Green Earth Action Blockchain

White Paper

Contents

1. Abstract

Green Earth Action (GEA) Chain is a modular blockchain open-source software developed to drive global environmental conservation efforts. It operates on a dual consensus mechanism combining Proof of Authority (PoA) and Proof of Stake (PoS) and establishes a peer-to-peer (P2P) network on top of it. It also includes the construction of a P2P network based on this modular blockchain framework.

2. Introduction

Our Earth, from its primordial state as a chaotic planet, has evolved over billions of years into a beautiful green world. Everything nurtured on Earth is a gift of nature, rendering it vibrant with life. However, our beautiful planetary home is now facing catastrophic blows. Depletion of energy resources and the worsening environment pose an unprecedented crisis to human survival. Confronted with such a daunting situation, the Green Entrepreneurship Global Foundation launched the Green Entrepreneurship Chain (GEC) on February 17, 2017. They established a mechanism for free participation, enhancing its accessibility, enabling more individuals to focus on and engage in the protection and development of the global ecological environment. Through the gradual demonstration of value via GEC, participants involved in its construction gain increased profits, thereby better propelling the global environmental conservation efforts.

On April 29, 2018, to significantly drive the advancement of global environmental conservation efforts and rally more individuals to raise awareness about environmental protection, taking action for our shared planetary home essential to our survival, the Green Entrepreneurship Global Foundation initiated the worldwide environmental campaign "Green Earth Action." Furthermore, they designated April 29th of each year as "Green Earth Action" Day.

With the progression of technology and the gradual maturation of blockchain technology, the main chain of GEC has undergone numerous upgrades and technological enhancements. On January 7, 2024, its underlying technology was officially updated to a modular architecture employing a dual consensus mechanism of Proof of Authority (PoA) and Proof of Stake (PoS). To emphasize our environmental conservation principles and better influence people in enhancing their environmental consciousness, we officially renamed it as the Green Earth Action Chain - GEA Chain.

3. Technical Overview

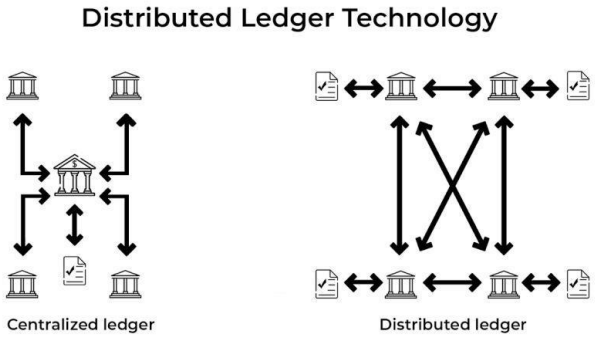
In today's digital era, technology is undergoing unprecedented transformations, and at the heart of this revolution lies blockchain technology. Among numerous blockchain projects, GEA Chain has emerged as an industry focal point, leveraging its innovative modular underlying technology incorporating the POA+POS dual consensus mechanism. This technology challenges traditional blockchain paradigms and pioneers the exploration of future directions in technological development.

The core technological advantages of GEA Chain lie in its unique architecture and advanced functionalities. These strengths set it apart in terms of high efficiency, low costs, reinforced security, and privacy protection. Simultaneously, its modular underlying technology employing the POA+POS dual consensus mechanism and decentralized characteristics are propelling the technology industry towards heightened efficiency and transparency.

As technology continues to mature and its applications become more widespread, GEA Chain is shaping the future of technology. It will yield a profound impact on global technological development and environmental conservation efforts.

The main technical aspects of GEA Chain encompass the following:

A. Distributed Ledger



Distributed ledger is a technology for recording and storing data. It achieves this by sharing and synchronizing data across multiple computers or nodes, eliminating centralized data storage and control points. Key features include:

a. Decentralization: Data is stored across multiple nodes in the network rather than being centralized on a single entity or server. Each node maintains a complete copy of the ledger.

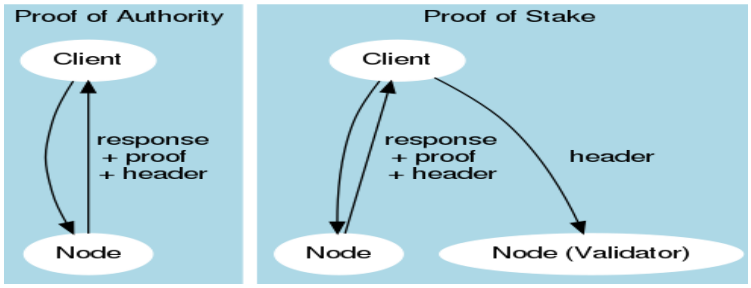
b. Decentralized Control: There is no central authority to control or manage the ledger. Each node has equal authority and achieves consensus through a consensus mechanism.

c. Transparency: Distributed ledgers are typically transparent, meaning every participant in the network can view and verify all transaction records. This enhances the credibility of the ledger.

d. Security: Due to data being distributed across multiple nodes, attackers would need to breach multiple nodes simultaneously to manipulate ledger data, enhancing system security.

e. Immutability: Once data is added to the ledger, it's usually impossible to alter or delete. This ensures the immutability of the ledger's historical records.

B. POA+POS Dual Consensus Mechanism



a. Proof of Authority (POA) is a reputation-based consensus algorithm that introduces a practical and effective solution for blockchain networks. The POA consensus algorithm leverages identity value, implying that those chosen as block validators rely not on staked digital currencies but on individual reputation. Therefore, the Proof of Authority blockchain is secured by trusted entity-validated nodes.

The POA model relies on a limited number of block validators, rendering it a highly scalable system. Blocks and transactions are validated by pre-approved participants who act as administrators of the system.

b. Proof of Stake (POS) is a consensus algorithm where validators are chosen at random to produce and approve blocks. Validators stake native network tokens by locking them within the blockchain. Validators receive rewards based on their total staked stake, incentivizing node validation within the network. Compared to the energy-intensive nature of Proof of Work (POW) consensus, as seen in Bitcoin, the POS consensus mechanism is more environmentally friendly and scalable.

In the Proof of Stake (POS) consensus mechanism, selected validators produce the next block based on their staked token amounts. Although random functions are typically designed to prevent consensus races, validators with larger stakes do indeed have a higher probability of generating the next block. Blocks are initially submitted by some validators and then broadcasted to others, verified by these validators, and upon validation, the approved block gets added to the blockchain.

The POS consensus mechanism incorporates multiple attractive elements in its design. Worth noting is that due to the incentive structure being economically driven, distributing native tokens as rewards allows POS to circumvent the lottery-like computational process in Proof of Work (POW). This design significantly enhances the performance and security of the blockchain network.

Moreover, in a blockchain network utilizing the POS consensus mechanism, cryptocurrency holders who prefer not to personally act as validators can still earn rewards by participating in the network ecosystem.

Leveraging the characteristics of distributed ledgers mentioned above, GEA Chain adopts the POA+POS dual consensus mechanism to securely persist users' transaction information. Simultaneously, it synchronizes and updates the latest states of various accounts, effectively safeguarding user privacy. This approach enables the blockchain network to operate more efficiently and possess better scalability.

C. Modular Architecture

GEA Chain employs a modular blockchain underlying architecture, enabling the network to adapt flexibly to various applications and demands. By decomposing network functionalities (such as transaction processing, data storage, and security measures) into different modules, it enhances the overall system's efficiency and scalability.

a. High Efficiency and Low Costs:

Through the network design based on modular architecture, GEA Chain exhibits significant advantages in speeding up transactions and reducing processing costs. This is particularly crucial for applications dealing with numerous small-value transactions (such as micropayments and smart contracts).

b. Reinforced Security and Privacy Protection:

GEA Chain prioritizes personal data protection and privacy security. By employing advanced encryption techniques and privacy measures, GEA Chain better ensures the security of user data, minimizing the risks of data leaks and misuse.

c. Scalability and Sustainability:

The modular design of GEA Chain is geared towards long-term scalability and sustainability. As the network grows and user demands evolve, GEA Chain can adapt to these changes, ensuring the stability and endurance of the network.

D. Block Structure

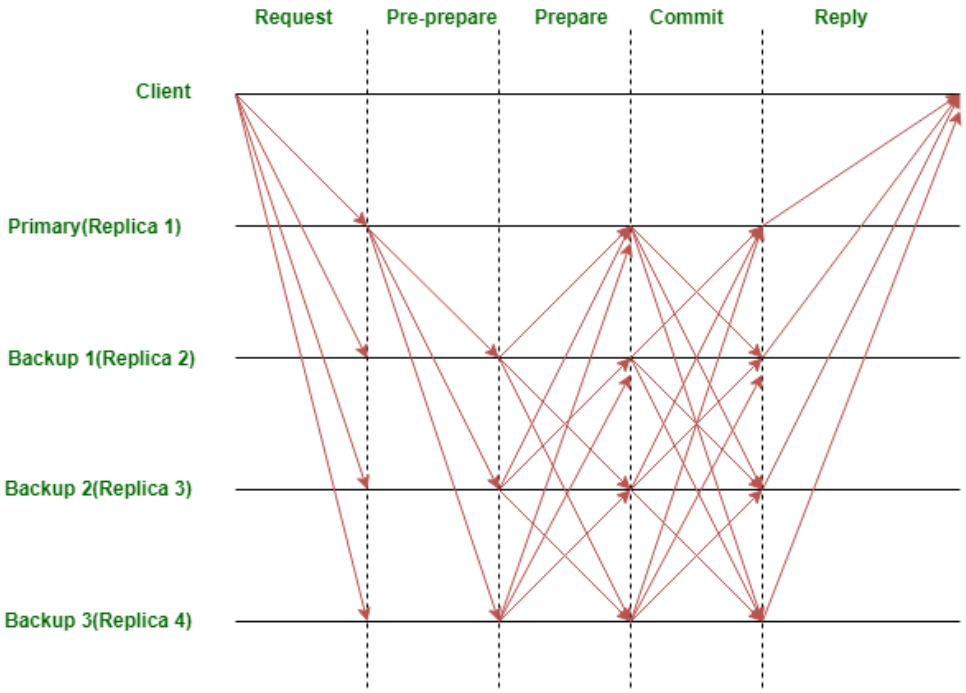
GEA Chain is a modular blockchain ecosystem employing the POA+POS dual consensus mechanism, and its block organization involves design and components across multiple levels. Below is a detailed overview of the general structure of GEA blocks:

a. Consensus Layer/Consensus Mechanism:

GEA Chain operates on the POA+POS dual consensus mechanism, utilizing the Tendermint consensus algorithm to ensure consensus among all participants regarding the state of blocks. Tendermint is a Byzantine fault-tolerant consensus algorithm that involves a set of validators taking turns proposing and confirming blocks, ensuring consensus across all nodes in the network regarding the order of blocks.

The main consensus characteristics of GEA Chain are as follows:

ⅰ. Byzantine Fault Tolerance (BFT):



GEA Chain employs a Byzantine Fault Tolerance (BFT) consensus algorithm, designed to tolerate a specific number of Byzantine faults, including malicious or malfunctioning nodes—malicious nodes or nodes exhibiting abnormal behavior due to network faults. This ensures the system's consistency and security even in the presence of a defined number of node faults.

ⅱ. Consensus Process:

The consensus process, termed 'Voting,' involves nodes casting votes on proposed blocks through pre-vote and pre-commit stages. Upon the generation of each block, nodes in the network vote on the proposed block. Nodes express their stance on the block through two stages: pre-vote and pre-commit. Once a consensus is reached among more than two-thirds of the nodes, the block is finalized and added to the blockchain.

ⅲ. Rounds and Heights:

Consensus is structured in rounds, each consisting of a proposal phase followed by a voting phase, and 'Heights' denote different states of the blockchain. Heights identify different blockchain states within the consensus, with each height corresponding to a specific block.

ⅳ. Finality:

Leveraging Tendermint to provide fast finality, GEA Chain achieves immediate confirmation without generating forks. Once consensus is reached by over two-thirds of the nodes, a block is deemed final and cannot be rolled back. This enhances system security and determinism.

ⅴ. Core Components:

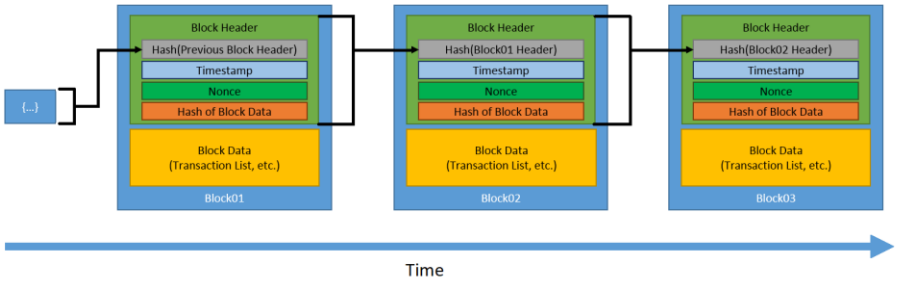
The foundational core components include the consensus engine, P2P network layer, and application layer. The consensus engine manages the consensus process between nodes, the P2P network layer facilitates communication between nodes, and the application layer encompasses blockchain applications handling specific business logic.

GEA Chain aims to provide a high-performance, secure, and reliable consensus algorithm. Leveraging Tendermint allows for the convenient implementation of these functionalities, making it applicable for constructing various distributed applications and blockchain systems.

b. ABCIs (Application Blockchain Interface):

ABCIs are a unique interface developed by Cosmos, and the blockchain within GEA Chain utilizes ABCIs to communicate with the Tendermint core. This defines the communication rules between GEA Chain (or other Cosmos blockchains) and their application layers. As a result, GEA Chain can not only support multiple independent Cosmos-based blockchains but also our specific partitions, each having its own application logic.

c. Block Header:



The block header is metadata for a block, containing vital information about the block. The block header in GEA Chain includes the following details:

ⅰ. Block Height: The position of the block within the entire blockchain, represented as an incrementing integer.

ⅱ. Previous Block Hash: The hash value of the previous block, linking the current block to the preceding one, forming a chain-like structure.

ⅲ. Merkle Root Hash: The hash tree root of transaction data, enabling rapid verification of all transactions contained within the block.

ⅳ. Timestamp: The block's timestamp marks the time at which the block was created. GEA Chain uses Coordinated Universal Time (UTC) to ensure the correct chronological order of blocks. The timestamp is crucial for maintaining blockchain consistency and accurate historical records.

ⅴ. Consensus Information: Identifies the consensus algorithm and related information used to create the block.

ⅵ. Validation Information: Identifies the information used to validate the block, such as signatures.

d. Transactions Set:

Blocks contain a series of transactions defined by the application layer. These transactions represent operations that change the state on the blockchain. Each transaction might involve the transfer of digital assets between senders and receivers, execution of smart contracts, and more. Transaction data is where actual value transfers and computations occur on the blockchain.

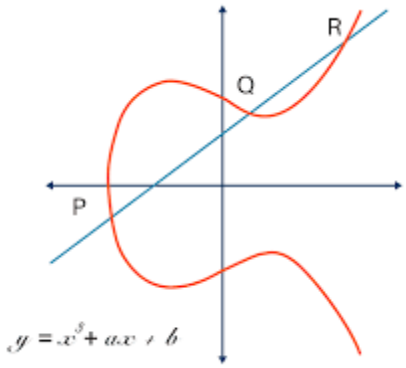
e. State Machine:

The state machine in GEA Chain is used to record and manage the blockchain's state. Each module has its own state, and the state machine is responsible for maintaining these state changes. The execution of transactions impacts the state machine's status.

E. Encryption Technology

The blockchain implemented in GEA Chain utilizes various encryption algorithms to ensure security, privacy, and data integrity. The key encryption algorithms employed mainly include:

a. Elliptic Curve Cryptography (ECC)



Elliptic Curve Cryptography (ECC) is a form of asymmetric encryption, utilizing mathematical structures defined by the equation y^2 = x^3 + ax + b, where a and b are curve parameters. On an elliptic curve, adding a point P to itself yields another point Q, termed point addition. This property makes ECC a robust cryptographic tool. Operations on elliptic curves often occur within a finite field, i.e., modulo a prime number. This aids in ensuring computational control and finiteness. ECC employs a key pair, where one is a private key (used for signing and decryption), and the other is a public key (used for verifying signatures and encryption). This key pair is generated through points on the elliptic curve. ECC allows for signing messages using the private key and validating the signature's authenticity using the

corresponding public key. Additionally, ECC can be utilized for implementing key exchange protocols, such as the Diffie-Hellman key exchange. Hence, within GEA Chain, ECC primarily serves for key pair generation, signing, and signature verification purposes.

b. Hash Functions

Hash functions in GEA Chain are algorithms mapping input data to a fixed-length hash value, featuring characteristics such as fixed output length, quick computation, discreteness, collision resistance, and irreversibility, also known as a hash code. This process is one-way, meaning it's difficult to derive the original input data from the hash value. The hash functions used in GEA Chain possess the following critical characteristics:

ⅰ. Fixed Output Length:

The hash values generated by the hash function have a fixed length, regardless of the length of the input data.

ⅱ. Quick Computation:

For a given input, a hash function should be able to compute the hash value within a reasonable timeframe.

ⅲ. Discreteness:

Even with minor changes in input data, the hash value should substantially differ, ensuring uniqueness.

ⅳ. Collision Resistance:

Collisions occur when two different inputs produce the same hash value. A good hash function should strive to minimize collisions, ensuring that even slight input variations don't result in the same hash value.

ⅴ. Irreversibility:

Deriving the original input data from the hash value should be challenging and ideally infeasible.

Some common hash functions include SHA-256, MD5, SHA-3, among others. In cryptography, more secure hash algorithms are typically chosen to withstand various attacks. For instance, SHA-256 is widely used in Bitcoin and blockchain domains, similarly adopted in GEA Chain for its robust security as the current most secure SHA-256 hash function algorithm.

4. Architecture and Components

The components of GEA Chain primarily comprise:

A. Nodes

Within GEA Chain, there are several types of nodes:

a. Full Nodes: Managed by the foundation, these nodes house the complete blockchain data, allowing for querying of all data on the chain.

b. Zone Nodes: All zone nodes can be perceived as validation nodes. They require approval through user voting within the zone and undergo foundation scrutiny before their creation, participating in the POS consensus.

B. Network

As mentioned earlier, GEA Chain's consensus utilizes Tendermint, a consensus widely used in various other blockchains. Therefore, the primary modes of communication among nodes within the distributed system are:

a. Prevote and Precommit Messages: At the core of the algorithm lies the consensus achieved through prevote and precommit messages among nodes. During each consensus round, nodes produce messages with their initial approval of a proposal and disseminate them throughout the network. Prevote messages signify a node's initial endorsement of the proposal.

b. Block Proposal Messages: Within each consensus round, a node within the network is selected as a proposer responsible for suggesting the next block candidate. This node generates a block proposal message containing the candidate block and broadcasts it across the network. Upon receipt, other nodes can assess the proposal's validity.

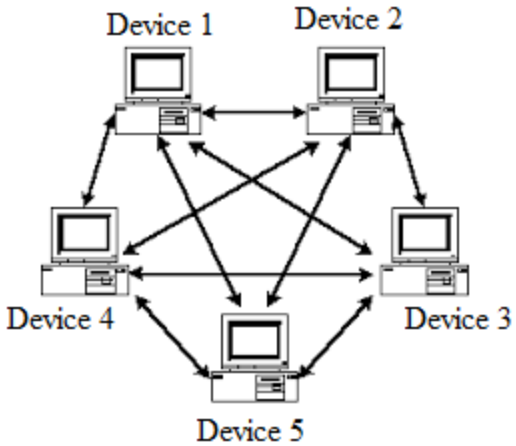
c. Commit Messages: When nodes receive a sufficient number of prevote and precommit messages, signifying consensus on a block, they generate messages confirming the final commitment to that

block. Commit messages represent a node's final agreement on the block, and consensus is reached once a sufficient number of these messages are broadcast.

d. Gossip Protocol: The network employs the Gossip Protocol to disseminate consensus messages among nodes. This protocol incrementally aligns the network towards consensus on the forthcoming block through successive message exchanges among nodes.

e. Peer-to-Peer Communication: Nodes engage in direct communication through peer-to-peer communication protocols. Nodes form peer connections for the exchange of consensus messages and block data.

The transmission and handling of these messages enable GEA Chain nodes to achieve consensus within a distributed environment. Throughout the consensus process, asynchronous information exchange among nodes permits consensus while upholding security within the network.



Peer-to-Peer Communication

5. Economic Model

A. Zone

Zone within GEA Chain is a distinct feature, functioning as an independent validation node or even as a separate chain. Users can access specific zones based on their identities to undergo KYC authentication, staking, and other operations to earn corresponding rewards. Zones are managed by designated zone administrators.

Creating a Zone: Zone administrators can create corresponding zones and oversee their management. During the creation process, parameters such as the maximum and minimum staking amounts for users and the total staked amount within the zone are set.

B. KYC Authentication

Drawing from real-world practices, GEA Chain enables users to register a KYC identity on the blockchain, with rewards for successful registration. Successful registration rewards users with a token, enabling them to stake and earn staking rewards. Users without registered KYC credentials will not receive this reward or be able to participate in staking. During the KYC authentication process, users' real identities are automatically verified based on their respective national zones. If the zone doesn't exist yet, users enter a public zone and can later migrate to the appropriate zone once it's established.

C. Tokens

The GEA Chain network adopts a dual-token model, using Authority Node Stake (ANS) value, Green Earth Action (GEA) as the primary circulating token, and Green Authority Governance (GAG) as the governance token.

a. The network's total ANS value is 20 million; the circulating GEA token supply is 8 billion, and the GAG governance token supply is 3.2 trillion. ANS stake values are distributed among global regions based on population ratios, and each region stakes based on ANS values to earn block rewards.

b. The total ANS stake value is generated during the network's genesis.

c. The minimum amount for GEA and GAG tokens is eight decimal places (0.00000001).

d. Upon KYC verification activation within each region, the KYC user's address receives 1 GEA and automatically stakes 0.0025 ANS, resulting in perpetual on-chain block rewards for that KYC user's address. However, this 1 GEA cannot be redeemed or traded.

e. GEA serves as the circulating token, generated through on-chain block rewards. It can be staked to earn GEA and GAG rewards. Upon receiving GAG rewards after staking GEA, users can use GAG to exchange within the vault of the region where the KYC user resides, at a conversion ratio of 40,000:1.

f. GAG is the governance token acquired through GEA token staking within the region for community governance and rewards. It's temporarily non-transferrable between users and requires a network-wide vote to enable transferability;

In summary, the GEA circulating token serves as the native cryptographic token of the GEA Chain, acting as the "lifeblood" of the entire ecosystem. It serves multiple purposes: as the native token, it ensures the overall network security, provides a unit of account and medium of exchange for local resources and third-party applications. In the long term, its goal is to become a value storage mechanism for various applications like individual users, smart contracts, and decentralized finance (DeFi) applications. Each role has distinct objectives:

a.Users expect secure assets and data;

b.Developers wish for broader application usage and sustainable revenue streams;

c.Validation nodes aim for higher income through providing validation services;

d.Token holders hope for long-term value retention of their tokens;

D. Mining/Consensus

a. Mining:

Post-genesis, validation nodes commence block mining to bolster network security and dispense rewards in GEA and GAG.

The network utilizes Gas Fees, calculated at one ten-thousandth of each transaction amount plus network overhead. If the transaction's one ten-thousandth is less than 0.002, it's set at 0.002. If the precision of network fees falls below 0.00000001, it's rounded up to the nearest multiple of 0.00000001.

Network fees generated by non-KYC addresses will be entirely allocated to the primary treasury and distributed by administrators. For KYC addresses, 90% of the network fees will go to the regional treasury, while the remaining 10% will enter the global primary treasury, also administered accordingly. This incentivizes and ensures the network's sustainable development.

The total GEA supply across the network is 8,000,000,000.00 (8 billion), and the total GAG supply is 3,200,000,000,000.00 (32 trillion). Approximately every five years (365×5=1825 days), the production output will halve. The initial time for this reduction follows the genesis time of the GEA Chain, starting from February 17, 2017, 00:00:00(UTC) , marking the first five years (365×5=1825 days) until the GEA Chain's genesis time on January 6, 2024, 12:00:00. It's expected to produce 4,755,617,196.6388 GEA and 1,902,246,878,655.52 GAG. GEC from the original GEC Chain will convert 1:1 to GEA. The remaining GEA and GAG will be allocated to the primary treasury for management by the foundation. KYC users across the network will oversee this, and upon a region's activation, a proportional allocation of remaining GEA and GAG will be distributed to the regional treasury for region development and on-chain rewards.

Starting from January 6, 2024, 12:00:00, the GEA Chain's genesis, the average time taken to generate one block will be approximately 5 seconds. Every 365 days, validation nodes will create approximately 31,536,000 seconds / 5 seconds = approximately 6,307,200 blocks.

For example, the production calculation formula is (rounded up to four decimal places):

First 5-year cycle (365×5=1825 days) from (UTC) February 17, 2017, 00:00:00 to February 15, 2022 23:59:25:

Mining: Approximately 4,000,000,123.3256 GEA, approximately 1,600,000,049,330.24 GAG.

Second 5-year cycle (365×5=1825 days) from (UTC) February 15, 2022, to January 6, 2024, 12:00:00:

Mining: Approximately 755,617,073.3132 GEA, approximately 302,246,829,325.28 GAG.

From January 6, 2024 to February 14, 2027 (blocks 1 to 19621424): Mining: Approximately 1,244,382,861.5104 GEA, approximately 497,753,144,604.16 GAG. Each block yields approximately 63.4196 GEA and approximately 25,367.84 GAG.

Third 5-year cycle (365×5=1825 days) from (UTC) February 14, 2027, to February 13, 2032 23:57:55 (blocks 19621425 to 51157415):

Mining: Approximately 999,999,967.4118 GEA, approximately 399,999,986,964.72 GAG. Each block yields approximately 31.7098 GEA and approximately 12,683.92 GAG.

Fourth 5-year cycle (365×5=1825 days) from (UTC) February 13, 2032, to February 11, 2037 23:57:10 (blocks 51157416 to 82693406):

Mining: Approximately 499,999,983.7059 GEA, approximately 199,999,993,482.36 GAG. Each block yields approximately 15.8549 GEA and approximately 6,341.96 GAG.

Fifth 5-year cycle (365×5=1825 days) from (UTC) February 11, 2037, to February 10, 2042 23:39:50 (blocks 82693407 to 114229198):

Mining: Approximately 249,999,991.08 GEA, approximately 99,999,996,432 GAG. Each block yields approximately 7.9275 GEA and approximately 3,171 GAG.

b. Election Design:

Each validator node's probability of creating a block is determined based on the ratio of its individual ANS stake to the total ANS stake in the network. This approach ensures equal block creation opportunities for each validator node. The probability calculation example is as follows:

Let's assume there are three validator nodes: v1 (192.168.1.110), v2 (192.168.1.111), and v3 (192.168.1.112) with corresponding ANS stakes of 30, 20, and 10, respectively. The total ANS stake is total=60, and the initial accumulators for each validator node are set to Accum=0.

First proposer node election:

v1.Accum: 30 (v1.Accum += v1.ANS)

v2.Accum: 20 (v2.Accum += v2.ANS)

v3.Accum: 10 (v3.Accum += v3.ANS)

v1.Accum is the largest, becoming the proposer node for this round; simultaneously, v1.Accum -= 60

Final v1.Accum: -30

Second proposer stage election:

v1.Accum: 0 (v1.Accum += v1.ANS)

v2.Accum: 40 (v2.Accum += v2.ANS)

v3.Accum: 20 (v3.Accum += v3.ANS)

v2.Accum is the largest, becoming the proposer node for this round; simultaneously, v2.Accum -= 60

Final v2.Accum: -20

Third proposer stage election:

v1.Accum: 30 (v1.Accum += v1.ANS)

v2.Accum: 0 (v2.Accum += v2.ANS)

v3.Accum: 30 (v3.Accum += v3.ANS)

v1.Accum is the largest, becoming the proposer node for this round (if Accum values are equal, nodes are sorted by their addresses in ascending order); simultaneously, v1.Accum -= 60

Final v1.Accum: -30

c. Consensus

Classic Byzantine Fault Tolerance (BFT Consensus)

Achieving consensus in the presence of malicious actors (in an open environment) has been a problem dating back to the early 1980s when Leslie Lamport coined the term "Byzantine Fault," referring to any arbitrary deviation from expected behavior, contrasting starkly with "crash failures" where a process simply crashes. Early solutions identified the message delay upper bounds in synchronized networks, though their practical use was confined to highly controlled environments like aircraft controllers and data centers synchronized through atomic clocks. Practical Byzantine Fault Tolerance (PBFT) was introduced in the late 1990s as an efficient partially synchronous consensus algorithm, capable of tolerating up to 1/3 arbitrary process behavior. PBFT became a standard algorithm, spawning numerous variations, including recent variants created by IBM as part of its contribution to Hyperledger.

Compared to PBFT, the primary advantage of Tendermint consensus lies in its improved and simplified underlying structure, some of which are results following the blockchain paradigm. In Tendermint, blocks must be committed sequentially, eliminating complexities and saving on communication overhead related to state changes in PBFT. In Cosmos and many cryptocurrencies, if block N hasn't been committed itself, then subsequent blocks N+i (where i>=1) cannot be committed. Wasting communication bandwidth on sharing votes for block N+i is futile if block N wasn't submitted due to limited communication bandwidth, network partition, or node disconnection, preventing any subsequent block submission.

Moreover, batching transactions into blocks allows for periodic consolidation of application states, unlike PBFT's checkpoint schemes. This enables faster provable transaction submissions for light clients and quicker inter-blockchain communication. Tendermint BFT also includes many optimizations and functionalities beyond PBFT specifications. For instance, blocks proposed by validators are fragmented, Merkleized, and broadcasted in a way that enhances performance. Additionally, Tendermint BFT doesn't make any assumptions about peer-to-peer connections; it operates normally even in the presence of weak P2P network connections.

d. Staking

Staking operations are only available on GEA Chain after KYC verification and are categorized into Regular Staking, Periodic Staking, and Permanent Staking conditions.

Regular Staking: Users can stake an amount not less than the minimum staking value set in the current country zone. Interest is calculated in real-time upon staking. This type of staking has no time constraints and can be staked or withdrawn at any time, with rewards credited upon withdrawal.

Periodic Staking: This can be understood as scheduled staking on GEA Chain, involving a lock-up period. The current period units are in days, including 30, 60, 90, 120, 150, 180, 210, 240, 270, 300, 330, 360, 720, 960, 1440, and 1800, totaling 16 period options. The longest period is 1800 days, and the shortest is 30 days. Corresponding returns vary based on KYC user votes and are set by administrators. At the end of the period, the principal and node rewards can be claimed. If the period is not completed, only the principal can be withdrawn, and node rewards cease upon period completion.

Permanent Staking: This refers to the 1 GEA reward received upon KYC registration, automatically staked to generate perpetual on-chain block rewards. However, this 1 GEA cannot be withdrawn or traded;

Conditional Staking: This involves staking set by users and cannot be withdrawn manually. It requires automatic release based on zone-defined rules before withdrawal, entailing additional rewards as set by the respective zone.

Staking Reward Calculation:

Whenever a validation node generates a block, it simultaneously rewards the corresponding GEA and GAG tokens (refer to the Economic Model section). Each zone obtains proportional GEA and GAG rewards based on its ANS value (refer to the Economic Model section) compared to the total ANS of the

entire network. When KYC-verified users in the zone stake GEA, the staked GEA amount is converted into ANS value. Users receive returns based on the proportion of their ANS value to the zone's ANS value.

Reward Allocation Example:

Assuming the total network ANS quantity is 20 million and Zone Z receives an allocation of 5 million ANS,

Assuming during the initial 5 years of network operation, each block generates 126.8392 GEA,

Suppose a KYC-verified user stakes 1 million GEA in Zone Z,

For each block produced:

User's staked reward in GEA = 126.8392 * (5 million / 20 million) * ((1 million / 400 + 0.0025) / 5 million) = 0.00158549158549 GEA

User's staked reward in GAG = 126.8392 * (5 million / 20 million) * ((1 million / 400 + 0.0025) / 5 million) = 0.00158549158549 GAG

6. Value and Applications

Exploring GEA Chain allows us to witness not only a technological breakthrough but also to drive innovation in tech finance and promote sustainable human development in its practical applications. It's not just a singular advancement in technology; it has the potential to reshape our daily transaction and payment experiences, offering more solutions to global environmental issues and advancing sustainable development in human society.

A. The Application Value in the FinTech Field

The technological advantages of GEA Chain can redefine how we consume, invest, and manage finances. From accelerated payment processing to reduced transaction costs, from enhanced payment security to driving financial inclusivity, GEA Chain will gradually alter our lives, leading us into a new era of financial services that are more efficient, secure, and inclusive.

a. Simplified Payment Processes

By integrating the technology of GEA Chain with traditional finance, we can make everyday payments more convenient and efficient for people. Traditional bank transfers and online payments often involve complex verification processes and lengthy waiting times, but leveraging GEA Chain's blockchain technology can significantly simplify these procedures. For instance, when shopping or conducting cross-border transactions, users can enjoy almost instantaneous transaction confirmations and lower fees, greatly enhancing the convenience of payments and providing consumers with a smoother shopping experience.

b. Enhanced Transaction Security

GEA Chain's technology enhances transaction security through distributed ledgers and encryption measures. In this system, every transaction is recorded on an immutable distributed ledger, reducing the possibilities of fraud and erroneous transactions. For everyday users, this means that their financial activities like bank transfers and online shopping are more secure, alleviating concerns about personal information theft or the compromise of financial security.

c. Promoting Financial Inclusivity

GEA Chain enables easier access to financial services, particularly for remote areas and low-income populations that face challenges in accessing traditional financial services. Through smartphones and internet connectivity, even individuals in remote regions can access basic banking services such as transfers, savings, and loans. This widespread availability of financial services helps improve their economic situation and quality of life.

d. Innovative Financial Products and Services

The integration of GEA Chain provides vast opportunities for developing novel financial products and services. For instance, blockchain-based investment tools and tokenized assets enable everyday investors to access previously unreachable markets, such as real estate or art investments, at lower entry barriers. Additionally, personalized and flexible financial products, like customized insurance schemes or loan products, better cater to the diverse needs of consumers.

B. Promoting Sustainable Human Development

The innovation in the field of financial technology is just the beginning; in addressing global environmental issues and fostering sustainable human development, GEA Chain can play a crucial role. This stands as one of the most significant core values of GEA Chain.

a. Carbon Emission Tracking and Trading Platform

In the exploration of applying GEA Chain's advanced blockchain technology to the environmental conservation domain, the concept of a carbon emission tracking and trading platform shines with innovative potential. This platform is not only technologically advanced but also carries a commitment to a better, greener future. It cleverly harnesses the core advantages of blockchain—immutability, transparency, and decentralization—to ensure the purity and authenticity of carbon emission data. Simultaneously, it opens up an entirely new world of transparency and trust."

On this platform powered by GEA Chain, all participants—be it businesses, government agencies, or independent auditors—can accurately record carbon emission data on an immutable blockchain. Each piece of data undergoes rigorous validation through smart contracts to ensure the authenticity of every digit. The digitization and tokenization of carbon credits not only streamline transactions but also introduce unprecedented transparency and fairness to the market.

The establishment of this platform is not just a technological innovation; it represents a profound awakening of environmental consciousness and action. It doesn't just enhance market efficiency; more importantly, it awakens people to the awareness and responsibility of their actions' impact. Both businesses and individuals begin to pay more attention to their carbon footprint, actively seeking ways to reduce emissions. Simultaneously, this system can serve as a powerful force supporting global emission reduction goals and encouraging green investments.

Through this innovative platform, we not only witness the power of technology but also glimpse hope for a more sustainable and environmentally friendly future. This project is both practical and emotionally resonant; it not only solves practical problems but also ignites a passion for collective human responsibility towards the Earth and the future. The innovative application of GEA Chain undoubtedly represents an important step for us collectively moving towards a greener and brighter world.

b. Traceable Green Supply Chain:

Under the blockchain technology framework of GEA Chain, the implementation of a traceable green supply chain project is not just a showcase of technological innovation but also a commitment to achieving sustainability and environmental goals. This project enables full traceability of every stage in the supply chain, from raw material procurement to the final product sale, ensuring transparency and authenticity throughout the entire chain. Through GEA Chain, data at every step can be accurately recorded, allowing verification of product origins and production process compliance, thereby enhancing the overall reliability of the supply chain.

Utilizing GEA Chain's smart contracts and automated verification capabilities, the project ensures that every participant in the supply chain adheres to relevant environmental and social responsibility standards. Additionally, the transparency of blockchain technology allows for an objective evaluation and certification of the environmental attributes of products, providing consumers with clear environmental information such as carbon footprint and recyclability.

This transparent and traceable supply chain system not only enhances consumer trust in products but also elevates the brand image and market competitiveness of businesses. As consumers increasingly prioritize environmental concerns and sustainability, this supply chain management approach helps garner consumer loyalty. Moreover, the implementation of this project encourages businesses within the supply chain to adopt more environmentally friendly production and operational methods, thereby driving the overall industry towards greener development.

The traceable green supply chain project realized through GEA Chain not only has a positive impact on businesses and consumers but also contributes to the sustainable development of the entire society and

environment. This project supports the goals of sustainable development, particularly in responsible consumption and production, showcasing the immense potential of blockchain technology in promoting global environmental protection and sustainable development.

c. Waste Management and Recycling Tracking System:

Under GEA Chain's blockchain technology, an idea for a tracking system dedicated to waste management and recycling emerges. This system not only represents technological advancement but also embodies our commitment to a cleaner, greener future. In this system, we aren't just tracking every corner of waste; we are caring for our shared home—the Earth.

Imagine every discarded item, from empty streets to bustling factories, having a clear and traceable story. These stories document their origins, every step of their journey, until their final processing and recycling. The transparency and efficiency of this system not only enhance the quality of waste management but also inspire deep reflection on resource recycling.

With the power of GEA Chain, we not only manage waste more efficiently but, more importantly, we can see the direct impact of our environmental conservation actions. Every instance of sorting for recycling, every choice of sustainable products, leaves a trace in this system. This sense of involvement and achievement is the driving force propelling us to continue taking action.

For governments and environmental agencies, this system provides valuable data and insights, assisting them in more effectively formulating and implementing environmental policies. This isn't just a response to current issues but also an exploration of the path towards future sustainable development.

This waste management and recycling tracking system is not only a technological innovation but also a profound reflection on lifestyle. It reminds us that every small act of environmental conservation holds significance, and every choice shapes our collective future. With the assistance of GEA Chain, we are steadily moving towards a more responsible and sustainable world.

d. Environmental Project Crowdfunding Platform:

Supported by GEA Chain's blockchain technology, a crowdfunding platform dedicated to environmental projects is burgeoning with endless possibilities. This platform is not just a place to raise funds for supporting the development of the environmental sector; it's also a community that sparks dreams and actions. Here, each environmental project showcases its vision, narrating how they are dedicated to

safeguarding our planet and improving our collective living environment. Through GEA Chain's transparent and secure technological framework, the stories of these projects resonate with every individual.

Imagine every flow of funds being open and transparent, where investors not only see how their funds are utilized but also feel directly involved in environmental conservation. This sense of involvement and transparency is unparalleled compared to traditional crowdfunding platforms.

For initiators of environmental projects, this platform provides not only the funding to realize their dreams but also acts as a bridge to connect like-minded individuals. Each update and report shared becomes an opportunity to share progress and achievements with supporters. With smart contracts ensuring the proper use of funds, they can focus on the project itself, turning ideas into tangible environmental actions.

On this crowdfunding platform, every click of support signifies not just a transfer of funds but also support for a greener, more sustainable world. This innovative application of GEA Chain demonstrates how technology can help us collectively build a better future. Here, everyone can become a part of environmental conservation, contributing to the Earth through their actions.

e. Energy Consumption Monitoring and Optimization:

The application of GEA Chain's blockchain technology in energy consumption monitoring and optimization has opened up new possibilities for more effective management and optimization of energy usage. The core of this system lies in real-time tracking of energy consumption data at various energy usage points, storing this data securely on an immutable blockchain. This ensures not only the accuracy and transparency of the data but also provides a reliable foundation for analyzing and optimizing energy consumption patterns.

Through this system, we can precisely identify patterns and trends in energy usage. For instance, in a large industrial park or a bustling commercial center, the system can automatically adjust the operational status of equipment to reduce energy consumption during off-peak periods. Additionally, by providing detailed energy usage reports and energy-saving recommendations to users, it encourages more environmentally friendly and energy-efficient behaviors.

This optimization not only generates a positive impact on the environment by reducing energy waste and greenhouse gas emissions but also significantly saves energy costs for businesses and households.

Furthermore, the system's transparency enhances public awareness regarding energy consumption issues, fostering societal emphasis on energy efficiency and sustainable utilization.

GEA Chain's application in this domain demonstrates how blockchain technology surpasses traditional energy management methods, bringing about more intelligent and efficient energy utilization. This is not just a technological innovation but also a commitment to a sustainable future and eco-friendly lifestyle. Through this innovative application, we are steadily progressing towards a more energy-efficient and environmentally conscious world.

f. Green Incentive Program:

Implemented within the framework of GEA Chain, the Green Incentive Program is an innovative initiative aimed at encouraging and rewarding environmental actions through blockchain technology. Its objective is to promote more sustainable lifestyles and business practices by identifying and verifying environmental activities of individuals and businesses, such as using public transportation, actively participating in recycling, or adopting renewable energy. Subsequently, these behaviors are rewarded digitally, often through tokens or points.

The core of these incentives lies in the application of smart contracts, ensuring that once environmental actions are verified by the system, corresponding rewards are automatically and accurately distributed to participants' accounts. This automated and transparent incentive allocation mechanism significantly enhances the efficiency and fairness of the program. Participants can view their earned incentives on a dedicated online platform and redeem them for various tangible rewards, such as discount vouchers, gifts, or eligibility for special events, thereby increasing the attractiveness and practical benefits of environmentally friendly behavior.

This Green Incentive Program not only increases public engagement and awareness in environmental activities but also propels society towards a more sustainable direction overall. It establishes a positive feedback loop, incentivizing more individuals and businesses to take environmentally friendly actions. By documenting and showcasing the achievements of these actions, it enhances the societal acceptance and visibility of environmental activities.

GEA Chain's Green Incentive Program showcases the immense potential of blockchain technology in promoting environmental activities. It not only encourages environmental actions by individuals and businesses but also contributes significantly to building a greener, more sustainable societal environment. Through this innovative application, we are gradually progressing towards a more responsible and sustainable future.

g. Clean Energy Trading Platform:

Under the leadership of GEA Chain, the establishment of a clean energy trading platform marks a significant stride towards a greener, more sustainable future. This platform harnesses the power of blockchain technology to tightly connect clean energy producers and consumers, creating a simplified, efficient, and transparent energy market. Imagine individuals and companies producing solar or wind energy being able to directly sell these valuable resources to those in need. This not only reduces intermediary steps but also lowers energy costs, making renewable energy more accessible and affordable.

On this platform, every energy transaction is accurately recorded on the blockchain, ensuring the fairness and reliability of transactions. The use of smart contracts further automates the transaction process, enhancing efficiency while reducing the risks of errors and disputes. This means that both households and businesses can easily select and purchase clean energy, supporting environmental conservation while saving on energy expenses.

For those dedicated to producing clean energy, this platform not only provides a direct route to bring their products to the market but also acknowledges and rewards their efforts and commitments. This peer-to-peer energy trading method encourages more production of clean energy, propelling the entire society towards a more environmentally friendly direction.

GEA Chain's innovative platform not only enhances the overall efficiency of the energy market but, more importantly, it empowers individuals with greater control over their energy choices. It allows each of us to become a part of driving environmental sustainability. Through this approach, we're not just choosing better energy options for ourselves and our families; we're also selecting a cleaner and greener future for the planet and generations to come.

h. Wildlife Conservation:

Under the umbrella of GEA Chain's blockchain technology, the vision for wildlife conservation is turning into a reality. This innovative application introduces the transparency and immutability of blockchain into the realm of wildlife protection, pioneering a new approach to combat illegal trade and safeguard our planet's precious biodiversity.

Imagine every stage of the process for each wildlife product, from capture and transportation to final sale, being meticulously recorded in a secure and transparent system. This record not only enables regulatory bodies to effectively track and combat illegal trade but also empowers ordinary consumers to

clearly understand the origins of the products they purchase. Through this approach, each one of us can become a part of wildlife protection.

The utilization of smart contracts ensures that every transaction must comply with strict environmental standards and regulations. This automated compliance check enhances the efficiency and reliability of the entire system. Additionally, this platform serves as a tool to increase public awareness about the importance of wildlife conservation, encouraging active participation in this noble cause.

The establishment of this wildlife conservation system is not only a robust countermeasure against illegal trade but also a strong support for the ecological balance of our planet and the preservation of biodiversity. Through this innovative application, GEA Chain demonstrates how blockchain technology can help us better care for our shared home - Earth. It's a harmonious interplay between technology and nature, an achievement of our collective efforts towards a greener and more sustainable world.

i. Environmental Quality Monitoring Network:

Underpinned by GEA Chain's blockchain technology, the establishment of an Environmental Quality Monitoring Network is becoming a significant milestone in improving our living environment. This network is not merely a collection of data and numbers; it's a bridge connecting us with the natural environment, enabling real-time understanding and perception of the world we inhabit.

By deploying environmental monitoring devices globally, such as air quality monitors and water quality testers, this network continuously gathers valuable data about our surroundings. Once collected, this data is securely recorded on the blockchain, ensuring its authenticity and immutability. This transparency and reliability transform our understanding of the environment from being one-dimensional to comprehensive and in-depth.

Moreover, this monitoring network provides a user-friendly platform, enabling easy access and comprehension of environmental data for everyone, be it government decision-makers, environmental researchers, or ordinary citizens. Each individual can find valuable information relevant to them on this platform. This sharing and openness of information not only enhance the efficiency of government environmental policy-making but also strengthen public awareness of environmental conservation.

Furthermore, this network fosters international data sharing and collaboration, offering new solutions to global environmental challenges. On this platform, people from different countries and regions can collaborate and address environmental issues together, working collectively to protect our shared planet.

In summary, GEA Chain's Environmental Quality Monitoring Network isn't just a showcase of technological innovation; it's a commitment to a healthier, greener future. It fosters a closer connection between us and the environment, allowing each of us to become a part of the noble endeavor to safeguard our planet.

The applications of the project, such as environmental project crowdfunding, clean energy trading platforms, and waste management systems, not only foster environmental awareness and action but also provide robust technical support for protecting the Earth's environment. Additionally, GEA Chain plays a crucial role in enhancing social transparency and fairness. Its applications, such as in wildlife protection and environmental quality monitoring networks, improve the efficiency and precision of policy-making while enhancing public awareness of environmental issues. Simultaneously, through incentive programs and energy consumption monitoring systems, GEA Chain encourages more individuals to take environmentally friendly actions, promoting a sustainable way of life.

7. Conclusion

GEA Chain's POA+POS dual consensus mechanism and modular architecture provide unprecedented flexibility and scalability, making it efficient and low-cost when processing complex transactions. The promotion and application of its technology is expected to greatly improve global financial technology. The industry ecosystem provides individuals and enterprises with more secure, efficient and inclusive financial services. This innovation can not only improve the efficiency and security of financial services, but also bring more opportunities and convenience to users around the world. GEA Chain will shape a smarter, more efficient, safer and more inclusive future for the financial technology field, which will greatly promote social and economic development and the improvement of human life.

More importantly, the application of GEA Chain in environmental protection shows its profound impact on the sustainable development of all human society. From crowdfunding of environmental protection projects, clean energy trading platforms, to waste management and recycling tracking systems, GEA Chain are shaping a more environmentally friendly and green future, these applications not only promote environmental awareness and actions, but also provide solid technical support for protecting our common global environment.

For the future, GEA Chain shows huge room for development. With the continuous improvement of technology and the expansion of applications, it has the potential to have an impact in more fields such as medical care, education, and smart city construction, bringing a wider range of positive benefits to the global society change.

GEA Chain represents a kind of confidence in the future and the unremitting pursuit of social progress. We have reason to believe that GEA Chain will play a key role in promoting the development of human society in a better direction.

Therefore, we look forward to more people paying attention to and joining GEA Chain. We will provide you with an opportunity to participate in innovation and jointly shape the future. With your joint participation and efforts, we will be able to accelerate the popularity of GEA Chain and provide better society services , promote the sustainable development of human society, let us witness and be part of this change, and jointly create a more prosperous and better future.