Star Cluster Protocol

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Star Cluster is one of the fastest platforms for smart contracts in the industry of blockchain

White Paper v1.00

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1. Introduction

The paper details an overview of the the Star Cluster. Star Cluster is one of the fastest platforms for smart contracts in the industry of blockchain. The platform is open for all, allowing smart programming contracts for decentralized applications. With the assistance of the Star Cluster platform, the following goals can be accomplished:

- **Star Cluster can build low-cost and fast solidity-compatible apps. The Star Cluster dApps can be launched to confirm transactions quickly and process thousands of transactions per second. The speed of the transactions is beyond any decentralized blockchain platform today. The smart contract on Star Cluster can be deployed using remix and MetaMask.**
- **Customized blockchains can be launched for both the private and public sectors. Blockchains can be deployed that fit customized needs, and virtual machines can be set up to ensure that the blockchain operates precisely as required.**
- **The platform gives access to millions of validators with minimal hardware.**

Launch Star Cluster dApps that confirm transactions instantly and process thousands of transactions per second, far beyond any decentralized blockchain platform today.

- **High performance and linear scalability for over 1000 nodes**
- **Improved degree of writing safety**
- **Enhanced performance when surviving partitions where most controller nodes are reachable.**

2. Purpose

2.1 Purpose of the Star Cluster

The Star Cluster is a distributed implementation of Star with its design featuring the following purposes :

- **The platform ensures an enhanced level of writing safety. The system keeps all the writes from clients connecting with the controller nodes. In rare cases, there are windows where the writing can be lost. The chances of losing partitions are higher when the clients tend to be in a minority**
- **partition.**

  Star Cluster has another cardinal purpose: to survive partitions where most controller nodes are reachable. Through replicas migration, masters who are not replicated by any replica will receive one from a master covered by multiple representations.

The Star Cluster ensures the implementation of all the single vital commands available in the non-distributed version of the Star. Complex operations such as set unions and intersections are implemented for cases where all the keys in the operation hash have a similar slot.

The Star Cluster platform was designed to support digital assets' development, transfer, and trade.

The device ranges from low to high powered and features low latencies that are cost and time-efficient. The engine sustains a global network of millions of devices that are interconnected and operate seamlessly.

Another cardinal purpose of the Star Cluster platform is to ensure the utmost security and follow an anti-attack protocol. The classical consensus protocols are designed

to bear up to f attackers and fail when faced with a size f+1 or larger attacker. In other words, the platform provides the utmost safety when the attacker is below a specific threshold that the system's designer can effectively parametrize. The Star Cluster platform is the first permissionless system and yet provides maximum security.

Star Cluster is designed to avoid the categorization of users with unmatching interests. The platform is structured to ensure it provides unprecedented decentralization. This relates to commitments for several client implementations and no centralized control.

Star Cluster is proposed to be a highly inclusive platform where anyone can use the network and participate in first-hand governance. Any token holder can opt for vital financial parameters and choose how the system can evolve.

Star Cluster of $STCL is designed to provide a flexible infrastructure to blockchains, where $STCL is used as a medium for exchange purposes. The platform supports balances and several scripting languages and ensures that many deployment scenarios are accommodated. Therefore, the platform is flexible for several clients and potential users, $STCL Total circulation 72 million.

The feature's design implements another distinctive concept called hashtags. This ensures that a particular key can be stored in the same hash slot.

3. Platform Synopsis

Section 3 provides the architectural overview of the star cluster. Various implementation details are discussed for Star Cluster.

3.1 Overview of the star cluster Platform

Subnets/Subnetworks: The Star Cluster platform supports the creation of many subnetworks or subnets. The subnetwork is a set of validators that work harmoniously to accomplish consensus on a set of blockchains. The subnet then evaluates who enters the network by requiring the validators to have specific properties. The subnet reduces the network traffic as the validator who does not relate to the blockchains in the subnet will not join the respective subnet. All validators must validate a subnet known as Default Subnet. The Default subnet includes the blockchain where $STCL is traded.

Virtual Machine Integration: Every blockchain is an example of a Virtual Machine. A Virtual Machine acts as a blueprint for blockchain platforms. The virtual machine defines the behavior and interface of the blockchain.

- **The contents of the block**
- **The state transition happens when a block is accepted in the mentioned process.**
- **The data that is endured to the disk**
- **The blockchains and their related endpoints that are exposed by the APIs**

When any blockchain is created, the Virtual Machine has to be specified and the state of the blockchain. A new blockchain can be developed using a Virtual Machine that may pre-exist. Ideally, there can be many blockchains that operate the same virtual machine. The critical aspect to note is that blockchains working on the same

virtual machine. The critical aspect to note is that blockchains working on the same virtual machine have distinctive states and are not dependent on other blockchains.

Bootstrapping occurs in three stages: connection to seed anchors/network, state discovery, and successfully becoming a validator. DNS seed nodes are used in crypto-related networks, a set of seed-IP addresses by which other network members can be discovered. The purpose of the seed network is to provide helpful information about the location of active participants in the network. Upon being connected to the seed anchor, the phase of the accepted frontier comes to its origin. This phase relates to the last official block, followed by the state transitions accepted by several deed anchors defined to be taken. Upon the condition, there is the prevalence of correct nodes in the set of seed anchors; the state transitions accepted are at least made by one right node. Lastly, the validator chain is used to define the membership set of the network. This paves the way to discover the current validators.

Consensus Protocol and Membership: The consensus protocols provide the guarantees relating to security on the assumption that up to a specific number of members in the system could be hostile. A standard attack is the Sybil attack, where the node floods the network with adversarial identities and can invalidate the security protocols. The star cluster platform chooses disk space (PoS) for the core Sybil control mechanism. The disk space is owned by large data center operators and bears costs such as electricity costs for hashing and leak value out of the ecosystem. The proof-of-work protocol opts for the miners who have connections to buy cheap electricity. The proof-of-stake is green and open to all and, therefore, widely popular.

Staking is the process for membership or participation in an open network. The nodes that are staked are economically driven to not enact in a way that damages the value of the stake. A node that wants to enter a network can do so only by putting

up an immobilized stake during the duration of node participation. The user determines the time of the involvement, and once it is accepted, there is no possibility of a stake being reverted.

The star cluster network does not use slashing, and therefore when the staking period tends to expire, the stake is returned. This helps prevent scenarios such as a failure in both software and hardware that can result in a loss of coins. There is also a particular stake transaction where a node in the star cluster platform can effectively participate. In such a transaction, the funds are locked until the end of the staking period. According to the protocol, the staking condition must be between the maximum and the minimum timeframes for which any stake could be locked. The staking key is only used in the consensus process. Therefore, the loss of the staking key does not directly result in the loss of assets.

Smart Contracts: The solidity-based smart contracts are supported by star cluster through the Ethereum Virtual Machine (EVM). The platform is intended to ensure that smart contracts are enhanced by introducing :

- **Smart contracts with on-chain verification and execution of the chain**
- **Parallel execution of the smart contracts. In other words, smart contracts that do not run in the same state in the star cluster will be able to execute in parallel.**
- **A new language, Solidity, will support an improved type system, fixed-point arithmetic, and better execution.**

The attributes of the cluster node: Each node has a unique name in the cluster and represents a 160-bit rand160-biter, acquired the first time the node is started. The node uses the same ID forever until a hard reset is requested. The node's ID identifies each node across the whole cluster. A node can modify its IP address without changing the node ID. The node ID ensures that the node is consistent globally, and

every node has a specific set of information linked. Some information is constant, while other information, such as when the last time the node was pinged, is local concerning each node. Information such as node ID, IP, port of the node, a set of flags, the link-state, etc., is maintained by each node about the other node. The information can be retrieved through the cluster nodes command, which can be sent to any node in the cluster.

Cluster Topology: In a cluster of N nodes such as the Star Cluster, every node has N-1 outgoing and incoming connections. The link is refreshed every time the node fails to expect a pong reply to ping in the cluster bus. Nodes use a gossip protocol and an update mechanism; this prevents exchanging too many messages between nodes during the standard conditions. The Star Cluster nodes form a full mesh.

Node Handshake: The Star Cluster node always accepts actions on the cluster bus port and replies to the received pings. If the sending node is not a part of the cluster, the receiving node will discard the other packets. There are only two ways in which a node can accept another node which are :

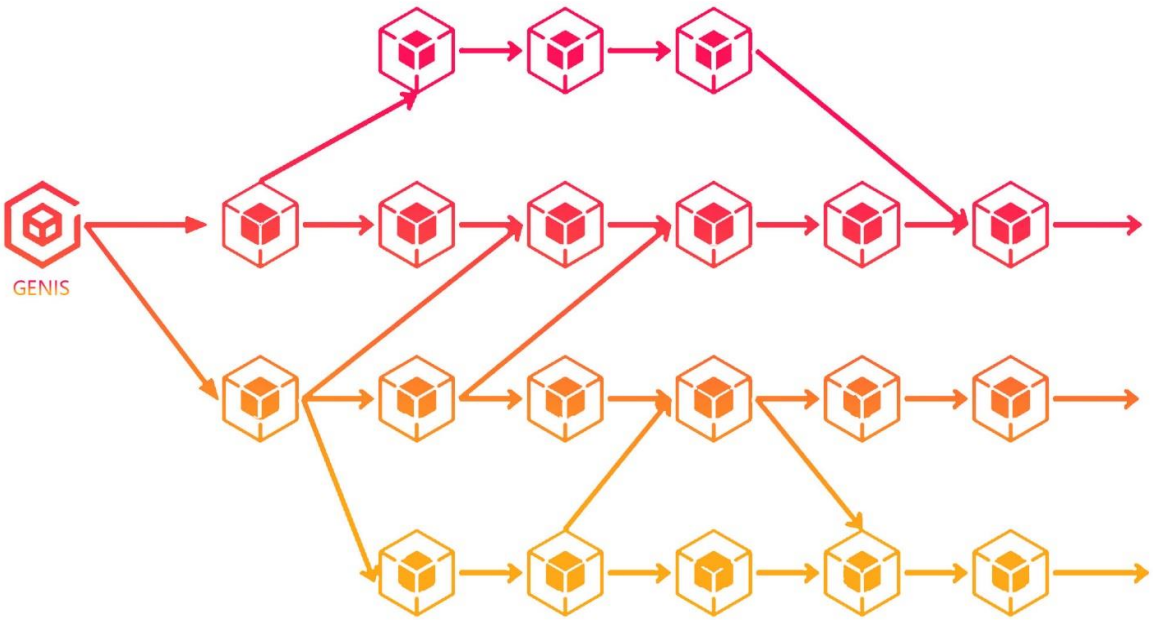
1. **Suppose the node identifies itself with a MEET message. This message links to a PING message but forces the receiver to accept the node as part of the cluster.**
2. **The node is already trusted and gossips about the other node. For instance, let there be three nodes, X, Y, and Z. If X knows Y, and Y knows Z, Y will send gossip messages to X about Z. When this event takes place, X**

The node handshake allows the cluster to automatically discover other nodes if there is a relationship of trust potentially forced by the system administrator. The handshake mechanism also prevents the mixing of the groups when the IP address is changed.

4. Sharding Protocol

Sharding protocols are database partitioning techniques used by companies, including that blockchain, to enhance scalability and effectively process more transactions per second.

The basic structure of the star cluster public chain adopts the hash partial order graph structure, which can process transactions on multiple nodes at the same time and can greatly improve the transaction throughput TPS; it can also support applications to be truly on the chain, as shown in the following figure:



The above figure shows that the entire star cluster system starts from the star cluster genesis block. All transactions and blocks are generated in strict chronological order and serially generate a hash partial order graph system. The advantages of this Hash POG are as follows:

1. **Strictly follow the evolution of distributed discrete event time series;**
2. **Reinforce the "sharded autonomy" parallel processing of blockchain;**
3. **Reinforce "inter-chip collaboration" and "inter-chip transfer" of blockchain.**

Since Hash POG naturally supports multi-block parallel accounting, compared with traditional blockchain technologies such as Bitcoin, it greatly improves the TPS of the system.

4.1 Sharding Protocol in Star Cluster

The state sharding is a design that attempts to provide scalability by assigning transactions to an independent network of validators. The sharding of the Star Cluster is made possible through the subnets. This is achieved through a developer that requires the support of Ethereum Virtual Machine (EVM) but wants to deploy the smart contracts in the private subnet; they can spin up a new subnet directly. In crypto platforms, sharding partitions several system resources to enhance performance and reduce load. In-network sharding mechanism, the set of participants is categorized into different subnetworks to reduce the burden of the algorithm. In the state sharding, the participants agree on maintaining a specific subpart of the global state. Thirdly, in transaction sharding, participants form an agreement to separate the processing of incoming transactions. Regarding the platform, the Star Cluster sharding is the first form of sharding that exists through the subnetworks. Subnets can exist entirely in parallel through sharding protocols, increasing transaction speed.

The Star Cluster, the client is given the authority to send queries to every node in the cluster, including replica nodes. The node analyzes the query, and if the question is found acceptable, the cluster will examine what node is responsible for the hash slot where the keys belong.

5. Decentralized Governance of the Star Cluster and $STCL Token

Decentralized governance is crucial for developing and adopting any crypto-related platform since Star Cluster faces updates and evolution. The platform ensures on-chain governance for the critical parameters of the network, where participants can vote on changes in the network. The decision to upgrade the web is based on the vote or decentralization. A process for discovering globally acceptable system parameter values is critical for decentralized systems without custodians. The platform uses its consensus mechanism to build a system that allows anyone to vote for transactions that they might be in. The participating nodes can issue the proposals in the system-wide polls.

The reward rate is an essential factor that affects any currency, whether flat or digital. The reward rate is directly subject to governance and within the set boundaries. This allows the token holders to choose whether $STCL is capped, uncapped, or deflationary.

The governance of the Star Cluster is structured predictably, and the changes to the parameters are highly dependent on the recent changes. Time and range are associated with each parameter. When a parameter is changed using a governance transaction, it is pretty challenging to change it immediately by a significantly large amount. This allows the system to change drastically in a shorter time frame, allowing the users to predict the system parameters in shorter periods, giving more robust control for the long term.

6. Web3 and Star Cluster

The primary feature of Web3 is decentralization and privacy. Decentralization in Web3 means users can not be quickly censored because the control in Web3 is decentralized. The power in Web3 is democratic, which means that users can control many aspects of the network. A member can only be edited if all of the distributed community feels a need for a member to be censored. Decentralization also means that the payment service can not be denied or restricted. Payments can be completed with little or no personal data and can not be annihilated because the prices are conducted on a peer-to-peer basis. The Web3 servers cannot crash as they comprise several computer functions worldwide.

The architecture of the Star Cluster is decentralized, which makes it perfect for Web3 and makes it immune to hacks, censorship, and other failures. The coordination of interlocking and the dependent chains is quite significant, dependent on the characteristic of Web3 to operate. Without decentralization, the ecosystem of Star Cluster can not scale up to massive 4,500 transactions per second.

Web3 is utilized by Star Cluster' s Dapps in ways that were impossible before in Web 1 and Web2. The Star Cluster Dapps can thrive autonomously using programmable logic through building intelligent contracts, saving development time, and ensuring a predictable system. Through this approach, the customers can benefit immensely through direct ownership as the decentralized system of Web3 does not require an intermediary to hold the user' s consent on their behalf. The Dapps can operate without any threat of censorship or a centralized body targeting a user.

Another way to efficiently use the nodes of Star Cluster in Web3 development is through Moralis. Moralis is the operating system for Web3 development, and through the Moralis' Speedy Nodes, one can get access to fast nodes from networks, including Star Cluster. The Speedy Nodes are fully integrated with the ecosystem of the Moralis, which allows for a more leisurely development of apps. The JavaScript project can be connected to the Star Cluster network, or the MetaMask network can be changed through Speedy Nodes to connect it to Star Cluster.

7. The Engine of Star Cluster

The consensus engine of the Star Cluster acts as a core part of the platform. The Engine features The gravity family of protocols, which combines the properties of consensus protocols with Nakamoto consensus. The gravity family of protocols achieves low latency and high throughput for the platform.

The Star Cluster protocols run through the repeated sampling of the network. Each node polls a constant-sized and randomly selected set of neighbors and switches its proposal if the majority is in support of another or different values. This mechanism in the engine can be explained through a solid example; the transaction is created by a user and sent to the node and is then multiplied out to other nodes in the network through gossiping. Every node opts for a small subset of nodes and queries to prevent conflicting transactions. Every other node repeats this procedure until the network comes to a consensus on one of the conflicted transactions.

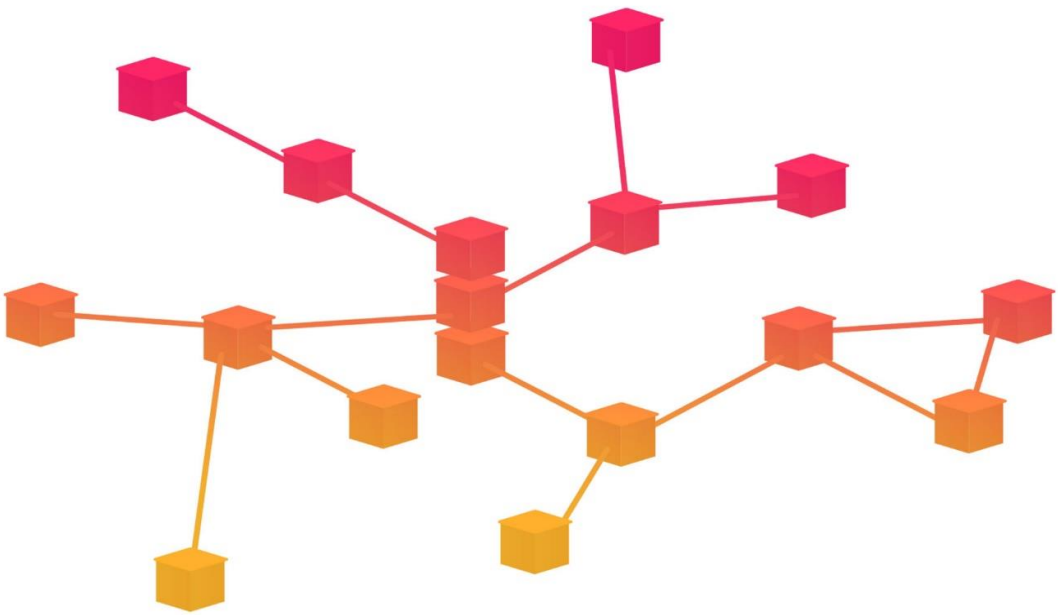
The consensus engine is open for all and permissionless. The latest blockchain projects employ classical consensus protocols, which require the knowledge of full membership. The Gravity protocols ensure high-security guarantees even when there are discrepancies between the network views of any two nodes. The validators of the Gravity protocols provide the ability to validate in the absence of the continuous knowledge of the entire membership.

The Gravity family of protocols is scalable and decentralized, which gives it the ability to scale without any tradeoffs. The Gravity protocols can scale millions of nodes without delegation to the subsets of validators. In all the proof-of-stake protocols, the mode of operation is to enable scaling by validating and delegating to a subcommittee. In Gravity protocols, these delegations are unnecessary, which allows every node operator to have a prominent stay in the system.

The Gravity protocols are adaptive, which allows the Star Cluster to achieve higher performance when the competitor or adversary is bigger also. The Gravity protocols do not require synchronicity to operate safely, preventing double-spending upon network partitions.

Another cardinal aspect of Gravity Protocols is low latency, enabling the blockchains to support business applications such as trading or daily retail payments. The finality of Gravity protocols is reached in less than or equal to a second, which is lower than longest-chain protocols and sharded blockchains.

Gravity protocols are known to prove a higher throughput. The Gravity protocols can build a linear chain and reach thousands of transactions per second. The new blockchain solutions that claim a higher transaction rate per second (TPS) typically choose more centralized and insecure consensus mechanisms. The enhanced performance results (10,000+) can be accomplished by assuming higher bandwidth provisioning for each node and the assigned hardware to verify the signature. The Layer-2 scaling solutions immensely increase the results.



8. Star cluster Block-Chain Operating System Structure

The blockchain of the star cluster system adopts a large-scale multi-layer chain structure (HGMBC) based on the unified star cluster public chain. The star cluster public chain adopts a hash partial order graph (hashPOG) chain structure, which contains and surpasses some single-chain structures. The public chain supports large-scale parallel transaction throughput Transaction Processing Capability (TPS) and supports massive industry applications to smoothly carry out various businesses on the chain with low cost, high efficiency, and improved credibility.

8.1 The basic structure of the application chain

The application blockchain in the star cluster system can adopt either a hash partial order graph chain structure or a conventional single-thread chain structure.

Figure: The conventional single-thread chain blockchain structure

The star cluster system delivers a mechanism for selecting the primary structure of the blockchain to create the application blockchain and writes it into the "genesis block " of the industry application blockchain. Once an application blockchain is made, the blockchain is designed according to a pre-selected basic structure.

The star cluster blockchain operating system endorses the development of various types of application chains which include:

1. **Application of public chain**
2. **Application consortium chain**
3. **Application private chain**

All initial customized features of star cluster are written into the genesis block of the star cluster, and the operation of star cluster strictly follows the Genesis block of the star cluster. The application chain contains a corresponding "configuration management sub-chain" by default.

All operation customization features and configuration data of the application chain are written into the "configuration management sub-chain" of the application chain and are managed and maintained by the designated nodes.

Since the consortium chain and private chain have relevant restrictions on the nodes participating in the consensus calculation, the star cluster blockchain operating system supports the dynamic management of the nodes participating in the consensus calculation. Through this approach, customized needs of applications in various industries.

At the same time, due to the possible limitations of consortium chains and private chains on permissioned nodes, the star cluster blockchain operating system also supports information homomorphic encryption of transactions and block content. The information homomorphic encryption ensures that only permissioned nodes can read relevant on-chain content.

The above functions do not require repeated development of the application alliance chain and application private chain. The functions only need to call the relevant functional mechanisms of the star cluster blockchain operating system, which greatly simplifies the chain creation, operation costs, and management of various customized application chain costs.

8.2 The composite multi-layer chain structure of star cluster ecology

The star cluster system integrates the existing side chain technology which is also known as sidechains. The integration is done so that the number of application chains (i.e. application chains and their sub-chains) can be integrated to realize the value flow between different application chains and the star cluster public chain.

star cluster system adopts a tree-like composite multi-layer chain architecture that unifies the star cluster public chain and parallelly runs multiple application chains. This forms a large tree-like multi-layer chain on the star cluster public chain as the main trunk and on the application chain as the branches. All application chains adopt the aforementioned multi-chain or single-chain structures.

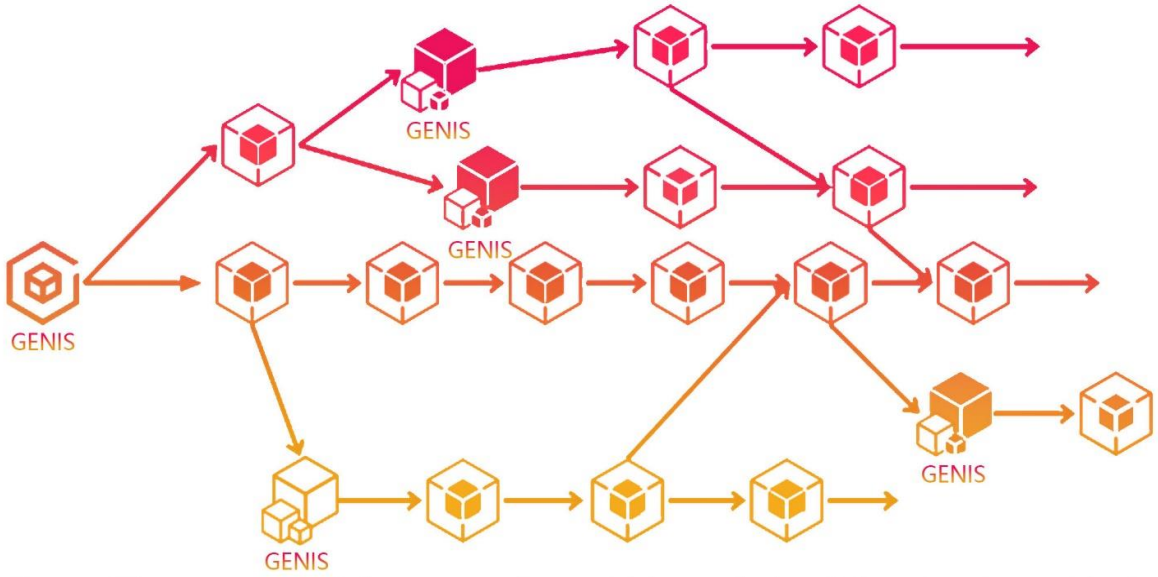


Figure: The structure of the composite multi-layer chain of the star cluster block-chain operating system.

The bottom layer of the star cluster system is the star cluster basic public chain, which is strictly defined by the genesis block of the star cluster public chain. As a result, the public accounting system of the overall star cluster system is established, that is, the entire accounting ecosystem is uniformly established and managed by the star cluster system.

9. The Consensus Mechanism of star cluster System

The consensus mechanism is the core of all blockchain systems, and its essential premise is decentralization. The number of computing power nodes is not fixed in the mechanism. The Proof of Work (PoW) consensus algorithm represented by Bitcoin uses the strength of computing power as the foundation for rewarding mining. It is challenging to cheat artificially, since the power consumption is massive, and the time for confirmation is lengthy. Due to the mining pool calculation, the gradual concentration of power makes the initial decentralization develop into a centralized reality. The proof-of-stake mechanism (PoS) defined by Diandiancoin and Ethereum, and the authorized proof-of-stake mechanism (DPoS) represented by BitShares immensely decrease energy consumption and reduce the confirmation time. Through the existence of supernodes, the consensus mechanism has the potential to become centralized.

The blockchain of the star cluster system embraces the decentralized random multi-stage workload consensus mechanism which includes two parts; The respective names of the two parts are "decentralized random consensus computing power election framework" and "multi-stage workload proof algorithm."

9.1 Decentralized random consensus computing power election framework

The public chain of the star cluster system embraces a decentralized random multi-stage workload consensus mechanism, and its primary core is the election of candidate consensus computing power.

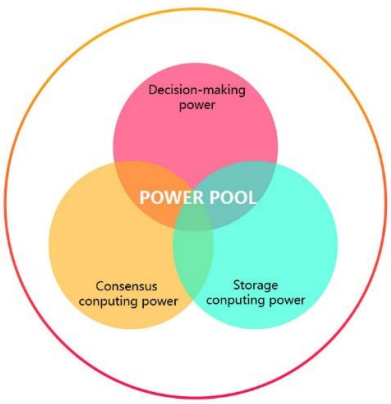


Figure: Decentralized random consensus computing power election framework

The figure above shows that all the computing power nodes join the virtual center of the "Hashpower Market" (i.e., distributed mining pool). The "alternative computing power pool" is spontaneously generated and screened. The computing power nodes of the "alternative computing power pool" spontaneously generate an "election decision-making group" at regular intervals. Then the "election decision-making group" regularly elects a "consensus computing power group." The "supervision computing power group" then processes a large number of transactions in the star cluster system and hands them over to the designated "consensus computing power group" for consensus calculation, that is, mining accounting, and the "supervising computing power group" is responsible for supervising and verifying."

$$Cki = Ek * Cki - 1 + \Delta Cki$$

$$\Delta Cki = w1 * Ski + w2 * Dki + w3 * Vki + w4 * Tki - w5 * Aki$$

Among them, ΔCki is the credit increment value in ΔCki. This cycle comprises the weighted sum of supervision workload S, consensus calculation workload D, election workload V, continuous online time T, and system incentive A.

Once any computing power node cheats or violates the rules, Ek will be zero, and so the "credit value " of Cki will also be consequently zero. The computing power node is reduced according to regulations until it has no credit, and the computing power node without credit can no longer participate in any consensus calculation.

9.2 Multi-stage Proof of Work Consensus Computing Algorithm

The public chain of the star cluster system adopts the decentralized random multi-stage workload consensus mechanism, and its second core is the specific consensus algorithm. The multi-stage workload proof consensus calculation algorithm

is adopted in the star cluster system.

The classic Proof of Work (PoW) consensus algorithm utilizes the full strength of computing power as the incentive basis for mining. It has been recognized as the most credible since the advent of Bitcoin and various other blockchain systems. However, its immense waste of power consumption is also indisputable, causing people to worry about its unsustainability.

The proof-of-work (PoW) consensus algorithm essentially solves the blockchain's immutable (or complex) tampering problem. The star cluster blockchain inherits the advantages of the classic proof-of-work (PoW) consensus algorithm and minimizes the weaknesses of the PoW algorithm. This causes the consensus calculation to be reasonable and steadfast.

The PoW algorithm requires a one-time Hash value that meets the requirements in about ten minutes. The Hash value will be used for a long time for future purposes. It is challenging to be found and tampered with by another computing power node "collision," so the current winning computing power node must have enough computing power.

The consensus algorithm of the star cluster system is the star cluster Protocol. The "star cluster" refers to the world of star cluster blockchain; all machines, nodes, and participants are a grain of star, equal and indistinguishable. The "cluster" refers to a whole and strictly follows the laws of gravity. Time is the only yardstick in the abstract world.

9.3 Mass transaction throughput and technical guarantee for security

The star cluster system can support second-level transaction response time and large-scale transaction throughput simultaneously.

The specific technical guarantees are as follows:

1. The event-driven account can be serialized to ensure the legality of transactions and avoid the double-spending problem.
2. All transactions and blocks strictly follow the time series evolution of distributed discrete events.
3. Blockchain "shared autonomy" and star cluster 's decentralized random consensus computing power election mechanism can ensure parallel processing of large-scale transactions in shards.
4. For a single account, star cluster randomly provides a limited number of consensus computing power nodes, a consensus algorithm for proof-of-work in the initial stage, and an event-driven transaction mode.
5. The multi-stage workload proof consensus calculation algorithm of star cluster, through multiple cycles of consensus calculation, greatly improves the immutability of the blockchain ledger and immensely reduces the overall calculation cost of public ledger accounting.

10. Decentralized Storage Technology of star cluster System

Decentralized storage technology is discussed in this section

10.1 Decentralized Borderless Storage Computing Network Platform

The star cluster builds a P2P transparent storage computing network based on distributed hash mapping within the complete Internet network. This storage network does not depend on any storage node and allows any storage nodes to dynamically join and exit, thus constructing a transparent storage computing network EMSC that can store massive data.

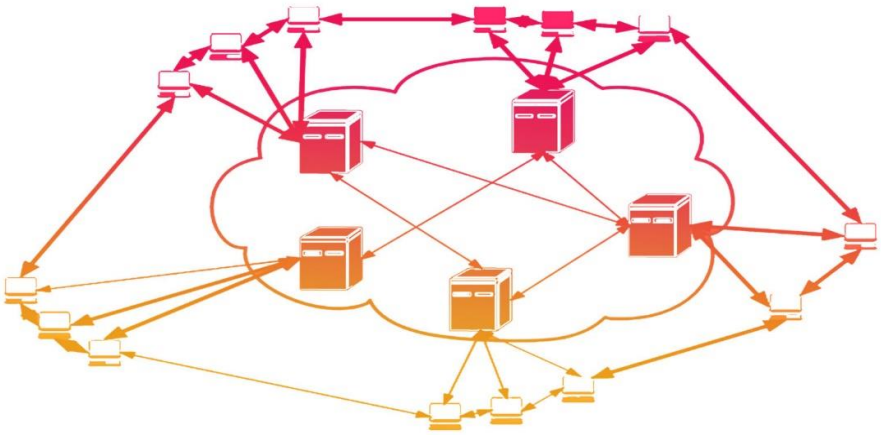


Figure: P2P Transparent Storage Computing Network EMSC

The figure illustrates that the theoretical computing model is used to establish unlimited storage space based on global computing power distribution. A computing power mechanism is introduced to make both storage and computing an essential condition for autonomous nodes to obtain incentives.

Galaxy Storage Computing Network EMSC supports the decentralized storage of blockchain transaction data. It supports the decentralized storage of digital application assets to realize the on-chain operation of application data in all walks of life.

11. On-chain application examples

The digital asset copyright trading platform based on the star cluster system will have the following features :

1. **Self-regulation immensely reduces the management cost of copyright protection.**
2. **It is easy to track and has stronger operability.**
3. **Decentralization and high security.**
4. **Strong scalability.**
5. **Effectively support self- media creation.**
6. **Greatly simplifies blockchain operations and on-chain application development.**

12. The Uses of the star cluster platform

The platform primarily has three uses: payments, staking, and atomic swaps.

Payments: Peer-to-peer payments are pretty central to the blockchain industry. The star cluster is an easy-to-use platform that supports payments using Visa, allowing thousands of transactions to occur globally in a decentralized manner.

Staking: On the star cluster platform, the Sybil control is acquired via staking. For validation, the participant needs to lock-up coins or be involved in the process of staking. Stakers are also referred to as validators, which are compensated for their validation services based on the during and amount of staking.

Atomic Swaps: The star cluster platform features atomic swaps; the STCL token serves as the universal exchange unit. The platform supports trustless atomic swaps, enabling native and decentralized businesses of any type of asset on star cluster.

13. The Challenges of the star cluster Platform

Post-quantum cryptography has gained popularity due to the advancements in the development of quantum computers and algorithms. The problem with quantum computers is that they can break some of the currently deployed cryptographic protocols, specifically regarding digital signatures. The star cluster network models provide access to any number of Virtual Machines to support a quantum-resistant virtual machine with the appropriate digital signature mechanism. The consensus mechanism does not expect heavy crypto for its principal operations.

The adversary in the platform has complete access to the state of every single correct node all the time and knows the random choices of all right nodes. Furthermore, the adversary can update its form at any given time, before and after the node has the chance to correct it. The mentioned powers of the adversary are theoretical since, in reality, the most potent adversary may be limited to a statistical approximation of the state of the network.

Another problem with permissionless platforms is the economic disparity, and the rich keep on getting richer. The system of the star cluster is designed in a way that allows the disproportionate distribution of wealth. The platform embraces an egalitarian distribution of minting where every participant involved in the gravity protocol is awarded proportionally based on stake. An instance is leader-based consensus protocols, where the assigned leader collects all the rewards during the operation. The minimum amount that is required to participate in the protocol is determined in the governance. This also refers to how the delegation is not necessary to join with a small allocation.

14. The cross-chain bridge of star cluster

A blockchain or crypto bridge, sometimes known as a cross-chain bridge, connects the two blockchains and allows the users/client to send cryptocurrency from one blockchain to another. In other words, if you have two different cryptocurrencies, you can take the help of the bridge to perform transactions. The challenges in the crypto industry include that block chain' s unable to work and complete transactions together. Each blockchain is limited by its obstacles relating to its domain. This can then lead to higher transaction costs and congestion. The cross-chain bridge solves these problems by enabling the feature of token transfer, data exchange, and smart contracts. Blockchains mint various crypto coins and run on different rules and regulations. The bridge plays the role of a common region where users can switch from one blockchain to another. The cross-chain is a breakthrough in the crypto industry as it allows for transactions between different blockchains.

The Space Bridge (SB) can be utilized to transfer ERC20 tokens from Ethereum to star cluster Chain. The MetaMask wallet is needed to interact with the STCL bridge to perform this action. STCL is required to pay for the transaction fees on the star cluster. STCL can be used from the airdrop to swap for more STCL on AMM to pay transaction fees. The STCL airdrop is only available when more than ten dollars is bridged. If the individual runs out of STCL, you will not be able to complete the transactions on the star cluster.

Firstly, one needs to visit the website of SB and ensure that the wallet is connected with the Ethereum Network. Once the wallet is connected correctly, you can continue choosing what asset and the amount you want to bridge. Once the transaction is approved, the process of bridging will now be complete. The assets will be ready to use freely on the star cluster platform.

15. Optimizing the star cluster Platform

Pruning: The blockchain platforms, such as those implementing the Nakamoto consensus, suffer from steady-state growth. This is because, by protocol, they have to store a complete history of transactions. For the blockchain to grow efficiently, it must be able to cut back on its old history. This is critically important for blockchains that support enhanced performance, such as star cluster. In the Gravity family of protocols, the act of pruning is quite simple. The nodes do not need to prove any history to the new bootstrapping nodes, and they merely have to store the active state.

Client Types star cluster: The star cluster can support three types of clients: light, complete, and archival. The star cluster supports light clients who merely need to interact safely with the network by using fewer sources; these clients prove that some transaction hash been completed without downloading or synchronizing the history. The archival nodes store the history of the $STCL subnet to genesis, which directs that these nodes serve as bootstrapping nodes for incoming nodes. These nodes can keep the entire record of the other subnets for which they opt to be validators. The archival nodes are machines with increased storage capabilities paid for by other nodes when the old state is downloaded. The full nodes only participate in the validation process, and they simply store the active state instead of keeping all history. The lightweight clients are known to engage in the repeated sampling phase of the protocol to ensure safe commitment and network-wide consensus. In other words, the lightweight clients in star cluster provide similar guarantees of safety as full nodes.

Sharding: Sharding is another process that optimizes partitioning the various system resources to increase performance and reduce load. In-state sharding, the

participants agree on storing to maintain only the subparts of the entire global state. In-network sharding, the set of participants is divided into separate subnetworks to reduce the burden relating to algorithms. The last type of sharding is transaction sharding, in which the participants decide to separate the processing of incoming transactions.

16. Conclusion

The paper discusses and evaluates the architecture of the Star Cluster. Compared to the other platforms, which run classical-style consensus protocols are non-scalable. The platforms that use Nakamoto-style consensus are inefficient and pose high operation costs. Therefore, Star Cluster is fast, scalable, and provides utmost security considering the different platforms. The powerful consensus engines allow Star Cluster to manage decentralized governance and instance blockchain transactions properly. The $STCL, or the native token, secures the network and pays for additional infrastructure costs. The $STCL has the potential beyond other platforms to achieve the optimum levels of decentralization, especially in the era of Web3.

Furthermore, the platform is deemed credible as it is democratic or listens to its participants. Each participant in the protocol has a distinctive voice that helps influence the evolution of the protocol. Furthermore, the STCL cross-chain bridge is vital in exchanging crypto-assets from one blockchain to another. The bridge can be used to transfer ERC 20 tokens from Ethereum to Star Cluster Chain and vice versa. Therefore, this yet again constitutes a distinctive feature of the Star Cluster platform.

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