GXChain WHITEPAPER 3.0

A Trusted Data Internet of Value

2018.10.10

Abstract

GXChain is a fundamental blockchain for the global data economy, designed to build a trusted data internet of value.

GXChain has evolved rapidly since its inception, which started from a decentralized data marketplace (commercialized on September 2017), to a fundamental blockchain ecosystem. The ecosystem is currently serving millions of users and software developers. To help people better understand what we are doing now, and where we are going in the future, we are continuously updating the whitepaper of GXChain. This version of the whitepaper focuses on the following topics:

This version of the whitepaper focuses on the following topics:

◇ Elaborated GXChain's governance structure, which can faciliate democratic, transparent and decentralized governance of GXChain. GXChain is growing from the early stage of team operation to the community–based governance, further improving consensus.

◇ Introduced the GXChain TrustNodes election, and earnings. The election campaign will make GXChain more distributed, improving the security and stability of the GXChain main net. Influential teams in the world will be introduced to the election campaign and participate in the governance of GXChain.

◇ Optimized technical and system structure of GXChain and the addition of smart contracts 2.0, cross chain technology, oracle machines, and trusted data modules. We also give examples of the applications of a trusted data internet and our technical strategies, thereby setting guidelines for developers.

◇ Announced to swap GXS to GXC with a ratio of 1:1, GXC will be the core asset and act as the main token for utility and governance of GXChain. Later, in the GXChain ecosystem, GXC will be the key utility token for payments, transactions, governance, and development.

◇ Illustrated business models of GXC, and its value, generation, and distribution mechanism.

◇ Announced the road map of GXChain, which focuses on improving its competitiveness through technical innovation, collaboration, and community governance.

Category

Introduction

Data Economy Dilemma

With the maturation of 5G, artificial intelligence (AI), and internet of things (IoT) technologies, the bigdata era has arrived. The ability of society to generate and process data has increased significantly. With the advent of the bigdata era, our knowledge, the efficiency with which we react to demands, social and business planning, as well as collaboration, may be drastically improved.

The development of the data economy is based on the advancement of computer technology and the internet, which act as a cornerstone for data acquisition, analysis, and other essential applications. Traditional internet schemes have laid a solid foundation for data acquisition, storage, analysis, usage, and exchange. It's safe to say, the world is digitizing and interconnecting at an ever–increasing speed.

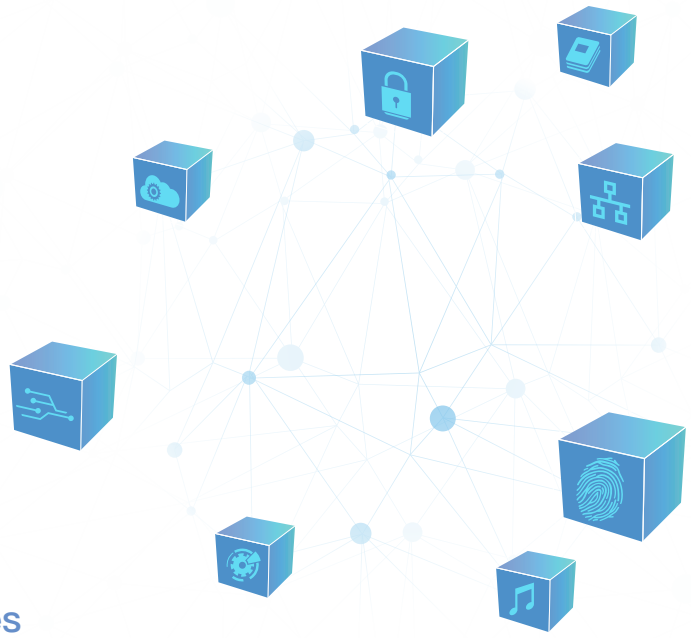
However, several threats loom over the development of the data economy. First, is the controversy of data ownership. The great value of personal data has become inescapably evident, with businesses competing fiercely for this data. Globally, there is a growing trend that personal data belongs to its producer—the individuals, instead of big cooperation's. On the other hand, we do not have a simple yet effective way to manage our data, especially under the current internet ecosystem and with current internet business models. Moreover, to strictly control the usage of personal data may also a waste resources by obstructing the effectiveness of resource allocation. Therefore, there is a great unmet need for a solution that could protect data ownership while also preventing inefficiencies associated with a lack of individualized business services.

Second, is the problem of data security. Recently, centralized corporations have suffered many data scandals and breaches, such as the Equifax data breach, and Facebook—Cambridge Analytica data scandal. Centralized data storage and usage is frequently a target

for easy exploitation. The data breaches pose a real threat to personal data security and privacy, especially for those on social networks. These problems impose a great burden on companies to maintain the safety of their network and datacenters as even a single breach may undermine their trustworthiness.

Third, is the emerging challenge of fake data. The current centralized data ownership and management model makes it very difficult to verify the authenticity of data, available means and solutions are limited, which significantly impedes social collaboration.

Forth, is the lack of incentive. Data is mostly generated by the individual. Currently, one lacks incentive to collect and manage their own data, as people cannot benefit from it. It is necessary therefore, to educate people on how to collect, manage, and use, their personal data. Big corporations currently benefit most from personal data. Everyone will benefit if there is a solution that can enable individuals to earn from their own data by allowing companies to ethically and legally acquire personal data by paying the individual.



Our Visions and Approaches

An infrastructure upgrade of the current data economy is necessary to solve the issues mentioned above, which could transform the method of data acquisition, storage, computation, and exchange. Specifically, people need a transparent, decentralized, high–throughput, and efficient data service oriented internet.

GXChain is a forward thinking fundamental blockchain directed to solving the issues of the data economy, based on decentralization, cryptography, and smart token design, GXChain provides a leading solution for the data economy. In the past two years, the team has developed multiple, trusted data modules to solve problems in the data economy, including ownership, security, authenticity, and lack of incentive. Data uploading, storage, computation, and exchange has been gradually realized with many commercialized applications.

We strongly believe that the data economy could fundamentally accelerate the efficiency and improve the trustworthiness of the world. In the past two years, the GXChain team fulfilled every promise, finished development of the fundamental blockchain, Decentralized Data Marketplace, Blockcity, and many data modules for developers. In the future, GXChain will continue innovating in the field of the data economy and provide a shared usage and governance, transparent, and secure infrastructure for people everywhere.

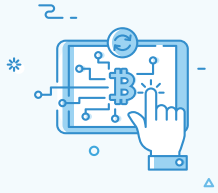
Governance

Structure and Mechanism

Governance is the key part of a public blockchain. GXChain combines "On-Chain" and "off-chain" governance, simultaneously putting people and computational code into the governance system, realizing decentralization, robustness, and efficiency. Every GXChain asset holder has the right to participate in the decentralized governances. All GXC holders could vote to determine the future direction, strategy, and operation of the GXChain ecosystem.

GXChain "On-Chain" governance is comprised of the Committee and TrustNodes. The committee constitutes 11 members, who can propose to vote for the modification of global parameters of GXChain. The TrustNodes constitute 21 members, who are in charge of the transaction verification, production, and broadcast of blocks.

On-Chain Governance



GXChain Committee

◇ The GXChain Committee is similar to the blockchain board, which is responsible for proposing and voting for the modification of global parameters of GXChain. The committee is comprised of the 11 top ranked members in the TrustNodes voting.

GXChain TrustNodes

◇ The TrustNodes are comprised of the miners of GXChain, responsible for transaction verification, block production, and broadcast of blocks. The minimum number of TrustNodes is 21.

Off-chain Governance

GXChain Foundation

◇ The foundation is a nonprofit organization registered in Singapore.

◇ Comprised of the Policy Committee, Advisor Committee, Execution Committee, Ecosystem panel, Code evaluation panel, Marketing panel, and Administration panel.

◇ Responsible for decision making, research & development, global marketing, fund management, and other operations.

Fig.1. Governance of GXChain

On-Chain Governance

The governance on the blockchain is via the GXChain committee and TrustNodes. The TrustNode delegates GXC holders to participate in the governance of GXChain. There are 21 TrustNodes in the GXChain ecosystem, which support the infrastructure of GXChain, including internet, storage, computation, etc. We encourage all TrustNode members to take the lead to build and develop their community, the competition to be a TrustNode strengthens each participant in the community and makes the GXChain ecosystem better. The top 11 of the 21 TrustNodes constitute the GXChain committee, who act as the governors of the ecosystem.

GXChain Committee and TrustNodes

There are three roles in GXChain governance.

1. The GXC holder, who holds any amount of GXC.

2. GXChain TrustNodes, elected by all GXC holders, the voting is conducted every hour, there are 21 TrustNodes. The TrustNodes are comprised of members ranked top 21 in votes. The TrustNodes are in charge of transaction verification, block production, and broadcast of blocks. Moreover, the TrustNodes will be rewarded using the transaction fees on the GXChain. The TrustNodes are open to the supervision of the GXChain community.

3. GXChain Committee, comprised of the 11 TrustNode members with the most votes. The committee acts as the governors of the GXChain community. The major role of the committee is to optimize and set up reasonable global parameters of GXChain, and foster the long-term development of the GXChain community. For example, the committee could propose a vote to change the block size, block time, block reward, number of TrustNodes, number of committee members, and fees in the GXChain ecosystem.

TrustNodes Competition Terms

Participants need to stake and lock 10000 GXC, when they want to cancel the competition, the locked GXC will return after 30 days. To promote efficiency, we made some terms to determine if the candidates are qualified to be a TrustNode member. These terms are approved by the ecosystem development panel of the GXChain foundation.

1. Should be a legal entity with a website and social media.
2. Must have nodes that are open to public testing.
3. Have necessary hardware and be able to maintain the server for the node.
4. Must stake and lock 10000 GXC.
   Withdrawal will be regarded as ceding from the competition.
5. Have a budget plan for the next three years,
   supporting potential hardware upgrades and community development.
6. Have community of a certain minimum size.

TrustNode Rewards

The income of a TrustNode comes from block production and broadcast of blocks. The amount of income is determined and voted for approval by the GXChain committee. A block reward is comprised of transaction fees and a reward from GXChain Foundation. GXChain Foundation will contribute 500,000 GXC to reward TrustNodes every year, for eight years.

TrustNode Election and Ballot

Ballot to GXC = 1:1, and GXC holders can vote for multiple nodes. The GXC for voting will be staked at the wallet, transfer of the staked GXC out of the wallet will cancel the voting procedure. Members ranked top 20 in votes will automatically be elected as TrustNodes, and one TrustNode will be selected randomly. There are three methods to vote.

1. Vote through Blockcity

2. Vote through mobile or PC wallet.

3. Vote through exchanges (requires support by exchanges).

Off-Chain Governance

GXChain Foundation

The GXChain Foundation established on November 2017 in Singapore. The foundation aims to facilitate sound and efficient development of the GXChain ecosystem and protect the rights of GXC holders. Also, the foundation is responsible for fostering communication among GXC holders, the GXChain community, TrustNodes, and developers.

The GXChain Foundation will disclose the development and operation progress of GXChain annually. In particular, the foundation will disclose the use of funds annually, and introduce third-party auditing for supervision. Auditing reports will be disclosed in the annual financial statements.

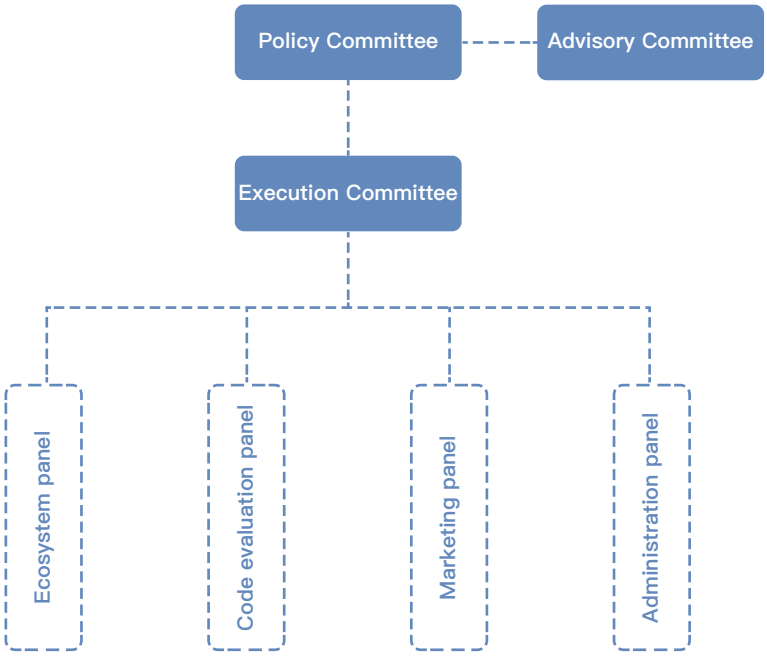


Fig.2. Organizational Chart of GXChain Foundation

Policy Committee

The Policy Committee is the decision marker of the GXChain foundation, which is comprised of 11 members, including project founders, developer lead, investor lead, and community lead. The committee will elect one president, one vice president, and one executive officer from the 11 members. Introduction of members will be disclosed at gxchain.org.

At least one meeting will be held by the president annually. Notification for the meeting will be sent out 30 days in advance, and the meeting cannot proceed until more than half of the members are present at the meeting. A proposal cannot pass until two-thirds of the members vote in favor of it, and the essential proposal must get approval by the president. The proposal can pass if all members vote in favor of it in written form, without calling for a meeting.

Responsibility

The policy committee is responsible for the following affairs:

1. Set and change the governance of GXChain Foundation**.
2. Elect and dismiss president and vice president.
3. Elect other committee members.
4. Decide the operations and investment strategy of GXChain Foundation**.
5. Budgeting**.
6. Add or reduce committee members.
7. Review performances of presidents and executive officers.
8. Determine to split, merge, and cease the foundation**.
9. Other important affairs not listed.

**Essential proposal and requires approval by the president.

Qualifications

1. Have strong aspiration to join the committee and acknowledge the foundation terms.
2. Have influence in a related community or business scope.
3. Have contributed to the development of GXChain Foundation.
4. No criminal record.

Election and Dismissal

1. The Founders, developer lead, and investor lead will nominate and determine the members for the first round.

2. The qualification and terms for the next round of the election will be announced 60 days in advance; all GXC holders can participate in the election, and the votes for the election will be cast by the rest of the GXC holders.

3. The salary of the policy committee members is open and under supervision by the community.

4. The policy committee can terminate the position of a committee member after investigation if the member violates the terms or harms the reputation of the foundation.

5. The policy committee can terminate the position of a committee member after investigation if the member commits a crime.

6. The policy committee can terminate the position of a committee member after investigation if the member resigns voluntarily or is unable to serve the foundation anymore.

Term of Office

Two years and may be reappointed consecutively.

The Responsibility of the President and Vice President

1. Summon and conduct committee meetings.
2. Propose to hold a temporary policy committee meeting.
3. Sign important documents and supervise the execution of approved proposals.
4. Decide for emergency events.
5. Nominate a candidate for other committee members

The Vice President can execute the rights of the president with a written form of authorization from the president.

Advisory Committee

The advisory committee is comprised of experts in blockchain related fields, including technical experts, professors, investors, and lawyers. The policy committee selects advisors, and the maximum number of advisors is 7. The members will be disclosed at gxchain.org.

Responsibility

1. Advise and make suggestions for the operations and development of the GXChain foundation.

2. Advisors can participate in the policy committee meeting, but an advisor cannot vote.

Qualifications

1. Professional in blockchain or a related field.
2. No criminal record.

Election and dismissal

1. The policy committee selects advisors.

2. After investigation, the policy committee can terminate an advisor, if he/she violates the terms or harms the reputation of the foundation.

3. After investigation, the policy committee can terminate an advisor, if he/she commits a crime.

4. After investigation, the policy committee can terminate an advisor, if he/she resigns voluntarily or is unable to serve the foundation anymore.

Execution Committee

The execution committee is in charge of the daily operations of the foundation. The committee is headed by an execution officer, who leads and manages most work of the foundation and manages the other subdivisions. The committee comprises the execution officer, vice execution officer, secretary, and head of panels. The members will be disclosed at gxchain.org.

Responsibility

1. Execute approved proposals.

2. Advise works of subsidiaries.

3. Decide to hire or dismiss the staff of subsidiaries, determine the salary of staff.

4. Develop proposal and plans for unexpected emergencies.

Election and dismissal

1. Advisors are selected by the policy committee.

2. After investigation, the policy committee can terminate an advisor, if he/she violates the terms or harms the reputation of the foundation.

3. After investigation, the policy committee can terminate an advisor, if he/she commits a crime.

4. After investigation, the policy committee can terminate an advisor, if he/she resigns voluntarily or is unable to serve the foundation anymore.

Term of office

Two years and may be reappointed consecutively.

Subsidiaries

The execution committee leads four subsidiary panels, including the Ecosystem Panel, the Code Evaluation Panel, the Marketing Panel, and the Administration Panel.

Ecosystem Panel

The ecosystem panel is in charge of the ecosystem development of GXChain, including investment and incubation of projects and dApps on GXChain. The ecosystem panel is also responsible for screening collaboration patterners, business development, and performing due diligence investigations.

Code Evaluation Panel

The code evaluation panel is in charge of research and development of GXChain projects, including GXChain, APIs, and reviewing code of community developers. Moreover, the panel will hold code sharing, presentations, and discussions to make sure the core developers keep their pace with the bleeding edge of blockchain technologies.

Marketing Panel

The marketing panel is in charge of brand building, and brand maintenance of GXChain, as well as community development and public relations.

Administration Panel

The administration panel is in charge of the accounting, fund management, human resources, legal affairs, and other administrations.

Technical Structure

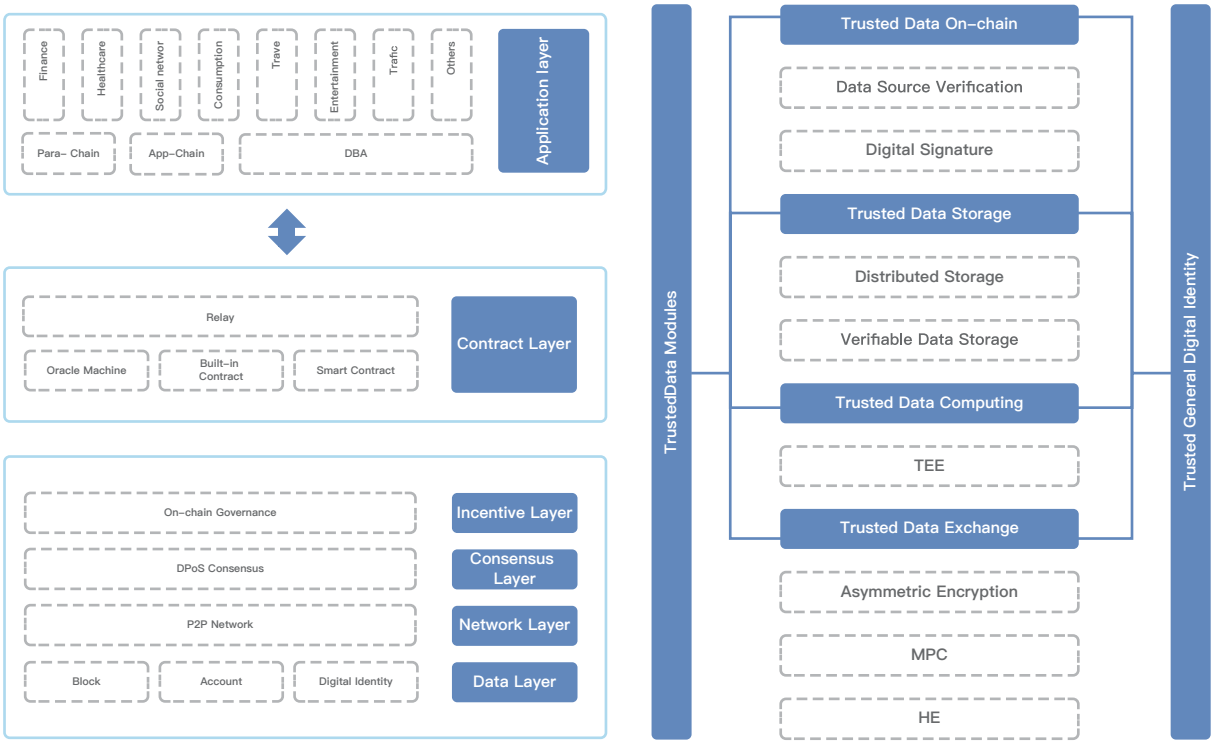


Fig.3. Technical Structure of GXChain

Data Layer

The data layer is the bottom layer of a blockchain; it dictates the block structures. The data layer of GXChain comprises the block, account, and digital identity. In graphene architecture, multi-signature accounts were stored in memory. GXChain improves this design and introduces digital identity. Namely, every account in GXChain has a unique corresponding digital identity (G-ID).

Network Layer

GXChain is a distributed topological network, comprised of full nodes. Each node interconnects equally and is capable of verifying transactions and blocks individually. There is no special node. Peer to peer networks are an important infrastructure for the data layer, the network enables nodes to find, connect, and communicate with each other, enabling GXChain to operate efficiently and stably.

Consensus Layer

Currently, most public blockchain uses proof of work (PoW) and proof of stake (PoS) as consensus algorithms. Bitcoin, the most successful cryptocurrency based on PoW, demonstrates the stability and fairness of the PoW algorithm. However, bitcoin was criticized for its energy-intensive mining activity. Billions of Dollars are invested in performing the calculations of SHA256 to maintain the network, besides that, limited applications are involved in this activity. Also, the current transaction speed of bitcoin is only 6 TPS, which cannot satisfy the scalability and high-throughput demands of a public blockchain. Peercoin is a relatively mature blockchain based on PoS, which addressed the high energy consumption of bitcoin. With a PoS system, new coins are generated based on the holdings of individuals. However, the rich get richer problem is more evident, making the whole network centralize gradually, although the PoS mechanism saves energy, it is still limited by scalability and security.

Delegated proof of stake (DPoS) mechanism was born to achieve scalability and high-throughput, while ensuring network security and decentralization. The DPoS algorithm requires verification of a current block that has been signed by a trusted node before generating the next block. DPoS employs TrustNodes by choosing elected nodes to represent other token holders to verify the transaction, produce blocks, and broadcast blocks. A TrustNode is required to remain online for a long time, solving the block generation delay problems which may occurred on blockchains based on PoS. DPoS is capable of 10000-100000 TPS, depending on the network quality, which is suitable for industrial applications. GXChain is designed to serve the data economy, the data exchange and computation applications demand long-term stability as well as a high-speed network, making DPoS is an ideal choice.

Incentive Layer

The incentive is an essential component of a public blockchain, token distribution and allocation play a vital role in the incentive layer. Compared to mining competition, the incentives of GXChain are more focused on cooperation and mutual supervision, which makes the incentive layer work more effectively.

The incentive layer of GXChain achieves its unique On-Chain governance and token allocation by:

> 1. The GXChain foundation will allocate some budget into a global smart contract and control the allocation by a linear algorithm.
>
> 2. The GXChain foundation contributes 4,000,000 GXC for the first 8 years to reward each block producers.
>
> 3. The chance for TrustNodes to produce a block is equal.

Contract Layer

The contract layer of GXChain consists of more than 70 **built-in contracts**, **smart contract** and **oracle machine**, and implements cross-chain relays on top of it, which enabling GXChain to interact with homogeneous and heterogeneous blockchains.

Smart Contract

GXChain Virtual Machine(GVM) uses WebAssembly(Wasm) to execute the smart contract, with Wasm, developers can write smart contracts with their primary programming language. Currently, Wasm supports C++. To make GXChain more developer friendly, we will add more programming language support in the future.

Using the GXChain compiler, one can convert high-level programming language like C++ to Wasm bytecode format, which facilitates code deployment on GXChain by calling the contract deployment API. After deployment, a smart contract account will be established on GXChain. The account stores the bytecode of the contract and corresponding application binary interface (ABI). Different from the general GXChain account, smart contract accounts, and assets are controlled by contract code, instead of by private key. Assigning an account name and contract method, then using the ABI to interact with the smart contract is required if users want to call smart contract. The ABI is generated by the GXChain compiler, which contains the contract methods, method parameters, and persistent data structures. The smart contract is stored in persistent memory in the form of an object. An object field and type can be customized by developers.

Calling a smart contract requires burning a small amount of miner fee, the fee is comprised of 3 parts: basic fee (fixed amount), ram fee (calculated by ram usage), and CPU fee (calculated by CPU running time). The amount of fees are adjustable by the GXChain committee.

Here are algorithms to calculate smart contract fees.

Smart contract deployment fee:

```
deploy_fee = basic_fee+transaction_size*price_per_kb
```

Smart contract transaction fee:

```
transaction_fee = basic_fee + ram_usage * price_per_kb + cpu_usage * price_per_ms
```

Built-in Contract

GXChain has more than 70 built-in contracts; these contacts are hardcoded to the blockchain, which is very convenient for developers to use, based on parameters of the contract API. Requests that do not conform to the API standards will be rejected, although hardcoding contracts sacrifices some flexibility, it increase security and stability.

Oracle Machine

The oracle machine reliably inputs off-chain data to GXChain, providing great computation convenience for smart contracts and DApps. The oracle machine is realized by the combination of built-in smart contracts and GXChain TrustNodes. Moreover, GXChain has a reward and punishment mechanism to encourage TrustNodes to provide authentic data feed services.

Cross-chain Relay

Using smart contracts, the cross-chain relay layer can achieve asset custody and cross-chain operation. GXChain TrustNodes implement off-chain input via oracle machines. With the help of Crosschain relay, GXChain can interoperate with parallel chains, application chains, and decentralized business alliances. GXChain cross-chain relay has the following features.

1. **TrustNode acts as relay.** Apart from transaction verification, production, and broadcast of blocks, TrustNodes can also function to enable a data feed service through oracle machines.

2. **Security Deposit/Reward and Punishment Mechanism.** TrustNodes will put some assets as a security deposit at the cross-chain relay, anyone may supervise the behavior of a TrustNode. If a malicious behavior is identified, a portion of the deposit will reward the whistleblower.

3. **Multiple source verification.** This setting is to further improve the credibility of the data feed. GXChain verifies the data authenticity with the help of various data sources.

4. **Free of fees.** Traditional relays require many broadcasts on a blockchain, consuming a large number of transaction fees. When inputting external data, GXChain has designed a unique method to make it free, by using oracle machines. This design is secured by the combination of **TrustNode acts as relay, Security Deposit/Reward and Punishment Mechanism, and Multiple source verification.**

Application Layer

The application layer of GXChain provides a rich API for application software. Also, it is equipped with client packaging for multiple programming languages, which simplifies the user experience. The application layer includes the following parts:

1. **GXClient:** contains built-in contracts, smart contracts, oracle machines, and cross-chain operation modules.

2. **DES-SDK:** trusted data exchange modules.

3. **BaaS-SDK:** trusted data storage modules.

4. **CLI_Wallet:** command line wallet, and packaging API to enable interaction with GXChain.

5. **GXX:** GXChain smart contract compiler, can convert smart contract to Wasm bytecode.

The application layer of GXChain provides a rich API for application software. Also, it is equipped with client packaging for multiple programming languages, which simplifies the user experience. The application layer includes the following parts:

Trusted Data Module

Trusted General Digital Identity

The trusted general digital identity will be the passport of the blockchain world, enabling users to experience the blockchain world freely by giving users access to every blockchain application.

Decentralized, and tamperproof characteristics are the best solutions to build trust. The influence of digital identity is tremendous, not only to people who have access to fiat currency but also to every human being on the planet. The assets behind digital identity are financial standing, personal information, credit history, and social relationships, which need trust, just as a currency does.

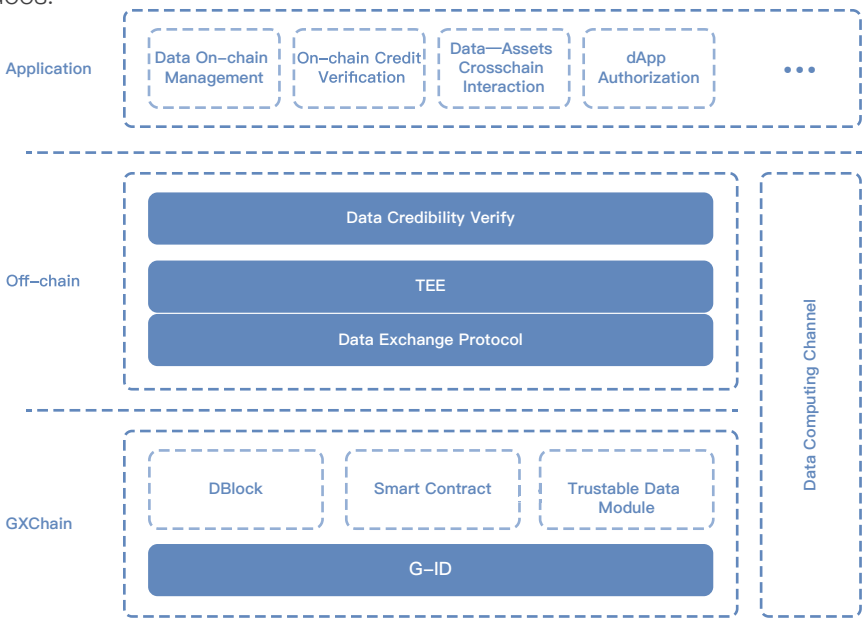


Fig.4. Application of GXChain G-ID

General Identity(G-ID) is a trusted general digital identity on GXChain, which is unique for each user after they have passed KYC, G-ID has the following functions:

1. Help uses record On-Chain data.
2. Help users record On-Chain behavior and credit history.
3. Help users get through the exchange of cross-chain data and assets.
4. Swift logon to every dApp.

Trusted Data On-Chain

Blockchain technology, as a distributed and tamperproof ledger, provides an excellent means for value storage. However, blockchain can only provide tamperproof property for data on the chain, it cannot control off-chain process. The GXChain trusted data module is going to solve this issue.

When we are talking about the credibility of data, we might think some examples of how to verify it. In China, one can use the full name and identification number verification API, provided by the police department. Also, bank information and accounts API can be used to verify financial information, provided by the banks. The emergence of blockchain technology is not going to overturn current modes, instead, to provide a more secure and efficient supplemental solution:

1. Digital Signature: If a third-party is credible, then GXChain agrees and acknowledges that. Verified data could be signed by the third-party, via a digital signature. The signature can prevent verified data from being tampered with, but also contains identification of the third-party. The signature is open to the public, allowing validation by everyone.

2. Data Source Verification: GXChain will provide a standard data On-Chain module, data exchange protocol, and proxy transfer contract. Under the approval of the data owner, the data can be encrypted and signed by the owner's private key (DataSign). The developer uses data and generates a checksum, calling the proxy transfer contract and binding the data with the G-ID of the data owner. To use data on GXChain, one needs the authorization of the data owners and to use DataSign and checksum to validate the authenticity of data.

Trusted Data Storage

One may question why we need credible data storage, since blockchain is born to be a distributed and credible ledger. Currently, it is very expensive to store data on the blockchain, and there are two main solutions:

1. Distributed Storage: Hadoop Distributed File System (HDFS) and InterPlanetary File System (IPFS) provide good choices in various environments. Storing data off–chain may not only make good use of the main net resources, but may also give flexible choices for private storage or public visiting.

2. Verifiable Data Storage: based on blockchain technology, it is important to leverage the advantage of the distributed ledger, which could ensure tamperproof data. Cryptography methods, like a digital signature and file Hash, help us to achieve storage of data off–chain, yet still records the file index and Hash on the GXChain main net.

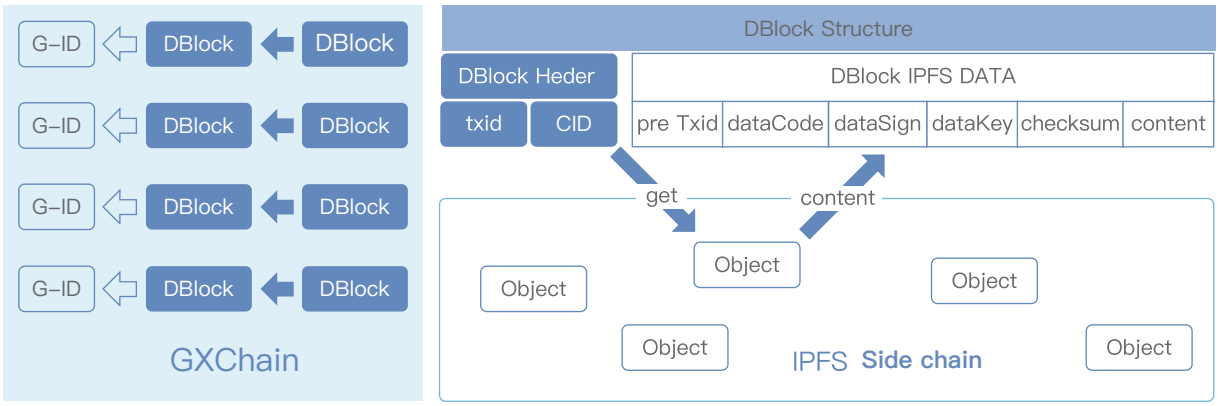


Fig.5. GXChain Trusted Data Storage

Figure 5 illustrates the design of trusted data storage. Individual data block (DBlock) will mapped and bound to the G–ID, each DBlock connects in series according to the data version. The data structure of DBlock contains txid and CID, CID is the Hash of the IPFS file. IPFS uses multiple formats to ensure each file produces a unique CID, which will irreversibly be stored at GXChain, making data tamperproof when it's written to the GXChain. On IPFS sidechain, DBlock data contains DataSign and checksum, ensuring its authenticity and verifiability.

Trusted Data Exchange

Data is an important production resource and hidden asset for both individuals and corporations. Everyone starts to accumulate data from the time of they are born. Trustable data modules aim to facilitate hidden asset flow and circulate this asset efficiently and securely. We already discussed some projects that we developed to solve the credibility of data On-Chain and storage. On this basis, we are answering, how to solve the credibility of data exchange and circulation. We think the key point is to solve the data breach problem during transfer and storage.

From the business point of view, we use off-chain computing to isolate data from its environment. Alternatively, we use data desensitization to remove private information before using. Technically, we have the following plans:

Asymmetrical encryption and decryption:
in the process of data transfer, only the private key holder can decrypt the message, ensuring other people can not decrypt the content. GXChain uses elliptic-curve cryptography (ECC), and Elliptic-curve Diffie—Hellman (ECDH) to calculate a shared private key from two public-private keys.

Secure multi-party computation(MPC):
provides the ability to compute values of interest from multiple encrypted data sources without any party having to reveal their private data.

Homogeneous encryption (HE):
a form of encryption that allows computation on ciphertexts, generating an encrypted result which, when decrypted, matches the result of the operations as if they had been performed on the plaintext. The purpose of homomorphic encryption is to allow computation on encrypted data.

Trusted Data Computing

The trusteddata exchange emphasizes protecting privacy during data transfer and storage, while trust data computing emphasizes safety during data usage and processing. Off-chain computing, data desensitization, MPC, and HE are essential techniques for trusted data computing. MPC and HE, in theory, are feasible. However, MPC requires a large amount of interaction, HE requires large computation, limiting their performance and efficacy and preventing large scale adoption.

Currently, the Trusted Execution Environment (TEE) is a more feasible option, providing three features:

> 1. Security, TEE is an isolated environment, unauthorized devices and operating systems cannot operate on it.
>
> 2. Privacy, programs running at TEE will be encrypted, unauthorized devices and operating systems cannot them.
>
> 3. Verifiable, under encryption, codes running at TEE could receive verification from outside environments.

Application Scenarios

GXChain Features

GXChain is a developer-friendly fundamental blockchain and it also has millions of users. Based on the DPoS consensus mechanism, GXChain is high-throughput, scalable, and efficient. GXChain equipped with many amenable functions, including G-ID, GVM, BaaS, Blockcity-Pay, TEE, and Oracle Machines, making it convenient for application development. The following features dictate its boundless commercial value:

High Performance and Scalability

In theory, GXChain is capable of processing up to 100,000 TPS. Considering the growing demand of On-Chain business, GXChain can expand both horizontally and vertically, enabling even higher transaction speed without a hard fork.

Massive Data Support

GXChain equipped trusted data On-Chain and trusted data exchange modules, supporting every area. Developers can trade and use these data under authorization by the data source at TEE. Applications on GXChain can use personal data of users, after authorization and desensitization, which is also compliant to GDPR. Based on this support, developers can better acknowledge the need of users.

Developer Friendly

GXChain has abundant API, IDE, and developer documentation which supports many programming languages. Also, the GXChain Developer Platform has rich resources, helping developers to begin, launch, and commercialize their applications.

Blockchain as a Service (BaaS)

GXChain provides BaaS API, which is based on multiple party bookkeeping contracts and IPFS. The BaaS combines the efficient storage and read ability of IPFS and powerful booking ability of GXChain. Any data storage can be traced on the blockchain forever.

Dynamic Global Parameter Adjustment

GXChain can adjust global parameters without a fork; GXChain committee can propose to change GXChain parameters, including block size, block time, and transaction fee.

Smart Contract IDE

GXChain developed a tool for developers to compile, deploy, and invoke smart contracts rapidly.

Pay Transaction Fees with any Asset

Assets issued in GXChain can be used for paying transaction fees. An asset issuer will stake GXC to maintain the exchange rate between an issued asset and GXC. This mechanism is like the issuer using GXC to purchase the token he/she issued. As a result, users do not have to hold GXC to use the GXChain blockchain.

Scenarios

GXChain is trusted data internet of value, aiming to serve the global data economy market. Features include high performance, abundant On-Chain services, and massive data support, giving GXChain a solid foundation for large-scale commercial use. GXChain built a thorough infrastructure for the data economy, enabling many commercial applications to provide products and services for users. GXChain provides blockchain solutions for data ownership, data security, data authenticity, and data incentive. In brief, we believe a data ecosystem based on GXChain could grow healthy and strong, covering finance, data management, social networking, gaming, healthcare, travel, and other fields.

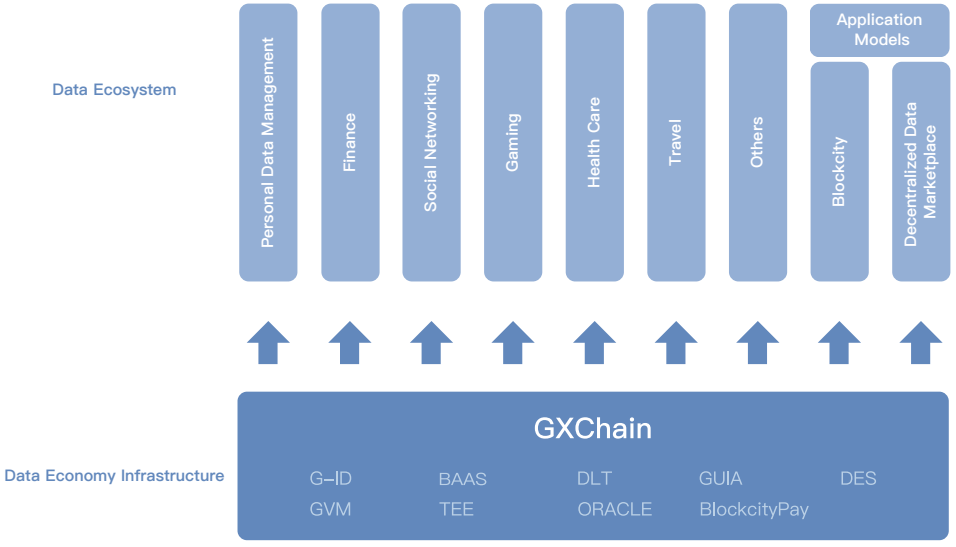


Fig.6. Application Field of GXChain

Application Models

Blockcity

Blockcity is the entrance for users to experience the blockchain world. It is a large-scale mobile app, based on GXChain. Blockcity attracts millions of users through "Mining" incentive. Moreover, many great dApps are introduced to Blockcity, which provide various services. One of our targets is to make Blockcity the largest blockchain dApp platform worldwide and help dApps to easily commercialize and benefit everyone. In the future, Blockcity will work on the trusted data economy and help users take control of and earn from their data.

Decentralized Data Marketplace (DDM)

The DDM provides a unique and novel solution for cooperation. Different from centralized data exchanges, including data middleman, data black market, the development of DDM based blockchain technology enables users to trade data peer-to-peer. The exchange does not cache data, prevents fraud, protects privacy and copyrights. Currently, the data marketplace is providing services for various industries, including government, finance, health care, and logistics. DDM solved critical problems in data exchange and circulation, which could be used by society and realize the value of data.

Personal Data Rights and Interests

Using On-Chain data to help users retain ownerships of their own data, and monetize their data. Currently, personal data is not well protected. Data breaches, the black market, and false data ownership are prevailing. Half of the fortune 500 companies had data safety issues, including data breaches and hacks. Big internet companies and black-market data peddlers make billions of dollars in profit from data of users, without sharing any profit with the users who generated the data in the first place. Using blockchain technology, GXChain provides a new way for users to collect their data themselves and manage it privately at GXChain, through asymmetrical encryption. Only users' Data-Key could unlock their data, which truly enables users to take full control of data ownership and potentially profit through legal monetization of personal data. Others cannot acquire or use your data unless getting authorization from you. Moreover, there is a token incentive for users who enable others to use their desensitized data.

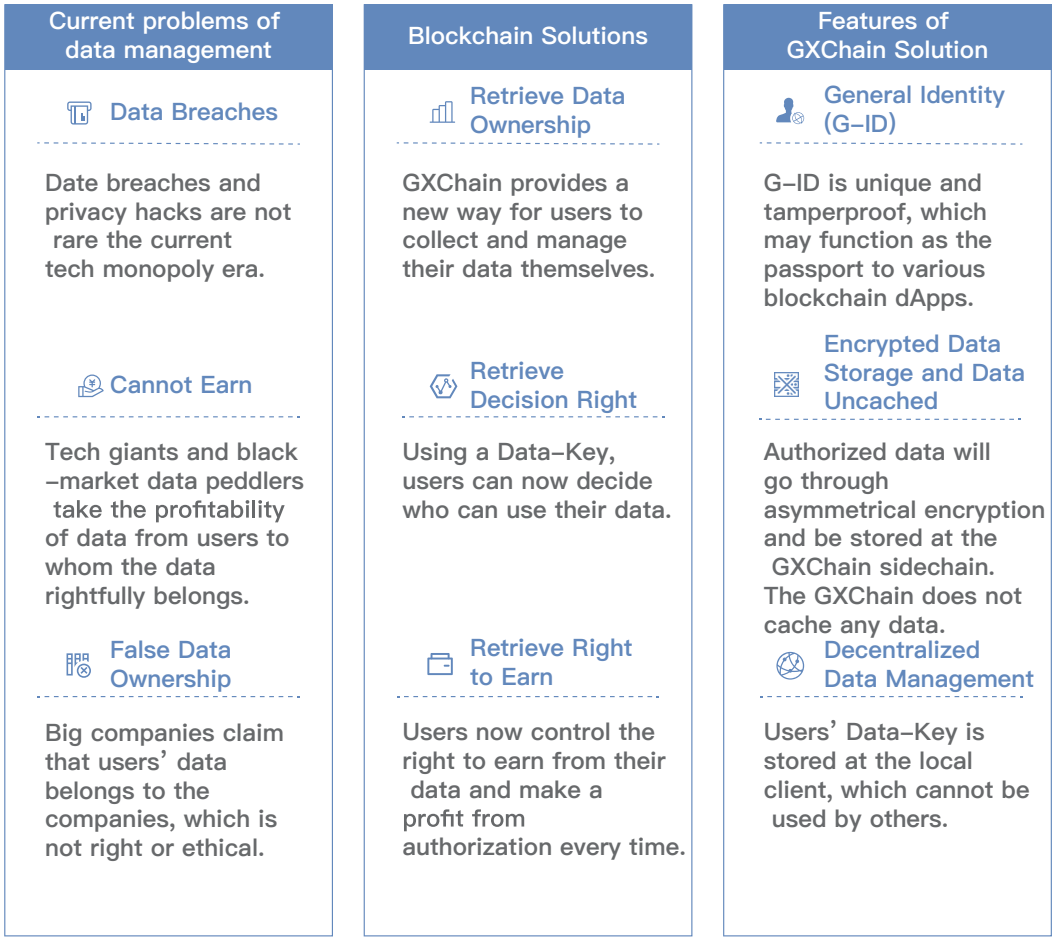


Fig.7. Comparison Between Traditional Data Management Methods and GXChain Solutions

Financial Services

Finance is the earliest commercialized field for blockchain. The emergence of Bitcoin is direct to solving the problems of the current monetary system. Later, blockchain technology gradually became adopted for cross-border payment and rapid settlement. Currently, blockchain technology is being used more and more widely in the financial area, including banks, insurance, equity trading, and derivatives. Many financial institutions, especially banks, are exploring and developing their blockchain technology, as shown in many banks' annual reports. Many blockchain projects have grown from proof of concept to prototype, and some projects have already realized considerable adoption and commercialization. Armed with On-Chain trusted data, distributed storage, and verifiable data storage techniques, GXChain provides solutions for rapid and low-cost credit verification for the financial industry.

Data and information are the keys to financial applications and products. Risk plays a vital role in the financial industry, and risk control depends on massive data. GXChain is a public blockchain with abundant trusted data, providing great support for risk control. For example, companies may send ERP, stock, cash flow, logistics, and business data to the blockchain, and exchange and compute with On-Chain data, which could provide genuine and effective risk control for supply chain finance. The transparent and tamperproof nature of GXChain could better ensure the data authenticity and consistency for financial risk management models.

Social Network

Networking is a basic need for human beings, which makes the social network the most fundamental and important application at this time. As of 2017, among all global internet users, 73.9% of them use the social network, which is a huge number and a good field for massive adoption of the blockchain. Current social networks have many issues, including fake accounts, bad security, offensive content, and a poor compensation for content creators. To our knowledge, there is no blockchain application presently that is ready for massive adoption.

Social Network applications based on GXChain could better solve that problem. Data sent to the GXChain could be better protected from fraud and breach, thanks to asymmetric encryption technology. Trustable data exchange modules could allow users to exchange their information safely, reducing asymmetric information, and improving understanding. Decentralized social media could protect everyone from forced advertising and content

distribution, making users the content judge again. Moreover, the introduction of the token to a social network could better stimulate quality content production.

Social applications based on GXChain could provide more convenient and accurate services, thanks to massive On-Chain data. For instance, the credit information service on GXChain could rapidly help two strangers get genuine information from each other. Currently, GXChain has abundant personal information, and everyone possesses a unique G-ID to bind their information, including credit card history, e-commerce, pension fund, education, age, and phone number. Those data may be stored on the GXChain through trusted data storage modules, which ensures their authenticity and security. For example, if person A wants to better know the information of person B, he can apply to check B's information, after getting B's approval, B can use his Data-Key to unlock his data and authorize A to check the information. We believe blockchain technology and the massive On-Chain data of GXChain can significantly empower social networks and help related applications commercialize.

Gaming

The token economy could also integrate with the gaming industry, which also has a large market and has been growing rapidly over the past 20 years. There are nearly 600 million gamers in the world, equating to holding up a more than 250 Billion dollar market. However, gaming developers are facing many difficulties, most games have a very short lifetime, and active users often decrease rapidly, despite a few top games operated by several titans in the industry. Also, pay rate and ARPU have little room for improvement. Blockchain technology offers a chance for gaming developers to address some of these issues. First, the stage of development of blockchain is early, providing a relatively balanced market. Second, the token economy could bring more user incentive and desire to participate. Blockchain-based gaming has a novel worldwide market, which has quality customers. GXChain has millions of high-net-worth users and supports handy token issuance, which is a great catalyst for gaming startups. Two famous games based on GXChain already proved the above statements. Moneyhorse, an artificial pet education game, attracted 240,000 users and generated 6 million CNY revenue in 3 months. Blockchain and Racing, another game based on GXChain, received token deposit worth more than 1.3 million CNY on launch day, which an ARPU of 1000 CNY, far beyond the industry average of 300 CNY ARPU. In the future, GXChain ecosystem will have more interesting games and boost gaming developers considerably.

Health Care

Healthcare accounts for a significant part of a country's economy. Blockchain in health care also has tremendous development potential. Blockchain technology could help to trace every transaction among pharmaceutical manufacturers, suppliers, and patients, which is essential for verifying and preventing counterfeit drugs. Tapan Mehta, market development executive, at a healthcare and life sciences services practice, at DMI, was quoted in Healthcare IT News, saying, "A blockchain–based system could ensure a chain–of–custody log, tracking each step of the supply chain at the individual drug or product level." "Working off of that would not only make it possible to distinguish the real thing from the counterfeit but, "to trace every drug product all the way back to the origin of the raw material used to make it.

GXChain is incubating a decentralized data exchange in the healthcare field, which aims to solve circulation problems of medical data. The project employs token as an incentive to motivate users to upload their data to the blockchain. For instance, an individual could allow and authorize their medical data to be used by a specific company and get a token reward in exchange. Additionally, this project could solve the data silo issues when patients seek healthcare outside of their country, using blockchain technology, one can rapidly share his medical data to healthcare providers worldwide.

Others

There are many other useful applications on the GXChain ecosystem and improving many aspects in human life. The high efficiency, abundant On–Chain services, and massive On–Chain data of GXChain could empower applications in every walk of life, including retail, catering, food traceability, renting, real estate etc. People cannot live without credit and trust; any credit–related application could build nicely on GXChain.

Massive data on GXChain could provide a solid credit evaluation service for applications that have credit evaluation needs. For instance, Lucia is a credit renting community that commercialized based on GXChain. Using GXChain to connect anyone who has need for renting, under the incentive of token, to build a credible and highly autonomous renting ecosystem. GXChain is helping everyone access the data they need, or to monetize the data they produce, and every steps counts.

Business Model

Utility of GXC

GXC is the core asset of governance and application on GXChain, with a total supply of 100 million. GXC is Similar to ETH on Ethereum network, EOS on EOSIO. Figure 8 depicts the business model and utility of GXC.

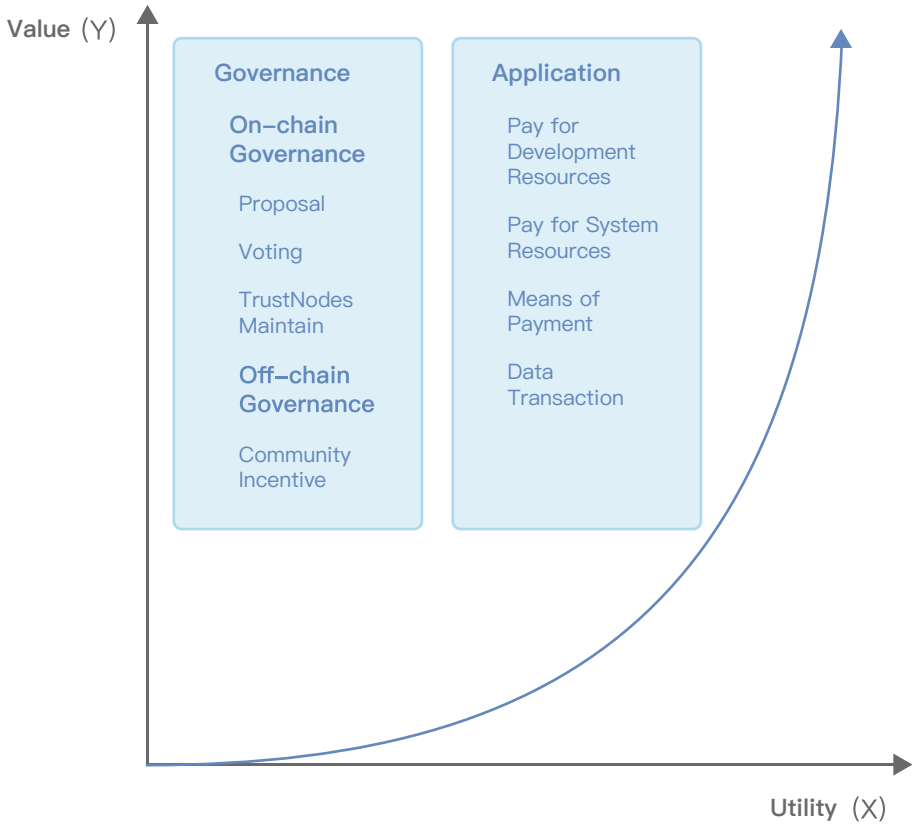


Fig.8. Utility of GXC and Business Model

Governance

GXC plays an important role in the On-Chain governance and off-chain governance. For On-Chain governance, GXC can be used for expressing opinions, for off-chain governance, GXC acts as an incentive.

For On-Chain governance, GXC has the following utilities:

> 1. On-Chain Proposal: committee members can make proposals, which consumes GXC, also, the approval of the proposal requires the committee to use GXC as payment.
>
> 2. On-Chain Voting: GXC could be used as the ballot for election of TrustNodes and policy committee members.
>
> 3. TrustNode maintainence: GXC will be consumed when creating and changing a TrustNode.

For off-chain governance, GXC is used as an incentive for developers and general users. GXChain Foundation will reward people who actively participate in GXChain community development.

Value of Utility

Besides governance, GXC has broad utility in the data economy. It plays a vital role in Development Resources, System Resources, and Means of Payment in dApps, and Data Transaction as shown is table 1.

Table 1 GXC Utility Details

Development Resources	dApp creation Smart Contract Deployment Use BaaS Asset Issuance Developer Registration
GXChain System Resources	Account Creation Account Upgrade Transaction Calling DApps Calling Smart Contract Using other Infrastructure of GXChain
Means of Payment in dApps	All dApps based on GXChain support GXC as payment for services and goods
Payment for Data Transaction	When others need personal data, they can use GXC to purchase it from users, under their consent, and acknowledgment.

Ways to Acquire GXC

1. Participate in GXChain “mining”, as the role of TrustNodes
2. Blockcity Rewards
3. Finish tasks and quests
4. Community contribution
5. Service fee income from applications
6. Data exchange income.

GXC Distribution

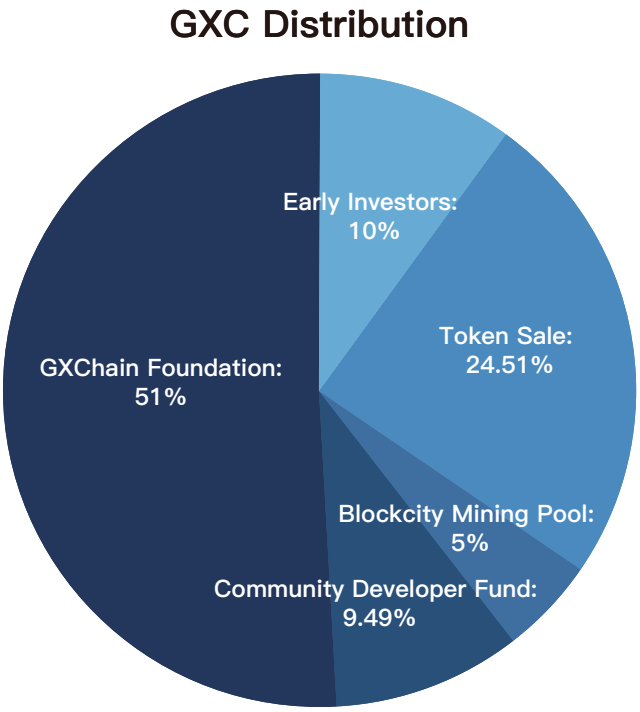


Fig.9. Distribution of GXC

Ratio (%)		Distribution	Details
10		Early Investors	Distributed to the earliest investors
24.51		Token Sale	Sold to a public investor in March 2017
5		Blockcity Mining Pool	The incentive for users to use Blockcity dApp, and authorize their data
9.49		Community Developer Fund	Fund to incubate developers to build dApps based on GXChain
51	21	Founding Developers	Will be used as a bonus for GXChain developers. Also, can be used for people who contribute significantly to the project.
	10	GXChain Ecosystem	Will use for the construction of GXChain data ecosystems, such as developer community growth, Hackathon, competition, and conference
	6	Marketing	Will be used for community operation, global press release and broadcast
	4	TrustNode Rewards	Incentive for TrustNodes
	10	Operations	Daily Operations, partial employee salary, accounting fees

Evolution of GXChain Projects

Timeline

August 2016, The GXChain project established

October 2016, Release data acquisition module–Metrix 1.0

February 2017, Release GXChain whitepaper 1.0

June 2017, GXChain main net launch, Decentralized Data Marketplace 1.0 launch

June 2017, GXC(GXS) start to trade at yunbi.com

August 2017, opened GXChain source code

September 2017, Decentralized Data Marketplace achieves commercialization

October 2017, Release GXChain mobile wallet

November 2017, Release GXChain whitepaper 2.0, discussed “CBD” data ecosystem

January 2018, Release personal mobile app–Blockcity, users passed 100,000 in 24 hours

March 2018, Blockcity passed 1 million users.

May 2018, Release GXChain BaaS.

June 2018, Decentralized Data Marketplace upgrades and serving more than 100 financial companies.

July 2018, Blockcity passed 2 million users.

August 2018, Release GXChain smart contract 2.0 test net, supporting WebAssembly.

September 2018, GXChain wallet account passed 1 million.

Roadmap

October 2018, Release GXChain whitepaper 3.0, discussed the role of GXChain in data economy.

Q4 2018, Release GXChain smart contract 2.0 main net.

Q4 2018, main net upgrade, replace GXS by GXC with ratio 1:1. GXC will become core asset in GXChain.

Q1 2019, Trusted Execution Environment (TEE) development, further improve the data security and privacy.

Q1 2019, Oracle Machine development, expand the application of GXChain virtual machine (GVM).

Q2 2019–Q2 2020, GXChain 2.0 development, explore a more developer friendly while highly standard fundamental blockchain infrastructure.

Conclusion

The whitepaper illustrates a technical upgrade from app–chain to the fundamental blockchain, including a revolutionized governance and consensus. GXChain will use the vision that blockchain technology could rebuild a credible world, armed with democratic, transparent, and decentralized governance, as well as more extensive community participation, to develop a trusted data internet of value.