditation status
- VPs with cleared KYC status.

Hence, users' personal information is never published or made available, and the STACS Protocol only stores enough information to fully manage the eligibility and transferability restrictions. If at any time an exchange or regulator needs to identify the holders of a certain security token or asset token, it is available through the VPs' existing Native STACS and own systems which have stored the user data in relation to the wallet addresses identified.

An Investor may have accounts with multiple VPs. Each VP may have an assigned client wallet that in effect belongs to the VP (centralised wallet). Even when withdrawing the tokens from the centralised wallet to its own wallet (decentralised wallet on STACS), the Investor will still need to satisfy the above eligibility conditions, and that its own decentralised wallet address must have gone through at least an account opening KYC process with the VP that is handling the related security/asset token. The Investor's eligibility conditions are also updated whenever a VP updates its conditions. For example, if an Investor is blacklisted, or account suspended, the corresponding wallet address will reflect the new eligibility status on the STACS Protocol.

In other words, there is no technical manner that a securities token will end up in the wallet address of someone who does not qualify or is not eligible to receive that token, and it is always possible to track the token transfers and the identity of the token holders at any time. This allows STACS to be operationally compliant with the global regulatory standards of the securities industries.

5.6 Essential Fields In STACS Standard Smart Contract (For All Types Of Securities/Asset Tokens)

STACS Standard will be a series of smart contract templates that will be made available for VPs to deploy conveniently. Hashstacs will assist VPs in the writing and deployment of these smart contracts, which will also be easily deployable on the STACS Market admin end in the form of menus and data fields, and also available via APIs. We also welcome external and public contributions to continually develop and expand STACS Standard. Below are the standard fields required to program a standard STACS Token Smart Contract. These are the essential general fields, while specific fields can be added in relation to the specific type of security and asset.

STACS Standard smart contract essential fields				
	Field name	**Example**	**Input type**	**Description**
Basic information	Name of issuing company	Rocker Group	Text	
	Name of product	Rocker class A ordinary shares	Text	
	Ticker name	RKFR	Text	
	Unique identification code	US-RKFR-A	Text	
	Endorsement	GSX, NASDAQ, HCMEX, JPM	Text	
	Token supply	1,000,000	Text	
	Token circulation	750,000	Text	
	Trading venue(s)	GSX, NASDAQ, HCMEX	Text	
	Type of security	ABS,Equity,Bonds,ETFs	Selection	
	Start of primary sale	5 days after approval	Text	
	Issue Price	1000 STACS dollar/token	Text	
	Supported Currency	STACS Dollar, USDT		
	Sale Period	01/01/18 TO 02/02/18	Date	Editable
	Status	active, matured, frozen, disabled		
General restriction	Lead approver	GSX	Text	prohibits listing without a lead approver
	Permitted nationalities	UK,USA	Selection	
	Permitted residencies	Australia, Europe	Selection	
	Status of investors	Retail, accredited, corporate	Selection	
	Permitted investors with cleared kyc from:	SGX,GSX,JPM,World Check,Reuters	Selection	
Primary sale retrictions	Lot size	100	Text	Totalling to token circulation of 750,000
	number of lots	7,500	Text	
	Lots per investor	min=2 lots, max=100 lots	Text	
	Provision*	legal documentation*		
	Lock up period	60days from final day	Text	(smart contract, VP)

As can be seen in the general smart contract fields, there are 4 main categories of smart contract input in the STACS Standard smart contract.

Basic Information

This is where all basic information of the issuer is included. Besides the name and type of underlying security, details of the offering are also programmed in, including number of tokens and issue price, date and time of offering, and the currencies accepted for subscription. Status of the token is also essential, as certain tokens may have matured (in the case of a bond) or frozen (in the case of a delisted/suspended share)

General Restrictions

There is where restrictions are written into the smart contract. Restrictions can be increased or removed accordingly, based on the VP that approves the issue. There is a “Lead Approver”, which is the primary exchange (VP) that has approved the listing. Without a Lead Approver, the Token cannot be issued. Here is also where the restrictions of token holders are programmed. Certain securities or assets are available only to certain nationalities/residencies, or certain accreditation status. Accreditation status may also differ across jurisdictions and institutions (VPs). Hence these conditions are all programmed into the Standard contract, and they are enforced on-chain as it interacts with the Investors’ wallet addresses, which already stores the eligibility information at all times.

Primary Sale Restrictions

These are the STO conditions, which may relate to size of subscription, locking period, further documentation required before unlocking of token etc.

Secondary Trading Restrictions

Here is where secondary trading restrictions may be imposed, if there are regulatory restrictions required for certain types of securities or assets.

5.6.1 Smart Contract Rules Specific To Equities/TDRs™ On Top Of The STACS Standard

STACS STANDARD Equities/ Tokenised Depository Receipts (TDRs)™			
Field name	**Example**	**Input type**	**Description**
Number of issuing shares security tokens	10,000,000	Text	
Dividends declaration date(s)	3 Jan, 2 Jul	Text	Optional
Votes per share	100,0	Text	1 share will allow 100 votes
Equities certificate	yes/ no	Selection	Yes, if its already issued elsewhere No, if it's a newly issued share
If Equities certificate = yes	Which VP is acting custodian	Selection	Prevents double accounting
Dividends payment Date			
Field name	**Example**	**Input type**	**Description**
Currency of dividends	usd, eur, gbp, usdt, STACS Dollar, btc, eth. STO (stock dividend)	Selection	
Dividends	$0.15/share or 0.025ST (security token)	Text	
ex-dividend date	10-Jan-19	Text	To receive the stock's upcoming dividend, an investor must purchase the equity security token prior to the ex-dividend date
Dividend payment date	14-Jan-19	Text	Date the dividend will actually be paid out
Dividend payment address		sender/payment wallet address	payment will made from this address

The above are the specific fields that can be added on to the STACS Standard. These specific fields are added to the above in relation to the specific type of security and asset, which in this case is a company's equity, or a form of Tokenised Depository Receipt (TDR). A further subset is 'Revenue-Share' tokens, which are neither debt nor equity, and entitle the holder to a percentage of gross revenues from the company.

With the use of STACS smart contracts, certain actions like voting, and dividend distribution, can be made more efficient, and cut down on time and monetary costs to the institutions and investors.

With the prospect of Tokenised Depository Receipt (TDR), VPs may even be able to issue a tokenised form of existing traded equity. These are existing traded public stock, held in a partner custodian VP. The held stocks are then tokenised and traded within the STACS Protocol, hence bringing greater liquidity through a pool of investors who may not have had access previously, providing better liquidity to the issuer and better investment options to the investors.

5.6.2 Smart Contract Rules Specific To Bonds On Top Of The STACS Standard

STACS Standard Bonds			
Field name	**Example**	**Input type**	**Description**
Currency	usd, eur, gbp, usdt, STACS Dollar, btc, eth	Selection	
Start date	1-Jan-19	Date	1 Jan 2024 (5years bonds)
Bond price	$990	Text	
Face value	$1,000	Text	
Frequency	daily/ weekly/ monthly/ quarterly/ semi/ annually	Selection	Frequency*periods = maturity (10*semi = 5 years)
Periods	10	Text	
Maturity date	Monday, 1 January 2024	Date	start date + (frequency* periods)
Settlement Date	Tuesday, 2 January 2024	Date	Settlement of face value repayments
Annual coupon rate	4.00%	Text	coupon payment = $20 every 6 months (coupon rate based on face value)
Number of issued bonds security tokens	10,000	Text	Face value* no. of issued bonds = $10mil
Call date	1 Jan 2022, 1 Jan 2023	Date	Call back of bonds before maturity, with the full face value repayment

The above are the specific fields that can be added on to the STACS Standard. These specific fields are added to the above in relation to the specific type of security and asset, which in this case is a company's bond, or structured loan contract, constituting a fixed claim on future streams of income.

With the use of STACS smart contracts, certain actions like repayment, and early call, can be made more efficient with reduction in settlement time and decrease in operational risks, which are very beneficial to the institutions and investors.

5.6.3 Smart Contract Rules Specific To Asset-Backed Securiities On Top Of The STACS Standard

STACS Standard ABS			
Field name	**Example**	**Input type**	**Description**
Underlying asset	Rocker Center	Text	
Deposit of certificate/deed	Yes/No (yes, with which VP?)	Selection	
Token Supply	1,000,000	Text	
Dividends/ payment/ revenue sharing declaration date	3 Jan, 2jul	Text	Semi-annual dividends declaration of dividends/ payment/ revenue sharing payout
Expiry date	1-Jan-25	Date	
Annual coupon rate	11%	text	
ABS rating (if any)	Moody's: A	text	
Dividends payment Date			
Field name	**Example**	**Input type**	**Description**
Currency of dividends	usd, eur, gbp, usdt, STACS Dollar, btc, eth. STO (stock dividend)	Selection	
Dividends	$0.15/share or 0.025ST (security token)	Text	
ex-dividend date	10-Jan-19	Text	To receive the asset's upcoming dividend, an investor must purchase the equity security token prior to the ex-dividend date
Dividend payment date	14-Jan-19	Text	Date the dividend will actually be paid out
Dividend payment address		sender/payment wallet address	payment will made from this address

The above are the specific fields that can be added on to the STACS Standard. These specific fields are added to the above in relation to the specific type of security and asset, which in this case is a company's asset-backed security, whereby underlying assets may have a business income, revenue, royalties, rental yield, or just simply price appreciation potential, an economic right to a real-world asset (art, commoditie etc). This model is already being used in real estate and infrastructure projects, for fungible or non-fungible assets.

With the use of STACS smart contracts, certain actions like repayment, can be made more efficient, and cut down on time and monetary costs to the institutions and investors, while larger assets can be subdivided into smaller units and unique and diversified products/derivatives may be created

5.7 Further Examples of Workflows and Types of Assets Classification on STACS

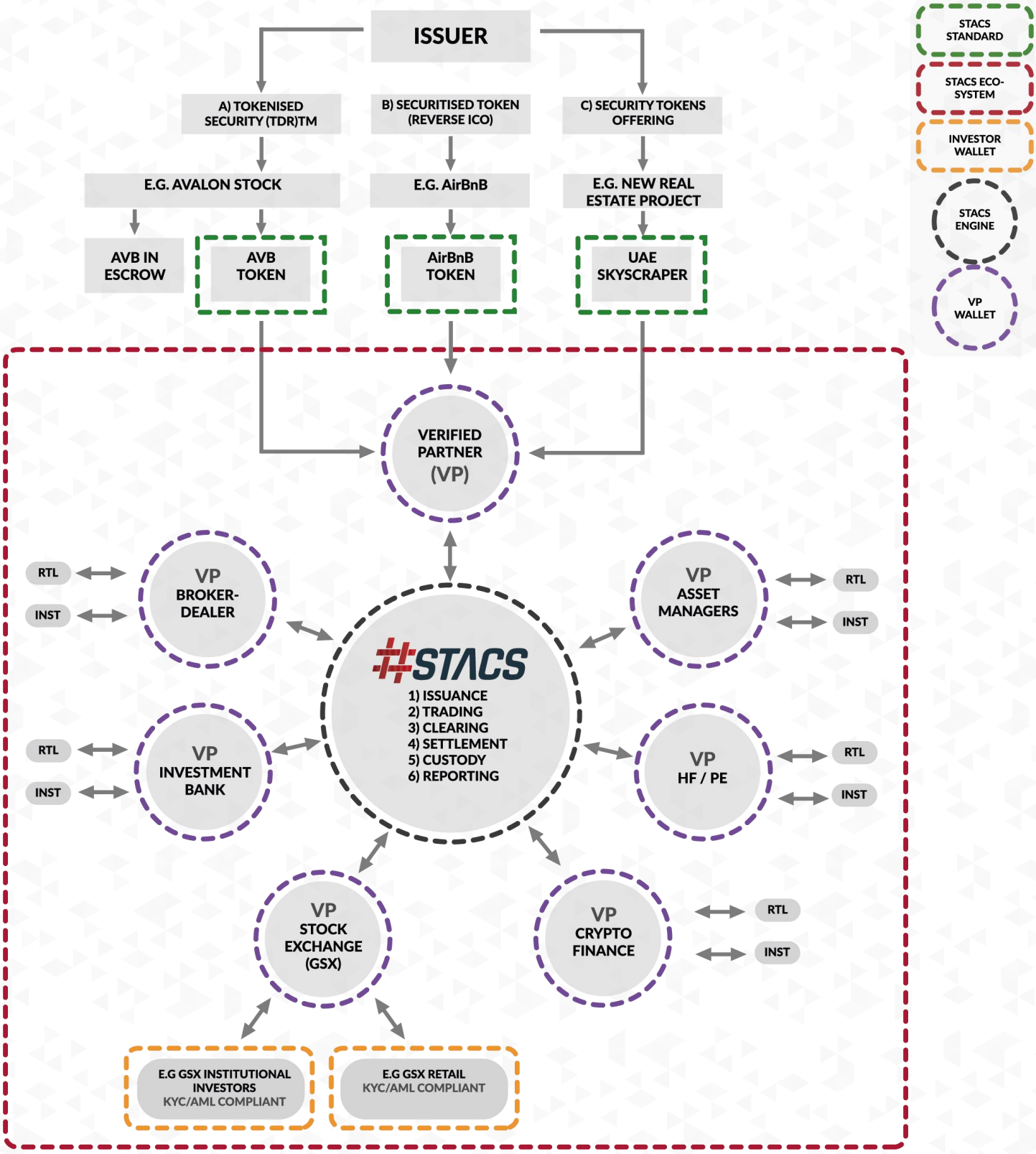


Figure 9 – Further examples of various STACS Asset Workflows

5.8 STACS Dollar

The native cryptocurrency in a Blockchain is regarded as the basic assumption and agreement among the stakeholders of the Blockchain ecosystem (developers, investors, block producers, service providers, end users) and used as the basic building block for Blockchain system design, though native crypto-currencies induce some critical problems in existing Blockchain ecosystems. The public Blockchain's native crypto-currencies traded in public exchanges are speculative assets which are constantly being involved in pump-and-dump schemes, making the native crypto-currencies highly volatile in price. For ordinary people who are naturally accustomed to stable fiat-currency like USD or GBP, it is very uncomfortable to use unstable crypto-currency as a payment/trading currency. People would not buy food in grocery stores using highly volatile company shares as a method of payment, and similarly they would not use existing crypto-currencies. Even worse, to use services provided by the Blockchain platform, people first need to buy crypto-currency by selling their fiat money through an external crypto exchange.

This is the big hurdle against mass adoption of Blockchain-based applications setting aside the scalability issue which encumbers current public Blockchains. Additionally, the financial benefits gained from these speculative crypto-currencies are unfairly concentrated amongst Blockchain developers who maintain large portions of coins after ICOs and early stage investors who can buy a disproportionate amount of total supply at cheap prices. Meanwhile the followers adopting the Blockchain, even if they are the service providers who are directly contributing to the Blockchain ecosystem by making applications generating meaningful transactions, are relatively less compensated.

The Introduction of a Fiat-pegged Stable Coin

In this paper, we introduce a new method of public Blockchain design without issuing native crypto-currency minted by the Blockchain itself. Instead, the fiat-pegged stable coin (e.g. digital STACS Dollar credit token) is issued as the foundational crypto-currency of the Blockchain, provided a trust entity such as a trusted financial institution or government backs the stable coins with an equivalent fiat money reserve. Fiat-pegged stable coins are not likely to be involved in speculation and most people are familiar and comfortable with stable fiat currencies.

The GSX Group will adopt the STACS Dollar as its currency of choice for entry into the STACS Ecosystem and it is proposed that:

- STACS will work with a top-tier, credible global institution to issue the stablecoin.
- The stablecoin will be named initially the STACS Dollar.
- The STACS Dollar will be programmed and issued by the Issuer on a one-for-one basis.
- The underlying fiat will be deposited into a bank account monitored and segregated from the company's own funds.
- The adherence to one-for-one issuance will be signed off regularly by a leading audit firm (EY for example).
- The costs of running the programme will be covered by interest earned through the underlying fiat deposit being invested in overnight money markets as well as clearing fees charged to users.
- The STACS Dollar will be used by all entrants into the STACS Ecosystem as well as other industry participants who wish to adopt the STACS Dollar as its currency of choice.
- STACS Protocol is open, inclusive and invites any regulated issuers to also issue a stablecoin of their own, and offer it to all participants on the STACS Protocol.

6 STACS Protocol Hybrid Model Overview

6.1 Problems with Today's Blockchain

Blockchain underlying technologies number in the hundreds of different types, however, services based on the real economy are still difficult to run on the existing Blockchain infrastructure

Low Efficiency

Most existing Blockchain technologies have low performance levels, which are difficult to meet commercial application requirements.

High Requirements

Business development on the public chain requires a relatively high technical threshold, and it is more difficult to build and operate than on the permissioned chain.

Difficulty Supporting Various Services

Different services have different requirements in terms of performance, business rights, data rights, etc. and business logic changes frequently. It is difficult for a single Blockchain to support various complicated needs.

6.2 The STACS Proposed Solution

As a hybrid Blockchain network STACS is composed of two different types of Blockchain systems – the Native STACS and the Global STACS. This enables us to support the VPs on the institutional layer with a permissioned Native STACS Blockchain that is fit for its business activities, while scaling globally through connecting to the Global STACS layer. This allows us to combine the performance advantages of the permissioned Blockchain and the distributed, public consensus of the public Blockchain.

6.3 The Native STACS Platform

Native STACS is a permissioned Blockchain system of the STACS Protocol, which is responsible for supporting specific services. It can be applied to any Verified Partner in the finance industry, or even expand to industries like digital assets issuing, verification centres, assets registration and transfer, digital assets management, distributed transactions, supply chain, exchanges, and even central banks.

Native STACS - Advantages

More efficient

Native STACS can perform between 12,000 – 130,000 transactions per second depending on the number of nodes deployed, the performance of the node, the network conditions and the nature of the transactions, with an average latency of less than 0.5 seconds per transaction. We further elaborate on this in Section 8. Such efficient performance makes it perfectly applicable to the financial industry.

More convenient for service access

STACS has built a simpler and faster platform access method. Compared with other complicated access methods, it can complete the business chain without understanding complex regional logic, therefore avoiding the obstacles caused by the technical barriers.

Flexible and customizable system

The configuration of smart contracts is more flexible. It integrates three smart contract writing technologies such as API, script and policy editor for the business scenario, which provides both simple smart

contracts and whole-chain smart contracts to ensure the requirements are met.

Extended accounting model

The innovative application of double-entry accounting books to Blockchain, meets the needs of various business scenarios.

Plug-in consensus algorithm

A consensus framework is provided. It supports a plug-in consensus mechanism, which allows flexible selection for different consensus algorithms based on different VP needs (RAFT and BFT algorithms are currently integrated).

6.4 The Global STACS

The Global STACS, a public Blockchain system, is the platform for STACS Protocol to realise the data witnessing of the whole network and it can also realise the whole network consensus for other system data, including Native STACS. Consensus, token exchange, p2p network, fast payment, regular clearing and settlement, personal wallet, distributed pricing, global assets circulation, data archiving and some other functions can be realised. An improved DPOS consensus algorithm solves the problem of hash rate concentration and also raises performance of the public Blockchain, while native cross-chain technology supports the circulation and exchange of each Native STACS system's Token and various other Tokens on Global STACS/

Global STACS Advantages

Efficient transactions

Transaction data can be packaged fast, producing blocks in seconds. Each block takes an average of 3 seconds to package.

Shared-governance community ecology within a regulated network of VPs

Shared-governance community model and reasonable incentive mechanisms are formed. The construction of shared-governance community includes the co-existence of online and offline activities of a global regulated network of VPs, which abide to the strictest of financial regulations, hence creating a new generation of co-governance ecology.

Higher transaction throughput

We expect Global STACS to easily support 400-700 TPS, which is at least 4000% more than existing public chains, while Native STACS can easily support from 12,000-130,000 TPS depending on its specifications, number of nodes, and nature of transactions as it is a permissioned network, and hence such a structure can support most functions of the financial institution.

7 Native STACS Specifications

Native STACS is the permissioned Blockchain system that supports the various VPs on the institutional level, and satisfies the standard institutional requirements of efficient performance, secure data and supervision-friendly.

According to the philosophy of decentralisation, Native STACS designs that every physical node contains full a software stack, which provides all functions from business logic interface to underlying logics of Blockchain. Nodes maintain consistency via consensus nodes, and to guarantee the equality among nodes, nodes are independent so that no special nodes and centres appear.

7.1 Hierarchical Structure vs Full Software Stack Structure

The design of STACS is a hybrid structure, the main thought of which is that the separation of different function modules enables cohesion and decoupling. When modules and subsystems are confronted with bottlenecks, the expansion of function modules or subsystems that have reached bottlenecks empowers the improvement of service capacity of the whole system. Most commercial cloud infrastructures adopt the model described above, and this is continuously improving and refining. In practice, we find that it is hard for hierarchical structure to avoid centralisation. The advantages of functional cohesion, as is stated previously, is obvious. Cohesion requires the refinement of functions, and distributed systems require the distribution of cohesion functions. However, the problem of centralisation needs to be reconsidered once achieving distribution.

For instance, in Blockchain system, functions like message queue (referred as MQ hereinafter) are always utilised. There are many implementations of MQ, and among which the MQ based on database is a typical centralised realisation. The development adopts distributed system (ZK+queue), but the node arrangement of ZK is limited in a certain scope. Even though it is more advanced compared to the centralisation of a database, it is still considered to be centralisation within a certain scale.

After continual development of a year and a half, we learned from our experience from deployments of various services of Native STACS, and we now launch the brand new Native STACS 2.0. We consider vertical functional segmentation combined with sufficient hierarchical segmentation (considering the needs in performance), plus the fact that every individual node contains full software stacks, that enables the equivalent design in structure and function among all the nodes and satisfies the philosophy of decentralisation of Blockchain. Today, Native STACS is a perfect reflection of this design thought.

Every individual node is divided into business logic layer (RS) and Blockchain core layer (Slave). Business logic layer is responsible for realising business logic and does not get involved with the complexity of the Blockchain core layer; while the core layer of Blockchain is aimed to build up trustable business environment through underlying Blockchain and guarantees participants conducting business activities established regulations.

7.2 Detailed Description of Structure

Native STACS has a divisible hierarchical structure, as is showed in the figure below:

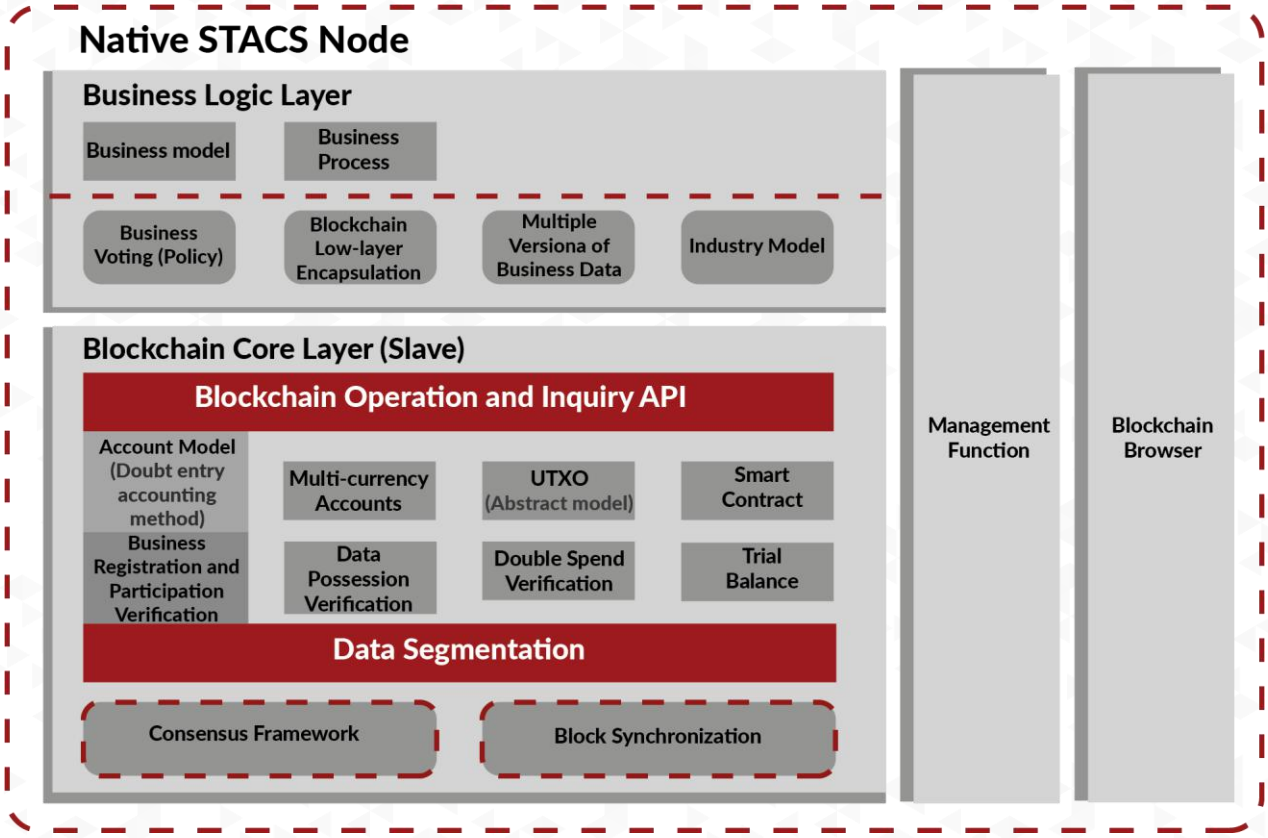


Figure 10 - Hierarchical Components of Native STACS

Business Logic Layer（RS）

RS is mainly responsible for the integration of external business systems and realisation of business logics. After receiving the business instructions from external business systems, RS completes business processing, and implements assembling based on regulations according to the processing result, submits it to Blockchain core layer and conducts further processing of underlying technology.

RS contains assemblers as below：

Name	Description
Business Model	This component stores the data format description of various requests sent to the business system and is responsible for transferring request information into correct transaction data, according to the business requirements.

Business Process	This component realizes external system interface and business processing logic of data and is responsible for receiving requests sent by business systems and processing business logic to transaction data after the business model transfers request data into transaction data, according to business requirements.
Business Voting	To verify the effectiveness of transactions in a decentralised environment, transactions are sent to other nodes to conduct distributed business logic judgement. Different businesses can implement voting methods through different policies, which contain nodes involved in voting, customised transaction verification and encryption logics, and verification methods of voting results (including the number of affirmative votes and necessary affirmative nodes contained), etc. This assembler initiates voting according to corresponding policy when the transaction is started and determines whether the transaction is effective according to the voting results received from the voters.
Blockchain Underlying Encapsulation	This component transfers and encapsulates orders verified by voting like transactions, voting strategies and inquiries into standardised Blockchain instructions, and sends the instructions to slave service to conduct associated Blockchain storage processing. Different order encapsulations can be conducted according to different businesses and performance requirements, e.g. execution of individual instruction or combined instruction set.
Multiple Business Versions	To support the business changes flexibly, RS stores business model, business process and business voting strategy, and differentiates historical versions via multiple version numbers, guaranteeing correct business conduct in transaction processing via obtaining corresponding business model, process and voting strategy based on a certain version number. In data inquiry, such version numbers ensure the correct analysis on historical data, which provide stronger support to the business system.
Industry Model	With the maturing and expansion of the platform, Native STACS will support more business scenarios in various industries like digital asset related business, financial payments industry, supply chain and logistics industry. We will abstract business model and business process further, construct specific business models of various industries, abstract different configuration templates based on these business models, enable customers to choose corresponding templates according to business scenarios and complete optimised practice within the industry, and provide services of the highest quality to various industries.

Name	Description
Operation and Inquiry API of Blockchain	This component conducts standardized encapsulation on underlying operations like transaction processing, transaction information inquiry, Blockchain information inquiry, and is responsible for receiving Blockchain instructions encapsulated by RS.
UTXO Accounting Model	UTXO is the accounting model adopted by Bitcoin. This model has broad applications in digital currency aspect, the main features of which is the easy verification of double spend and efficient traceability, which can be applied in business environment that had high requirements of privacy and operating performance. To Native STACS, UTXO is a standardized Blockchain accounting model. As a main algorithm of verification transaction, Native STACS can support UTXO.
Financial Accounting Models	The finance industry is the main application direction of Native STACS. To improve Blockchain adoption in current financial business operations, is the main objective of Native STACS. Accounting model and double entry accounting method are commonly used in financial business. Since the application of system is complex and the circulation of fund or capital relies on multiple methods, traditional Blockchain UTXO accounting model has no efficient expression. UTXO accounting model has significant limitations especially to the records of accounting status. In the meanwhile, it is difficult to realize effectiveness verification of associated accounts in transactions utilizing double entry accounting methods. Therefore, besides the ability to support the UTXO accounting model as above, Native STACS constructs a brand-new accounting model suitable for financial accounting models and realises a set of logic that verifies accounting data via the double entry accounting method, which can be utilised for business that has higher requirements on accounting outputs and satisfies the business requirements of financial industry.
Smart Contract	A smart contract in the Blockchain is a series of codes written on the Blockchain. Once the provisions in a contract are triggered, the codes will be automatically executed. This enables the Blockchain to be programmable, as well as the realisation of business logics of higher complexity. Smart contract technology used by Native STACS has significant differences with smart contracts commonly utilised currently in the market. Native STACS concludes the functions of mainstream Blockchain smart contracts in the market comprehensively and makes targeted design on the shortcomings, e.g. unable to support in utilising functions like circulation, and conduct underlying encapsulation of complex processing and provide externally via API interface. This ensures the readability, performability and simplicity of smart contracts and improves the security and stability of smart contracts.

Business Registration and Participants Verification	Native STACS is a permissioned Blockchain system which has no possibility of random access like a public chain. Therefore, since every permissioned Blockchain has a certain level of connection within the system, business registration is required when a business joins a specific permissioned Blockchain system to guarantee the business satisfies requirements within the whole Native STACS network. The registration process enables nodes of every Native STACS to complete initialisation process, guarantee the operation of network and realise privacy protection. Currently, Native STACS is only available to VPs.
Data Possession Verification	Privacy protection is a significant feature of Native STACS. The finance industry attaches great significance on protection of customers' protection. Data possession verification and data segmentation achieve privacy protection through cryptography. Every node only has access to the data corresponding to the key held. Private data is segmented via private keys.

Blockchain Core Layer (Slave）

The Blockchain core layer realises Blockchain processes, including Blockchain operation and inquiry API, accounting verification, Blockchain data packaging, business data segmentation and data synchronization between blocks.

Slave contains assemblers below：

Double Spend Checksum	Double spend checksum upon transactions is related to the accounting model adopted in Native STACS. Transactions adopting UTXO accounting model support double spend checksum via uniqueness check towards txID; to transactions adopting the accounting model, double spend checksum is focused on integrity of account verification and avoiding multiple debits.
Trial Balance	Conforms to accounting regulations and standards of recognising asset, liability and equity. Trial Balance is responsible for summary calculation and comparison of actual amounts and balances in all accounts associated with transactions based on accounting models. Also, the function is responsible for checking whether the account records are correct and guaranteeing the effectiveness of transactions.
Data Segmentation	Through setting up a virtual business chain, the co-existence and logic segmentation of different businesses within the same Native STACS is realised, which guarantees the data security and enables the convenient transactions among different businesses. Data segmentation and data possession verification are core function blocks of privacy protection in Native STACS.
Consensus Framework	To obtain efficient consensus processing, the number of consensus nodes of Native STACS network is limited, and consensus nodes are in a permissioned network that has security protection. Therefore, Native STACS adopts BFT and Paxos consistency algorithm commonly used in distributed system instead of consensus algorithm in public Blockchain like POW, POS, DPOS, and this satisfies the requirements on consensus efficiency of Native STACS. Meanwhile, Native STACS conducts framework encapsulation of consensus algorithm, supports flexible options of consensus algorithm under different requirements of performance and security and avoids the influence of algorithm changes on high-layer business logics, which enables easier adoption of other potential new algorithm consensus which results in the future possibility of greater flexibility, strength and expansion of Native STACS.

Management Function

Provides management functions like node management of permissioned Blockchain, currency management and transaction type management.

Blockchain Browser

Through the general Blockchain browser provided by Native STACS, transaction data contained in blocks, as well as height, hash value, announced time and miners of the block etc. can be inquired.

7.3 Detailed Description of Business Process

The whole process consists of two parts: business logic procedure and Blockchain core layer procedure, The former mainly aims to accomplish the logical voting and verification of multi-transaction nodes at the business level, and at the same time accomplish the preparation of data verification through the smart contract, while the latter basically accomplishes the consensus calculation to get a fixed result at the Blockchain level, after receiving a request.

The following flowchart shows the process for business logic. Through the smart contract, it is ensured that multiple participants in the same transaction can “process” it according to their own business logic and use “signature” to write the processes into transaction requests. And finally, it is recorded into the Blockchain through the lower-level modules

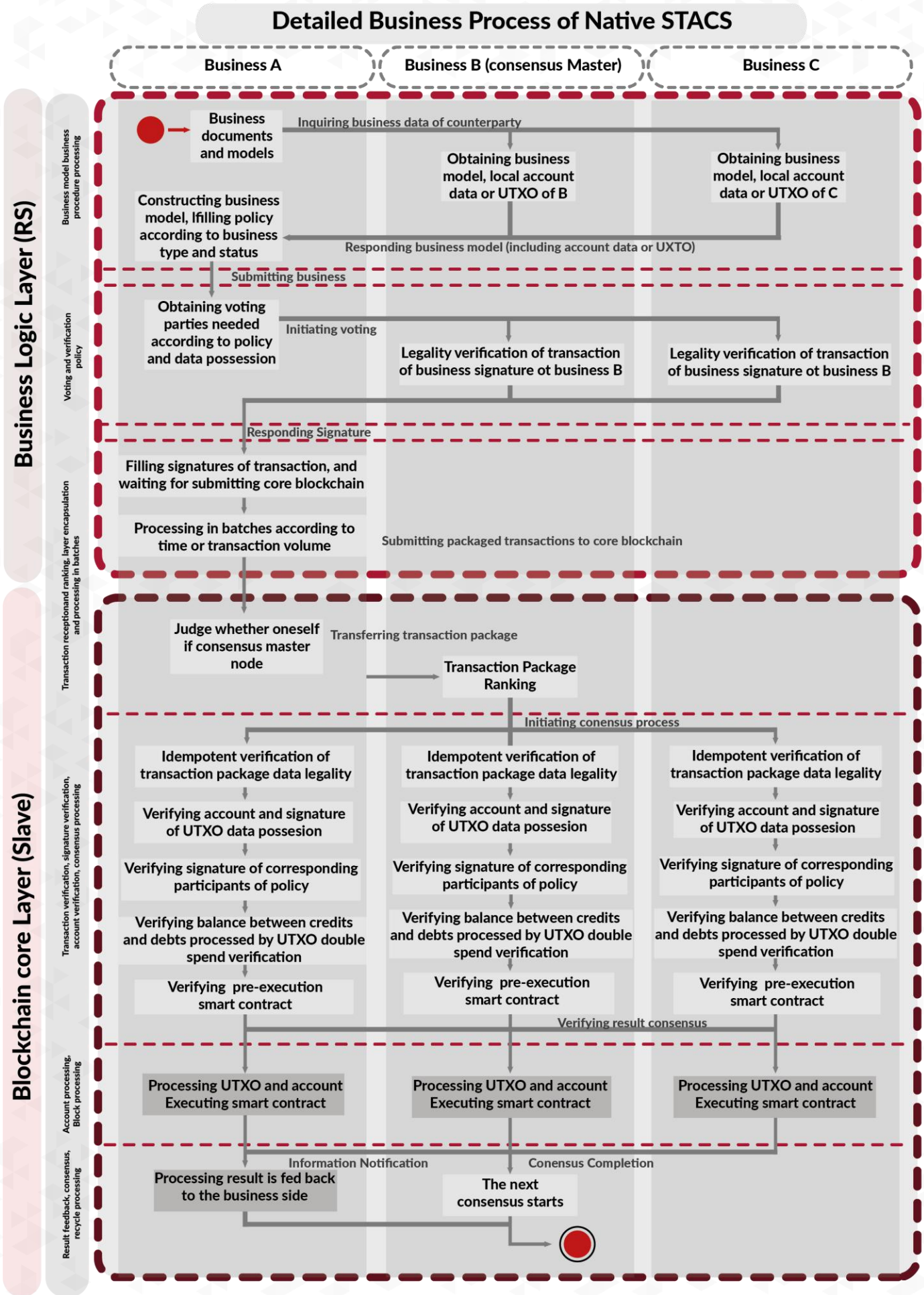


Figure 11 Detailed Business Process of Native STACS

7.4 Accounting Model

Native STACS realises complete accounting methods of accounting and supports applying traditional accounting logics in Blockchain, e.g. account verification and trial balance. Through the combination of accounting model and Blockchain, traditional accounting data are guaranteed to be stored on Blockchain, while ensuring unique Blockchain features like tamper-resistance and transparency can be enforced, which is one of the core competitive advantages of STACS.

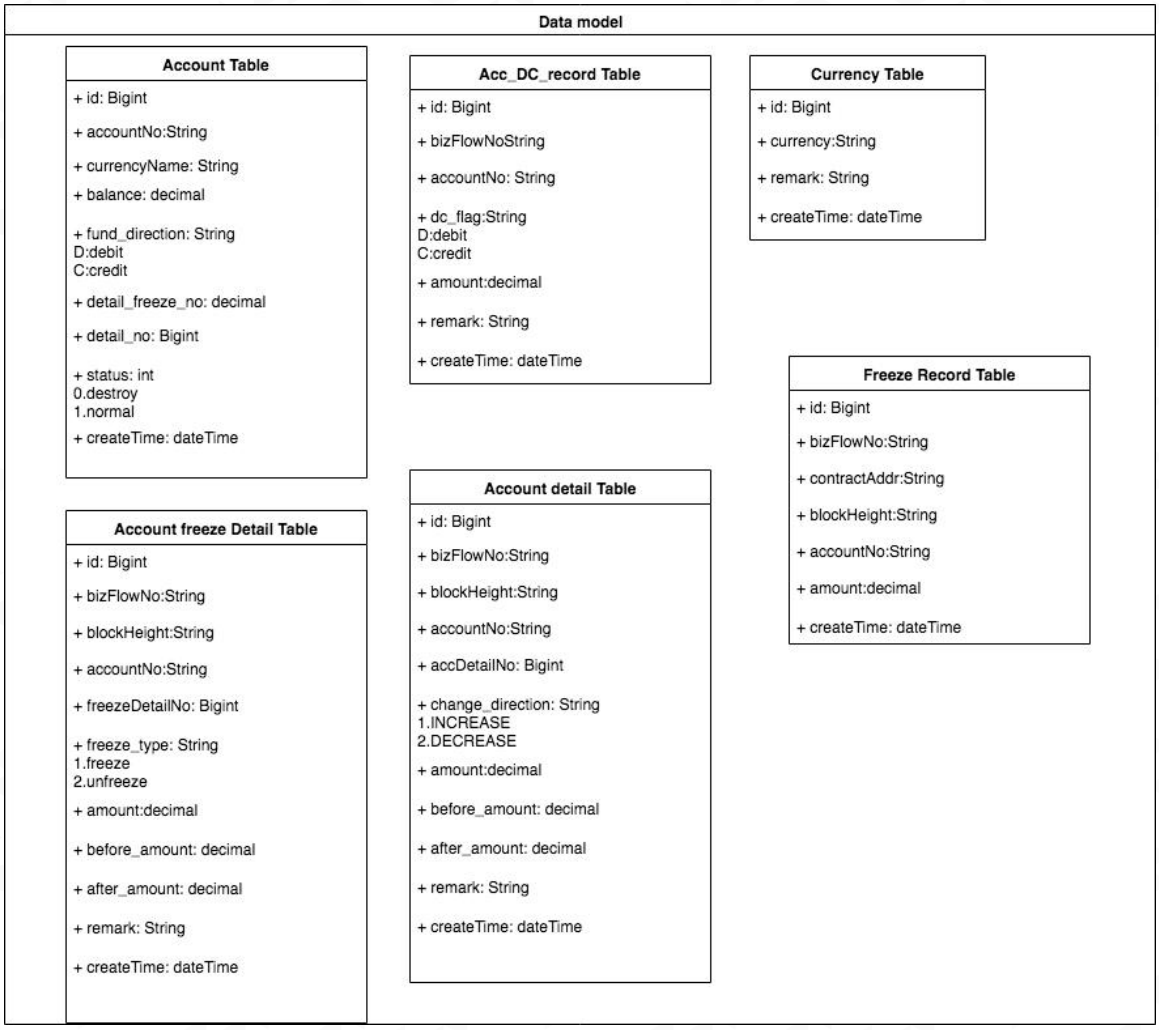


Figure 12 Detailed Accounting Model of Native STACS

Through data segmentation and data possession verification, STACS Trust uses methods of cryptography to transform accounting information in traditional financial industries to address information based on Blockchain. Only account ID formed by address code can be viewed in slave, and these account IDs cannot be matched to associated actual KYC information, hence guaranteeing the private data of an account is not exposed and thus protecting the privacy of information.

7.5 Consensus Model

Native STACS is operated in a system environment based on commercial terms and conditions. Adding new consensus nodes requires a series of business process like approval and identity verification. As a consequence, the consensus nodes are limited and known, and consensus can be conducted through predetermined consensus algorithm.

The feature of this algorithm is that the result cannot be tampered if most consensus nodes reach consistency and obtain a result. There will no branches in consistency algorithm unlike in public Blockchains.

The consensus framework of Native STACS is currently able to support the two algorithms of Paxos and BFT, and more mature consensus algorithms in the future.

7.6 Smart Contract

Smart contract technology of STACS mainly contains components below：

- API interface writing encapsulation for Native STACS
- A set of script execution codes similar with JavaScript and corresponding interpreter
- Policy editor

These three modules ensure that users can write smart contract according to customised business needs. The reasons for setting up these modules are:

- Policy editor is used to complete detailed functions in smart contract, including assignment of voting nodes, settings of voting success basis and API interface utilised in business logics
- To guarantee the usability and security of executing the contract, we reform the script, and only provide ordinary commands and limits the use of complex language to avoid possible mistakes in the execution process of a contract
- Provide API interface to encapsulate complex logics operated by the system, which mainly contain interfaces of encryption and decryption, interfaces of signature and verification, and interfaces with voting logics.

The whole objective is simplicity, to encapsulate complex parts via use of API to avoid losses due to erroneous codes written under the circumstances of not fully understanding the system.

By providing script support, we enable users to write customised contract based on the requirements of business. Also, we already offer various STACS Standard smart contract templates as covered in the previous examples in Sections 5.6.1 to 5.6.3.

7.7 Cross-chain Atomic Exchange

As the different Native STACS form to support the various networks of VPs in various regions, and as tokens representing different securities and assets begin to circulate on each Native STACS, there will inevitably exist token exchange between different Native STACS, which can be done through cross-chain atomic exchange.

Cross-chain atomic exchange mainly contains two steps:

1. Freeze assets on the original chain (or Native STACS)
2. Exchange assets according to certain rules (on Global STACS)

Atomic exchange is realised by building a side chain based on Global STACS.

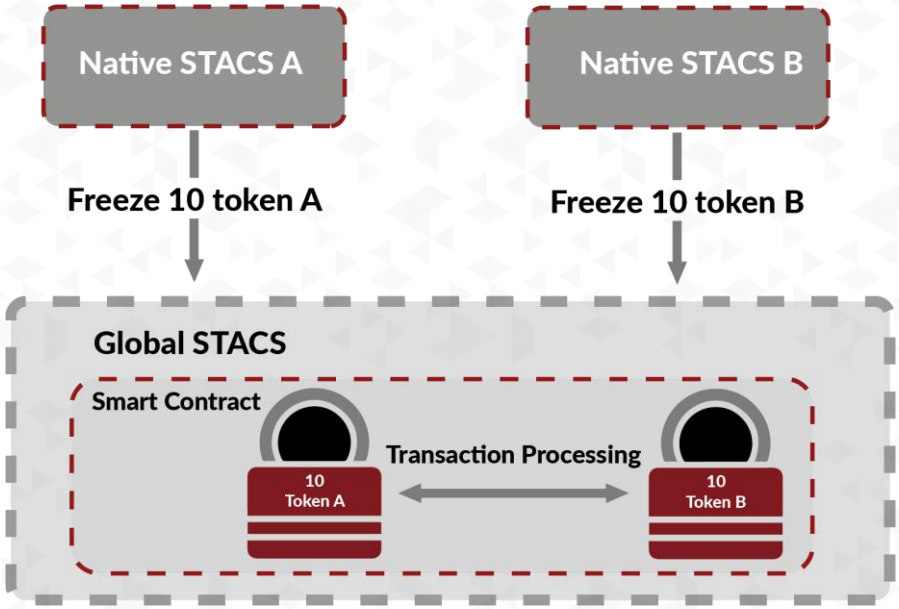


Figure 13 Cross-chain atomic exchange

This process consists of two parts

1. Freeze the assets on the Native STACS with sidechain technology (Native STACS Trust natively supports frozen API services or self-written smart contracts)
2. The side chain sends the message to the main chain, and the main chain confirms that assets have been frozen on the side chain, and the assets in main chain are issued.

7.8 Features Of The Cross-Chain Solution

Generality: Atomic exchanges between STACS and other types of Blockchains can be achieved through customised development of corresponding client software on different Blockchains. Therefore, this cross-chain service is flexible and may include other native chains in future.

Security: In the side chain scenario, all information of the transaction is more secure through consensus of multiple nodes.

8 Global STACS Specifications

Currently, most public Blockchain systems cannot realise the full value of the Blockchain and satisfy business enterprise performance requirements at the same time. STACS Protocol satisfies the performance and business requirements of Verified Partners' business systems integrated with Blockchain. To satisfy the demand of data witness, STACS Protocol supports to push Native STACS data on Global STACS to realise data witness.

Global STACS solves delegated proof of stake (DPOS) branch problems by utilising modified DPOS consensus algorithm to enable the second-level network consensus. To solve the problems of high concentration of miner hash rate and high participation barrier for users in a public Blockchain, the STACS Protocol uses specific Global STACS Nodes, Global Node whitelist and Node efficiency consensus to solve the problem of high concentration of hash rate.

8.1 P2P Communication Framework

8.1.1 Design Objective

Being different from common P2P network, the main design objectives of P2P network in Global STACS are efficiency and reliability. Only an efficient and reliable underlying network model can empower the fast processing of high-layer businesses.

8.1.2 Detailed Process

Being similar with all the P2P networks, all nodes in the P2P network of Global STACS are equal. Therefore, every node contains the realisation of client as well as server. Client is responsible for constructing and sending messages. Server's responsibility is to supervise network and receive messages.

Also, any P2P node can realise the service of node registration. Through this service, nodes can obtain a batch of node addresses randomly generated at the first start-up and use these node addresses to construct the initial P2P network. This is the difference Global STACS has compared to other underlying networks of Blockchain. Every node can become a registration centre.

After the connection of a node with other nodes has been established, it will send a Hello message which contains information of this node like public key, signature, IP address and endpoint. When the counterparty receives the message, it will verify the authenticity of this information. After the successful verification, the counterparty node will first store the information of this node and respond with a Hello ACK message, which contains node information like public key, signature, IP address and endpoint. Hello and Hello ACK information is like a handshake message. After a successful handshake, both nodes ensure that the counterpart side is legal. Only legal nodes can send information in STACS Global P2P.

Two nodes that have had a successful handshake can send Get Peers information to each other, collect node information continuously and construct connections with other nodes until reaching the maximum connection number.

8.1.3 Principles of Communication

P2P network communicating contract of Global STACS is based on TCP contract, since TCP contract is a full-duplex communication protocol which is convenient for receiving and sending data between both nodes. Communication data is transferred in the form of binary compression format.

Communication among all the nodes in Global STACS is driven by information and information processing is done asynchronously to guarantee the efficiency of the system.

8.2 Consensus Model

8.2.1 Defects of Current Model

Currently, Bitcoin and Ethereum realises consensus through network mining. However, network consensus is of low efficiency, which is the reason why generating one block takes 10 minutes. In Ethereum a block can be spread to 95% of the whole network in 12 seconds, based on the analysis on the spread of Bitcoin. Setting block generation time as 12 seconds improves the speed generating blocks, but to actual business system, 12 second-delay is still difficult to accept. To solve the problem of efficiency, network consensus must be transferred to partial consensus. Dash proposed the solution of Master nodes consensus, Bitshares proposed the solution of delegated proof of stake (DPOS), modifying network consensus to consensus between token holders as tokens being proof of stake. According to the economic theory of proof of stake (POS), if one person holds many tokens in the network, he has no motivation so destruct this network which causes losses to the token value. If package nodes are provided reasons to hold these tokens, they have no motivation of conducting branching operation theoretically.

Traditional DPOS involves only one node during one consensus process. If DPOS node chosen is malicious node, temporary branching will occur. Relying on the longest chain to solve branching problem during system operation causes unreliability of information in a round of consensus. After several rounds, data on abnormal chains is abandoned. The only solution on the platforms of Bitcoin and Ethereum is to wait for confirmation of following blocks of a certain number. The transaction is only confirmed, or the request is processed correctly after the confirmation from a certain number of following blocks, which is more complex for business access. On the business side, after a request is processed and responded by Blockchain, the data on Blockchain may disappear within a period. If using such confirmation strategies like the ones used on Bitcoin or Ethereum, a business has to wait for the confirmation from a certain number of blocks to process the result responded from Blockchain (judging whether the responded result is on the main chain according to the confirmation situation of following blocks) after the confirmation of consensus. Therefore, the actual processing time delay of blocks is actually added on to the block generating time delay. As such, a typical transaction on the Bitcoin or Ethereum network today, may take as long as 1 hour to safely confirm its execution. Since it needs the confirmation from a certain number of blocks, this logic of complexity needs to be processed by institutions, which causes the higher complexity of business and increases the costs of current applications.

8.2.2 Consensus Algorithm and Block Generation In Global STACS

The consensus algorithm in Global STACS resolves such problems and overcomes the above defects, which allows the Global STACS to be able to achieve financial institution standards on a global basis. It is based on DPOS, and hence requires less technical burden on nodes than the traditional PoW, and normal users can gain entry to packaging transactions using normal computers.

Global STACS has two types of Nodes:

1. Global Nodes (unlimited number and can be increased anytime) which are in charge of packaging transactions into blocks, and

2. Supernodes (21 in the beginning) which are in charge of validating block transactions packaged by Global Nodes.

Supernodes are selected VPs and are international, top-tier institutions that are widely trusted and credible, while Global Nodes are entities and may or may not be Verified Partners. Global Nodes have to apply to us and once their identities are verified, they will be allowed to be Global Nodes. This ensures that every Supernode and Global Node owner is known and are credible entities and individuals, who can be counted on to govern the network to the best interests of all stakeholders.

VPs need to stake more STACS tokens to be able to run Supernodes (exact number of tokens to be confirmed later) while Global Nodes only need to stake lesser STACS tokens (exact number to be confirmed later). For security reasons and proper segregation of duties, Global Nodes cannot own Supernodes, and Supernodes are not allowed to own Global Nodes.

8.2.3 Enhanced DPOS Consensus Algorithm in Global STACS

The key points of the DPOS algorithm consists of two aspects:

- Reducing the number of Blockchain nodes generated but guaranteeing that the process of choosing nodes is random enough to ensure the equality of choosing Blockchain generating nodes. If we're only choosing POS nodes on a small scale, the risk of the whole Blockchain system being attacked will increase.

- How to handle packaging relationship in chosen POS nodes. To ensure a distributed system, forming a fixed block result each time is significant to avoid branching of Blockchain. Global STACS optimises these two aspects through a self-researched algorithm, and the detailed design is as below:

How to guarantee the random and equality of choosing POS nodes

- Admission: Since Global STACS is a public Blockchain platform, every verified user can access Global network through registering as a Global Node, and every node can become a POS node theoretically. Therefore, when they access the network, they will get an initial integral value which is the same to every access node.

- Changes in integral value: Every Global Node accesses the Global STACS network via a P2P network. When receiving and verifying new blocks packed and broadcasted by other Nodes, one's integral value increases;

- Choose block generating nodes: Every Global Node is an independent Blockchain node that completes individual and separate work, and every Global Node operates fixed POS node option algorithm when mining to generate the current POS node set. The detailed description of POS node option algorithm is as below:

- Conduct Hash algorithm to all nodes through block id + node address of latest packed blocks to generate Hash series of every node

- Distinguishing three integral levels of high, medium and low through ranking all the nodes based on integral value

- Determining the number of POS nodes needed in different integral level according to the number of POS nodes needed in packaging node sets
- In each integral level, ranking is based on Hash series number of nodes, obtaining nodes ranked in higher levels according to the number of nodes needed and forming the POS node set of this integral value level
- Merging POS node set of three integral levels, forming POS node set of current blocks and conducting network broadcasting after putting into the blocks.
- After a round of packaging activities, merging, reranking randomly, and obtaining top-ranking level nodes of needed amount at the DPOS node where last successful packaging was conducted, forming new packaging node set and conduct consensus, which leads to DPOS node set of the next packaging activities and enables the next node activity.
- Hash series number generated by Hash algorithm of Global STACS, which guarantees the enough random of POS node ranking and ensure the fairness of DPOS result.

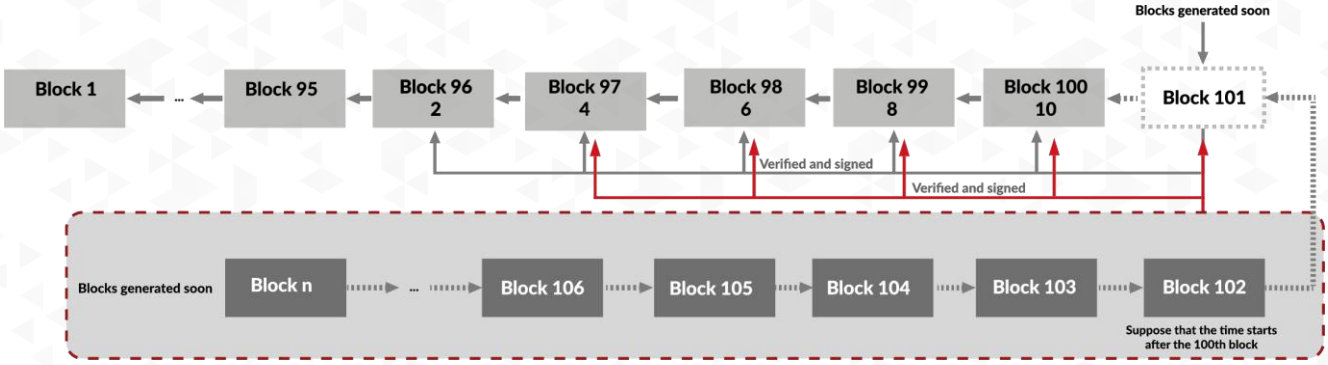


Figure 14 Selection Process of POS Nodes

Block Generating Process in DPOS

Packaging is based on the above DPOS algorithm, which means that there is a set of algorithm which scores Nodes on their eligibility. Each Global Node starts off with the same integral value and will have an equal chance of getting selected to package any block, as long as it is eligible. With an example of 100 nodes, 15 will be chosen by the scoring algorithm to package the next block. Only 1 will package the block, and hence get the transaction rewards, and this node will then restart with a starting score, while non-selected Global Nodes get their integral increased to give them a higher chance for the next nodes. Global Nodes that are non-performing (errors, offline) get punished with integral deductions, so that bad nodes have a lower chance of affecting the effectiveness of the network.

- Competing fairly

The randomness of verification and signature and the singleness of competitive result guarantee the equality of competing package rights and avoid branching; Since signature nodes are formed by the package nodes randomly chosen, the possibility of competing for packaging rights unfairly is reduced effectively.

- Completing Packaging Activities of This Round Cyclically

After completing packaging activities of one block, Global Nodes successful in packaging will lose the right of competing packaging rights of blocks following this round, and the integral value is deducted according to integral regulations. Global nodes remaining in package node set continue packaging data and compete for packaging rights of following

blocks until all the blocks are processed successfully in this round and the packaging activities are completed in this round.

After the packaging activities of the last round, Global Nodes that has successfully packaged the last block become voting nodes of packaging activities of this round. According to POS node set written into the block when mining and generating new DPOS node set and completing consensus according to POS choosing regulations, starting up mining activities of the next round.

Block generating process example:

Suppose 10 blocks need to be processed in every round of packaging. Currently, block packaging work of 100-level height has completed, and the new round of packaging activities has started.

1. Successful packagers of blocks from level 91 to level 100 become voting nodes, merging, deduplicating and reranking randomly POS nodes set stored in blocks from level 91 to level 100, obtaining DPOS nodes set formed by nodes ranking top 15, and sending to other voting nodes to complete consensus. DPOS nodes set contains 15 DPOS nodes from DPOS 1 to DPOS 15 and starts block packaging activities next round from level 101 to level 110.

2. Global Nodes in blocks from level 91 to level 100 become verification and signature nodes, and the weights are as below:

Block Height	91	92	93	94	95	96	97	98	99	100
Weights	536	598	596	599	568	344	592	472	584	88

3. 15 DPOS Nodes conduct business data package and signature, and send data pack signed to verification and signature nodes to compete for packaging rights, and the final result is as below:

Block Height	91	92	93	94	95	96	97	98	99	100
Weights	536	598	596	599	568	344	592	472	584	88
Nodes	DPOS8	DPOS1	DPOS8	DPOS8	DPOS8	DPOS7	DPOS7	DPOS8	DPOS8	DPOS8

The weight gained by DPOS8 is the highest, so DPOS8 obtained the packaging right of the block in level 101.

4. DPOS8 generates POS node set of level 101 block according to the POS node option regulations, which generates blocks combined with data pack signed, and complete Blockchain store and network broadcasting. The block generation process in level 101 block ends.

5. Remaining 14 DPOS nodes continue mining activities in level 102 bock until the mining in level 110 block ends. Mining of this round finishes and the next round starts.

6. After packaging, blocks are then validated by Supernodes, which are entities pre-selected by STACS, based on their credibility. These Supernodes stake a higher number of STACS Tokens each, and are highly regarded in their various industry fields.

7. Supernodes can be replaced, to punish non-performing Supernodes or introduce new ones.

8.3 Incentive Mechanism

Currently, for Bitcoin or Ethereum, consensus algorithm is based on hash rate, which leads to the appearance of ASIC miners. The appearance of these miners concentrates hash rate in professional mines, while common users cannot participate in mining, which is contrary to the primary objective of Blockchain that encourages the involvement of every individual.

Part of the reason of concentrated public Blockchain hash rate in the market is that inverse hash algorithm of POW can be transferred into ASIC. Since there are no limits of admittance threshold of miners, miners are manufactured in a large amount, and hash rate mining pool centralized operating is formed, which causes the concentration of hash rate.

Global STACS considers the participation of users in design. Therefore, Global STACS does not use intensive PoW mechanism that are skewed towards ASIC miners, but are simpler to implement using normal equipment, with low power consumption, which is suitable for the use by individuals and organizations and will not form customized hash rate.

8.3.1 Consensus Incentives

Transaction fees on Global STACS are based on the Gas price concept, whereby the complexity of the output will incur higher fees. Hence smart contract transactions will cost more while simple transactions will cost less. Transactions are paid using STACS Dollar (a stablecoin pegged to fiat USD), so that VPs have confidence in the stability of transaction fees and valuation of securities, so that there is no uncertainty of using another non-stable cryptocurrency where the fees may become very high for a single transaction, or conversely, asset values dip to negligible if the underlying cryptocurrency is at low prices.

STACS undertakes to use the incurred fees on STACS Dollar to convert to STACS Token token to fulfil its staking rewards to the Global Nodes and Supernodes.

The distribution of the transaction fees is:

- 70% of all transaction fees will be used to purchase STACS Tokens from the open market and shared with Global Nodes and Supernodes, 10% will be used to purchase STACS Tokens from the open market and retained in an Investor Protection and Governance Fund, while 20% will be allocated to Hashstacs Inc to maintain and continually develop the STACS Protocol

- Of the transaction rewards of 70% in STACS tokens, it is shared 80/20 with the Global Nodes getting 80%, all to themselves, when packaging a block, while the Supernodes get 20%, shared among all Supernodes, for validating a block.

- Using an example of 1000 Global Nodes and 21 Supernodes: Every Global Node has a chance of packaging a block, and they are scored based on the DPOS algorithm as in the Block Generation Process above. For the next block, 15 out of 1000 Global Nodes are shortlisted based on their integral number based on the algorithm. 1 of these 15 Nodes will package the block, and get 80% of the transaction fees in this block. After packaging this block, Supernodes will have to verify it, before it gets broadcasted. After verifying the block, all 21 Supernodes get an equal share of the 20% of the transaction fees in this block.

8.4 Reliability Analysis

Since the arrangement of Slave is of multi-nodes and the external services are of high usability, Slave can bear node disconnection or data loss less than 51%. Native STACS designs failover processes to respond to the scenarios of disconnecting or losing nodes, as well as to support data recovery service caused by bug in high-layer business system. Native STACS conducts disaster recovery design to internal data storage, which further guarantees the fast operation of failover after data storage exceptions.

8.5 Performance Analysis and Actual Performance Data

To achieve enough network nodes for testing of scalability, we construct enough nodes by running docker component on JVM, and the maximum scale simulates the circumstance of 1000 network nodes. Through pressure measurement of network nodes of different scales, we obtain TPS and latency data as below:

Network Node Quantity	TPS	Latency(s)
3	138363	0.23
5	136363	0.23
7	135363	0.25
21	125063	0.37
49	123054	0.53
99	106307	0.83
149	100432	1.12
199	89643	1.39
249	80157	1.66
299	75189	1.9
349	65954	2.14
399	58669	2.35
449	49549	2.55
499	39810	2.73
549	30666	2.89
599	22335	3.04

649	18031	3.16
699	14013	3.26
749	14001	3.34
799	13631	3.4
849	13331	3.43
899	13337	3.43
949	12971	3.42
999	13092	3.37

In actual deployment, TPS will depend on a variety of factors, including the performance of each node, and the performance of the network. We base our tests on standard equipment and standard network conditions. The nature of the transactions will also affect the TPS results. Unlike other chains who might market their TPS tests without being detailed about the nature of transactions, we actually define our transactions in 2 different categories. We based these above tests on simple basic transactions of data witnessing and data attestation on-chain, without the use of more complicated logic like smart contracts and UTXO accounting models.

Hence, based on the above testing results, for simple transactions and data witnessing and attestation, with the fact that most Native STACS deployment are having smaller networks with less than 50 nodes, and that some Native STACS may even have only the basic minimum 3 nodes (1 VP only), most of the Native STACS that will be in the STACS Protocol Ecosystem should expect a high TPS of more than 120,000 with latency of less than 0.5 seconds. That will be able to support the needs of many VPs who may do their actual trade executions on their current systems, and only do data attestation on-chain.

For more complicated, complete transactions involving smart contracts and full UTXO/double-entry accounting models, we have found TPS to be approximately 12,000 on Native STACS and 400-700 on Global STACS. This is still a vast improvement over many of today's private or public Blockchains, when it relates to executing full trades on the chain. The full trade transaction cycle requires a higher computing capacity which is the reason why this number should be more relevant if evaluating a system's performance and ability to execute actual trade transactions, whereas if the subject is just a simple transaction of data witnessing/attestation, we can use the higher number of 120,000 as above.

From the trend of data and figure above, it can also be found that when the number of network nodes reaches around 700 and above, TPS and latency remain stable.

8.6 System Arrangement and Maintenance

System Arrangement: To realise the fast arrangement of Native STACS, we develop a specific one-click arrangement script, which will be published together with the source codes of Native STACS.

System Maintenance: Native STACS provides complete basic supervision and business supervising system, which will be published together with the source codes of Native STACS. In the meanwhile, we will provide fault processing tools which mainly processes failover and fault segmentations after the faults. These tools will be open source as well.

9 STACS Token

9.1 Introduction

STACS Token will be the utility token of the STACS Protocol Ecosystem. We mentioned that it is free for all institutions to be a Verified Partner (VP) and use the STACS Protocol, either deploying a Native STACS system or connecting to our Global STACS via APIs. However to be able to use the STACS Protocol and be a VP, we require them to stake a certain amount of STACS Tokens to be able to use the STACS Protocol.

VPs also have the option to run Supernodes. We expect to invite a total of 21 Supernodes initially, with each VP only allowed a maximum of 1, and this will require a staking of STACS Tokens.

The Global Nodes will also be available for any corporate entity to run, but only upon successful application to Hashstacs Inc, who will verify and select Global Nodes stringently. These Global Nodes will also be required to stake STACS Tokens before being able to run a Global Node.

Transaction fees on Global STACS are based on the Gas price concept, whereby the complexity of the output will incur higher fees. Hence Smart contract transactions will cost more while simple transactions will cost less. Transactions are paid using STACS Dollar (pegged to fiat USD), so that all users and VPs have confidence in the stability of transaction fees, and asset values. STACS undertakes to then use the incurred fees on STACS Dollar to convert to STACS Token on the open market, to fulfil its staking rewards to the Global Nodes and Supernodes.

The distribution of the transaction fees is:

70% of all transaction fees will be used to purchase STACS Tokens from the open market and shared with Global Nodes and Supernodes, 10% will be used to purchase STACS Tokens from the open market and retained in an Investor Protection and Governance Fund, while 20% will be allocated to Hashstacs Inc to maintain and continually develop the STACS Protocol

Example:

- 100,000 STACS Dollars (USD stablecoin) of transaction fees are incurred globally in the entire STACS Chain in a week from 1 April to 7 April. Based on our fee distribution model, 70% of all transaction fees will be used to purchase STACS Tokens from the open market and shared with nodes, while 20% will be put into the Maintenance Fund to maintain and continually develop the STACS Protocol while 10% will be retained for investor protection and governance. In other words, 70,000 STACS Dollars will be used to purchase STACS Token from the open markets, and distributed as node rewards over a period from 7 April to 13 April, 10,000 STACS Dollars will be used to purchase STACS Token from the open markets and kept in an Investor Protection Fund, while 20,000 STACS Dollars will be provisioned to the Hashstacs Team for further development of the STACS Protocol Ecosystem.

9.2 The impact on Rock Token (RKT)

This section outlines the impact on existing GBX RKT holders including detailing the current use and the future use once they can be used to fuel the STACS Protocol

1. All present RKT holders will be invited to swap their tokens into STACS Tokens when the STACS Protocol is accessible, expected to be Q1 2019. To make it straight-forward and avoid confusion, we have replaced our present ECR20 RKT token with the ERC20 version of STACS on 23rd November, 2018.

2. All present ERC20 STACS token holders will then be invited to replace their ERC20 STACS tokens into Protocol STACS Tokens when the protocol is accessible, expected to be Q1 2019, on a 1-1 basis.

3. There will be NO additional tokens minted beyond the 900,000,000 RKT tokens that were minted last February. Once they are all replaced by STACS Tokens, the total circulation of the STACS token will remain at 900 million also.

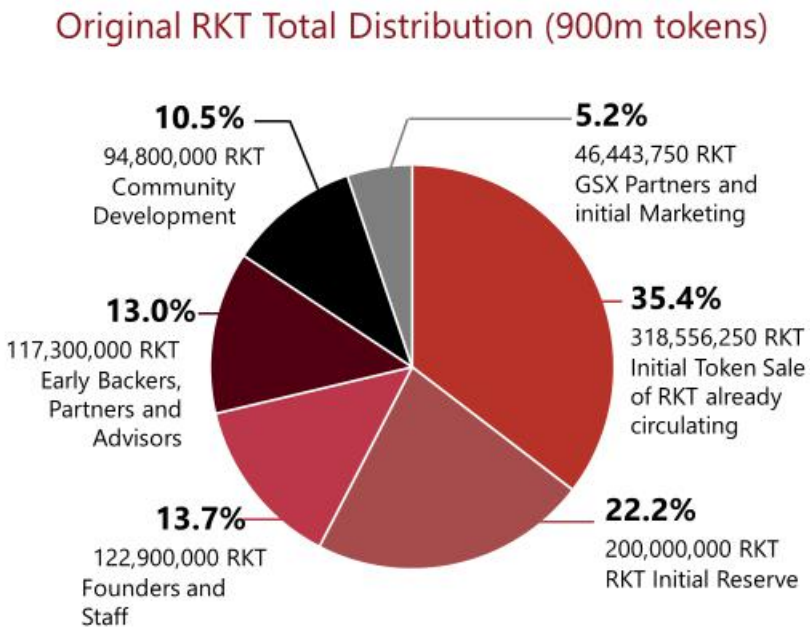


Figure 15 – Initial RKT token distribution

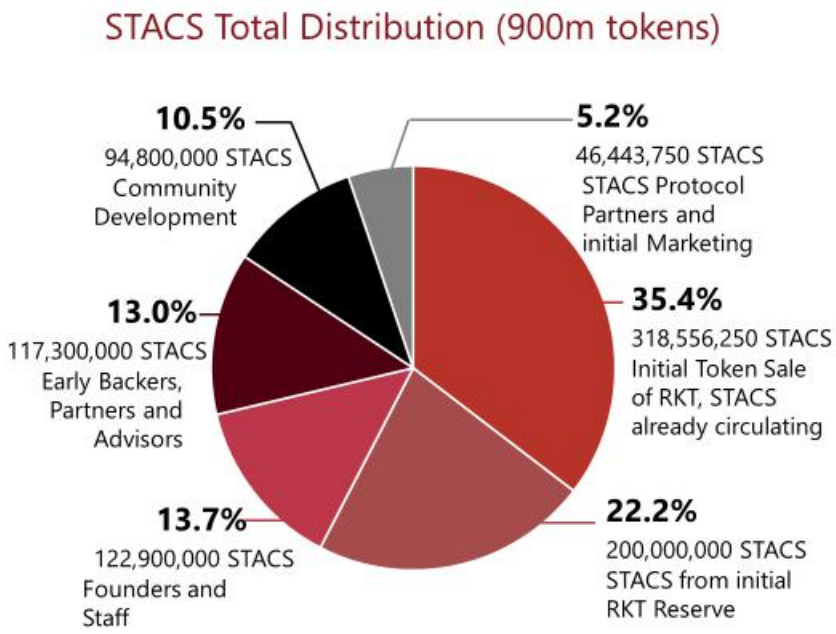


Figure 16 – Updated STACS Token distribution (unchanged distributions/supply)

9.3 Utility of the STACS Token

1. VPs do not need to pay any fee to use the STACS Protocol, but will be required to stake STACS Token to use the Native and Global STACS.

2. Any entity who wishes to be a Supernode or Global Node, will also be required to stake STACS Tokens, to earn Node rewards.

3. Transaction fees on the STACS Protocol will be payable in STACS Dollar for all transactions made on the STACS Protocol, and these will generate staking rewards for the Supernodes and Global Nodes of the Protocol.

4. 70% of all transaction fees will be used to purchase STACS Tokens from the open market and shared with nodes, 10% will be used to purchase STACS Tokens from the open market and retained for investor protection and governance, while 20% will be put into the Maintenance Fund to maintain and continually develop the STACS Protocol

5. settling of the GBX application fee ("Application Fee"), listing fees (“Listing Fees”) and Sponsor fees (“Sponsor Fees”) on GBX;

6. staking by Issuers on GBX;

7. settling trading fees (“Trading Fees”) on the GBX DAX;

8. medium to pay fees in the GSX Group Ecosystem including Juno corporate services, fund services and fees; and future services and fees in the GSX Group ecosystem

9. GBX Blockchain Innovation Centre campaigns, rewards for GBX Blockchain Innovation Centre campaigns and other incentives.

10. settling of the GSX application fee ("Application Fee"), listing fees (“Listing Fees”) and Member fees (“Sponsor Fees”) on GSX;

11. medium to pay fees in the GBX Ecosystem including corporate services, fund services and Juno fees;

12. It also provides:

13. membership to GBX, with privileged account benefits including discounts on trading fees;

14. priority access to token sales; and

15. other potential incentives and voting rights on select community initiatives and developments;

10 Summary

The emergence of the Blockchain and distributed ledger technology promises to transform securities markets. The efficiency, transparency and subsequent liquidity these technological innovations produce will transform practices and protocols for clearing, custody, and trading of securities.

We at the GSX Group, believe that it is the right approach to move from traditional securities to those moderated by emerging Blockchain technologies.

Just as the true power of the Internet was unleashed only after the advent of distributed web services and architecture (Web 2.0), the utility and transformational capacity of the Blockchain will be fully discovered with a distributed architecture of DLT-based solutions. The GSX Group's STACS Protocol Ecosystem integrates Blockchain technology with Verified Partners that include professional financial institutions, financial service firms, banks, broker/dealers, corporate finance advisors, custody providers, third-party technology providers, issuers and investors in a radically transparent, compliant way using industry-leading smart and STACS Standard smart contract technology for the issuance, trading and settlement of securities.

The STACS Protocol is expected to provide access to the capital markets for a wide variety of issuers and participants including:

- traditional and non-traditional counterparts including global conglomerates, institutional licensees, operating companies, family businesses, investment vehicles, family offices, and ETFs; and
- participants who can trade within the GSX marketplace and build investment portfolios with confidence and without the layers of intermediaries, barriers to entry, and cost associated with traditional markets. This has the potential to give participants access to a spectrum of investments, capital, and/or income generating assets that might not otherwise be possible in the same manner and to the same degree under a traditional stock exchange model.

With the adoption of the Blockchain-based trading system, the STACS Protocol will dramatically boost efficiencies whilst reducing costs by integrating the entire spectrum of exchange services including, but not limited to, listing, execution, clearing, settlement, AML/KYC controls and processes, security, digital identity management and custody.

The existing financial community owes the visionaries responsible for creating Blockchain technology a debt of gratitude. The time has come for a fundamental transformation of capital markets powered by these innovations. Such changes will make the market better, more liquid, and more efficient. However, the full application of this revolutionary technology is only possible when we create an infrastructure that supports the financial industry in a complete ecosystem.

Blockchain technologies and Codes of Practices

The thought leadership behind the STACS technology and structure stays rooted in years of innovation – forming world-leading and regulated institutional-grade Gibraltar Stock Exchange (GSX) and Gibraltar Blockchain Exchange (GBX). The minds involved in forming the STACS protocol stem from regulatory expertise and know-how in traditional finance, Blockchain and codes of practices.