



SHENZHEN GACHAIN TECHNOLOGY CO,.LTD complied

目录	
The Leading Figure	6
Declaration	8
Description	8
Copyright	8
Disclaimer	8
Preface	
The background and significance of the research	and development
of GAChain	
The crisis of trust: A fierce collision between c	entralization and
centralization	13
Inspiration from the law of nature	15
1. The connotation and distribution	of
blockchain	
1.1 Development status of blockchain	19
1.2 limitations of existing blockchain	20
2. The overall structure of the GACh	nain 21
2.1 GAChain	21
2.2 GAChain platform	22
2.2.1 basic services	24
2.2.2 user management	25
2.2.3 Access right management	26
2.2.4 Database	28

2

SHENZHEN GACHAIN TECHONOLOGY CO., LTD.

ź	2.3 The Ecosystem of GAChain28
	2.3.1 Characteristics of ecosystem29
ź	2.4 Virtual private ecosystem
	2.4.1 Create VDE
	2.4.2 Use VDE
	2.4.3 Request Web resources
	2.4.4 The permission of read data32
ź	2.5 Consensus mechanism
	2.5.1 DPoVE consensus mechanism
2	2.6 Smart contract processing mechanism
	2.6.1 Smart contract
	2.6.2 Contract structure
3. 7	2.6.2 Contract structure
3. T GA	2.6.2 Contract structure
3. 1 GA	2.6.2 Contract structure       34         The technical features and advantages of the       42         Chain       42         3.1 Programming languages independently developed by       42         5AChain       42         3.2 Sovereign level management       43         3.3 DPoVE consensus mechanism       43         3.4 Exchange information between ecosystems and other       43         4.5 Smart transaction processing mechanism       44
3. 1 GA	2.6.2 Contract structure       34         The technical features and advantages of the       42         Chain       42         3.1 Programming languages independently developed by       42         5.4 Chain       42         3.2 Sovereign level management       43         3.3 DPoVE consensus mechanism       43         3.4 Exchange information between ecosystems and other       43         3.5 Smart transaction processing mechanism       44         3.6 comparison of the popular concepts between GAChain and       44

	existing blockchain	44
	3.6.1 The concept of subchain and side chain	44
	3.6.2 Cross chain concept	45
	3.7 block bloated and node concept	48
	3.8 Isolation verification	49
	3.9 Token usage and zero rate	50
	3.10 Operation interface	51
	3.11 High performance TPS	52
4.	Industry vertical subdivision areas	53
	4.1 Tax supervision and audit	53
	4.2 Financial services	55
	4.2.1 Banking system	55
	4.2.2 Internet Finance	56
	4.3 enterprise financing service platform	60
	4.3.1 The overall process of financing supervision	60
	4.3.2 User management	62
	4.4 Supply chain	63
	4.4.1 supply chain finance	64
	4.4.2 Tracing the source of supply chain	69
	4.5 Internet of things	71
	4.5.1 The data security of the blockchain of the Internet of	
	things	71

4.5.2 Homomorphic encryption7	3
4.6 Intellectual property services7	4
4.6.1 The existing problems of7	4
4.6.2 Based on the GAChain of intellectual property services7	7
5. GAChain token: GAC8	1
5.1. How does a block generate?8	1
5.2. Incentive costs generated by the block	1
5.3. GAChain system authentication GAC8	2
6. Common problems8	3
7. Terms and definitions	1
7.1 The main terminology of blockchain technology9	1
7.2 GAChain platform terminology9	4
8. Conclusion	1
8.1 the fundamental value of the spirit of the Internet and the	
blockchain10	1

# **The Leading Figure**



# Lin Wan The Director of GAChain

The early figure who popularize blockchain and translate blockchain articles in China. In 2014, Lin Wan has presented the business decentralization and management centralization concept, and leaded a team to create a disruptive production – GAChain, which updates the entire blockchain configuration, and has applied for more than 10 national invention patent.

- Executive Director of Emercoin Blockchain Engine China
- Co-Founder of GXChain
- CEO of Chain Hold Technology Investment,
- Founder of GAChain
- CEO of Shenzhen GACHAIN Technology,
- Blockchain columnist, pseudonym: Namjar
- Blockchain industry continuous successful entrepreneurs
- Early researchers and sermons for blockchain.
- · Executive director of Emercoin China

#### The development timeline of GAChain

#### 2016.10-2017.2

Payment system

#### 2017.7

Built-in application development

#### 2017.9

GAChain V1 online Digital ecosystem hosting and computing ability interaction

#### 2017.11

Non-complete node

#### The first half of 2018

Smart contract visualized configuration system

2019

GAChain main chain development

Virtual machine program language (G-Languge, Chain-Language) Inherit development environment (Mollis) to

client-side

multiple language resources

Application modulization for import and export

#### 2017.3-2017.6

Contract signature GAChain V1 test network

#### 2017.8

Built-in application development Interface designer Visual interface designer

#### 2017.10

GAChain test network Parallel multithreading mechanism. The client performs resource intensive calculations. Support hybrid database (SQL and NoSQL)

#### 2017.12

GAChain V2 online Publish clients for Windows / Mac OS X / Linux / IOS / Android/ Wechat mini apps

#### The second half of 2018

Global ecosystem network GAChain BaaS platform

SHENZHEN GACHAIN TECHONOLOGY CO., LTD.

### Declaration

#### Description

This document is the 2.0 version of GAChain's white paper, which contains more descriptions of the strategic objectives and technical roadmap of the GAChain. GAChain will keep updating this white paper to present our progress. For more information about development, strategic partner, team of GAChain, please visit GAChain official website. https://gachain.org

#### Copyright

This document is copyrighted by ShenZhen GAChain Technology Co., LTD., and All rights are reserved.

#### Disclaimer

The GAChain will continue to develop its technology and organizational structure, but it goal is to maintain the existing management principles and protect the rights and interests of users and enterprises.

No content in this white paper shall be deemed to constitute any type of content instruction or investment solicitation, nor in any way constitutes an offer or an offer for the purpose of buying any securities in any jurisdiction. This document is not prepared in accordance with or in accordance with any jurisdiction or laws or regulations designed to protect investors.

#### Preface

# The background and significance of the research and development of GAChain

Https://mp.weixin.qq.com/s/XeTWayuZErtD0JAgYW8J3A (Centralization and Centralization)

The characteristics of blockchain are described in many resource descriptions, which have been identified as "decentralization, distributed database", and the version 2 of blockchain has added programmable functions. That is, the automation execution that realized as "smart contract". In view of the current society, we want to ask two questions:

1. Does completely decentralization really bring efficient and transparent to the society?

2. Does smart contracts be able to fully drive the automation execution?

Two questions above are not the most critical ones. The one we need to point out in particular is that:

"Is it true that the cost of all Token services must be paid, and can it be popularized?"

The foundation of the development of GAChain is the solution to problems above. In short, GAChain is not only a technical solution to the practical application, but also a radical correction and subversion of the current direction of the blockchain industry!

### GAChain is not only a blockchain underlying protocol, but also an innovative blockchain operation system.

In May 20, 2018, China's Ministry of Industry and Information Center, publishes "2018 China blockchain industry white paper" on the "China Blockchain Industry Peak Forum". The Industrial Economic Research Institute of the Ministry of Industry and Information Center led the establishment of a joint research group, through the Beijing, Hangzhou, Shenzhen, Guiyang and other all. The field investigation of nearly 100 blockchain industries and application enterprises in many cities in China has made a thorough research on the floor application of blockchain technology, and enumerated the display of typical fields, models and cases. In the field of e-government, "GAChain", which is the focus of the Ministry of industry, has been listed as a "typical case". "Egovernment is the information service and information processing system of the electronic government organs. Through the technology of computer communication and Internet, the government carries out electronic information transformation, thus improving the efficiency of government administration work and the level of government administration according to law. With the further advancement of egovernment and the continuous accumulation of government data, data communication between different departments is very important to improve the efficiency of government administration work. However,

there is a contradiction between safety and efficiency in e-government data sharing. Government service platform involves a large number of sensitive information of personnel and enterprises, and the process of sharing data is complex. It is not only prone to human error, but also easy to be attacked by hackers and lead to information disclosure. With the combination of government agencies, economic data and financial transactions, GAChain has developed a multilevel authority management system for administrative departments. The use of smart contracts and smart laws by GAChain makes the permission monitoring system flexible and allow to automatically track access rights, which achieve data interconnection and interoperability safely. For now, GAChain and the Nansha District government of Guangzhou has established a cooperation relationship regarding to blockchain as a government affair.

In this project, GAChain conducts with the collaborative process of different ecosystem to achieve scientific decision-making, efficient command, improving government service management level effectively, promoting the sharing of multi department resources of government service, shortening the time of circulation, improving the efficiency of business examination and approval, and delicacy management."

12

"China Blockchain Industry White Paper in 2018"}.

In the white paper, the project implementation and application of "GAChain" in the field of e-government are given extremely high recognition and evaluation. At present, China's blockchain technology continues to innovate, and the blockchain industry has taken initial shape. GAChain is closely combined with the industry field and takes its own technical advantages to accelerate the production of blockchain technology in China. The application of industry and enterprise by GAChain will play a key role in the field of blockchain standardization, which made an important contribution for building the modern economic system in China.

# The crisis of trust: A fierce collision between centralization and centralization

Centralization system: The central controller is a system that controls the underlying structure of the system by directly or using the hierarchy of power (for example, to order a middle layer to indicate a lower level of composition). The complex behavior of the system is the result of "control" by the central controller to the bottom layer of the system, including the dynamic supervision of the middle ground.

The complex behavior displayed in the decentralized system is

generated by the operation of the underlying information based on local information and is not affected by any command. This form of control is called "distributed control", or each of the components of the control system is equally responsible for the global and complex behavior of the local information in an appropriate way.

The efficiency of centralization is high, and the cost is corruption and deterioration. Once the massive data of the centralization of the industry giant is exploited maliciously, the consequences is unbearable. For examples, the Facebook's data leak and Wei's event do have certain warning significance impact. With the progress of science and technology, such as the gradual maturity of artificial intelligence, the attendant benefits and threats are increasing, and the crisis of trust in the society is becoming more obvious. Each of us cannot trust his back to the other side in the game. Through competition and merger acquisition, the large-scale centralization platform will gradually form a monopoly, including the current bitcoin mine field, which is more averse to the involved parties to create value, because the status is not equal and the information is asymmetric. Centralization is the root cause of monopoly, and ridging is not a shared economy. Not to mention the "consensus economy" of the technical objectives of the blockchain.

The efficiency of decentralization is low, but transparent and open. Of course, centralization is not absolute. Depending on the specific

SHENZHEN GACHAIN TECHONOLOGY CO., LTD.

14

situation, some situation are more suitable for centralization. Hence, is it not absolute to be decentralized for the sake of decentralization.

For blockchain believers, decentralization is an ideal, but there is also an evolutionary process. Absolute decentralization is a false proposition, and there is no need for entanglement. So, what we may need at the end is a hierarchical structure. Neither decentralization nor complete centralization.

#### Inspiration from the law of nature

People who criticize the blockchain think that the world is centralization, so the "decentralization" blockchain cannot be successful. But in fact, the world is multi centralization. Countries, governments, small business, families, they all have their own center. Even everyone has their own center. So, when the real cooperation happen, trust is incomplete. Blockchains can play a fairer and trusting role among people and groups.

The human autonomic nervous system is a system dominated by the brain, but it is largely unaware, regulating body function, such as heart rate, digestion, respiration rate, pupillary response, urination, and sexual arousal. There are many activities (unconditioned) that are not controlled by the will of the brain, which is called autonomous execution. The central nervous system (CNS) is also composed of the brain and spinal cord in our body's nervous system. In theory it is a centralized control system. But in our brain, our memory is distributed. Therefore, many examples in nature and human have shown that centralization, distributed data structure and information processing are all mixed together. This should also be the form of distributed ledger technology.

The application of blockchain can also learn from the operation of the human nervous system. On a sovereign ecosystem, a distributed data structure application (DAPP) is set up for various application scenarios. The data of each application are stored in distributed encryption, and the documents are automatically transferred and executed through smart contracts.

Therefore, GAChain is a comprehensive platform for business decentralization and management centralization based on current national conditions and real scenes.

The blockchain subverts the existing conventional technologies and concepts, and GAChain subverts the existing conventional blockchains.

# 1. The connotation and distribution of blockchain

The Internet has solved the efficient transmission of information, which makes the free sharing and flow of information less expansive, but the reliability and security of information is not guaranteed. Therefore, the trust system of Internet transactions is facing the threat of collapse. In this context, in 2008, "Satoshi Nakamoto" in the cryptology mail group published the ground-breaking paper "Bitcoin: A point to point electronic cash system", which creates a decentralized trading tool based on the distributed ledger, and the blockchain technology is excavated from the underlying technology of bitcoin.

 Blockchain is a new application mode based on a series of technology integration. Blockchain technology is not a single technology, but a result of a variety of technology integration, including the comprehensive application of cryptography, mathematics, economics, and network science. It is a new type of application mode. These technologies are combined in a specific way, storing all the data in a block mode in a time sequence, using cryptography to link the data blocks in order to ensure the security of data transmission and access. Without a central server, the data can be generated and updated. In this application mode, a decentralization of distributed data systems can be established.

The research on blockchain mainly focuses on one aspect: (1) Explore the solution of problems existing in the current system and the improvement of the system. For example, the traceability and transparency of data in blockchain systems can solve the existing supply chain existing problems, and the blockchain technology, a new information technology, will indeed reform the various fields of economy and society. The development of health care applications based on blockchains is devoted to improving the interaction between users and medical applications and improving the overall efficiency of the medical practice workflow. Using blockchain technology to facilitate the convenience of global bank remittance.

② Explore how to combine blockchain with different fields. The blockchain economy is first applied in the reform of the financial industry, which optimizes the business process, reduces the fraud and rent-seeking phenomenon in the transaction process, and thus reduces the transaction and operation costs, and improves the synergy efficiency. These advantages are also reflected in such fields

18

as "blockchain +" financial services, Internet of things, public services, social welfare and supply chain management.

#### **1.1 Development status of blockchain**

The development track of blockchain is divided into blockchain version 1.0, 2.0 and 3.0. It application area is also expanding with the upgrade of the version. The real estate market service has carried on the research scope of the blockchain. This paper studies how to use the Internet of things and blockchain to create secure shared and economic distributed applications. Record a blockchain application developed for the energy sector. We use blockchain technology to balance the power of all parties involved in corporate governance, and verify the security guarantee based on blockchain technology.

For example, the research on consensus protocol in blockchain system; For user privacy protection, the address privacy of consumers in e-commerce.

The development of blockchain has gone through the process from the bottom of bitcoin platform to the "blockchain +" process, and an economic society about blockchain is slowly approaching. **Blockchain technology reform the existing way of building trust between the existing information interaction, simplifying the value transmission process, removing the uncertainty of execution under the** 

SHENZHEN GACHAIN TECHONOLOGY CO., LTD.

interference of human factors, reducing the transaction cost and improving the efficiency of interoperability.

## **1.2 limitations of existing blockchain**

•The scalability is poor (the amount of data per node increases).

•Low bandwidth and low TPS;

•As the resources of the verification data are densely increased,

the concentration trend is presented.

# 2. The overall structure of the GAChain2.1 GAChain

The GAChain is a distributed public blockchain underlying protocol and is also an innovative blockchain operating system platform. Any "centralization" and "decentralization" operating ecological application environment can be implemented in the operating system platform of GAChain.

Therefore, in order to achieve goals above, the bottom structure and function of GAChain are quite different from most existing blockchain platforms.

 The development and usage of blockchain applications are carried out in a sovereign software environment, called ecosystems. Initially established by the founder of the ecosystem, each ecosystem has its own members and rules, which can be decentralization or centralization.

- Activities in ecosystems are based on creating registers and recording/modifying the data involved using smart contracts, whereas in most other blockchain platforms activities are based on exchanging transactions or messages between accounts.
- Management of access permissions to registers, and relation management between ecosystem members are regulated by a set of rules called smart laws.
- The GAChain integrates smart contract, database and interface pages that can be connected outside of the chains. It is separated from frontend and backend, naturally completes the function of cross chain and cross platform. GAChain can handle complex business environment, and output independent front-end interface according to different application environment.

### 2.2 GAChain platform

The GAChain platform is an application development environment developed and integrated by GAChain Technology Co.,Ltd., and has a multilevel system of access to data, user interface and intelligent contracts. The platform was originally developed for the implementation of e-government projects, so the team decided to name the project as GAChain (E - government as a service). In the autumn of 2017, the test network of the first version of GAChain (V1) was created. The software client of the GAChain platform is named Molis. The software foundation of the Molis client is the set of applications, which consist of user interface, intelligent contract and database table. Its programming language: G Language is the contract language, and Chain Language is the interface editing language. At the same time, the source code refactoring process is started. The software client's code is completely rewritten (based on the JavaScript React Library), creating a new version of the REST API V2, so G Language and Chain Language have been improved. In addition, the concept and function of specialized ecosystem have been developed, and the work of visual page designer has been started, and other correlation changes and improvements have been implemented.

Because the project will not only adapt to the government service projects, but also can be widely used for the development and application of business, personal and other projects. Therefore, our team has made some modifications to the brand logo of the project.

① For projects of government and institutions, the name "政务链" is still used, and the English name is GAChain (Government Affairs Chain).

② for business organizations and individual customers, the Chinese name is "智乾链", and the English name is still GAChain.

By the beginning of 2018, the GAChain platform has been ready to compete with the current mainstream blockchain platform Ethereum and NEO. The team believes that the GAChain, which has the subversive product plan and design, excellent performance and so on, will bring the impact from the concept to the practical application to the existing blockchain products.

#### 2.2.1 basic services

Database management system

The platform' s unified database, copies of which are stored and maintained up-to-date on every full node of the network, is used for storing large volumes of data (registers) and quick retrieval of data by contracts and interfaces. In the formation of a new block and its addition to the blockchain, all full nodes of the platform carry out a simultaneous update of database tables. Thus, the database stores the current (up-to-date) state of the blockchain, which ensures the equivalence of data on all full nodes and unambiguousness of contract execution on any Validating Node. When a new full node is added to the network, the up-to-date status of its database is reached by way of subsequent execution of all transactions recorded in the blocks of the blockchain.

② Cross sectoral collaboration

24

The Molis software client can access database management tools, contract editors, interface editors, and other functions needed to create applications in the ecosystem without the need for any other software module.

Only after receiving the private key for accessing one of the ecosystems can users become users of the GAChain platform. The user can be a member of multiple ecosystems. If you need to switch between ecosystems, you can use the special menu of the software client.

③ Integrated development environment

The Molis software client includes a full-scale integrated development environment (IDE) for creation of blockchain applications. Working with this IDE does not require the software developers to have profound knowledge of blockchain technology.

IDE is composed of the following parts:

- Ecosystem parameters table;
- Contract editor;
- Ecosystem parameters table;
- Interface editor and a visual interface designer;
- Language resource editor;
- Application import / export services.

### 2.2.2 user management

The GAChain has a multi-level access permission management

SHENZHEN GACHAIN TECHONOLOGY CO., LTD.

system. Access rights can be configured to create and change any elements of an application, such as contracts, database tables, interface pages, and ecosystem parameters. Changes in access rights can also be configured.

By default, all permissions in the GAChain ecosystem are managed by their Creator (defined by the MainCondition contract. By default, each ecosystem has this contract).However, after the creation of specialized smart laws, access control can be transferred to all ecosystem members or a group of members.

#### 2.2.3 Access right management

1 Definition of permissions

1. using the ContractConditions function, the contract name can be passed to the function as a parameter. The contract should include the use of data table values (for example, user role tables) and presentation of ecosystem parameters.

2. Using the ContractAccess function. The corresponding contract list can be passed to the ContractAccess function as a parameter.

For example, if we list the accounts in the ecosystem identity and enter the ContractAccess ("TokenTransfer") function in the rights field of the sum of the sum, only allow the operation TokenTransfer contract to change the value in the sum of the sum of the sum (only by calling the TokenTransfer contract to perform the Token) transfer exercise. All

SHENZHEN GACHAIN TECHONOLOGY CO., LTD.

contracts made). The function of the access contract itself can be managed in the conditional part. They may be quite complex, including many other contracts.

3. the simplest way to define permissions is to enter logical
(Boolean) expressions in the permission field. For example, \$member =
= 226310985989020033, which gives the ID of an ecosystem member.

② Specific access right

In order to solve the conflict that is critical to the operation of the ecosystem, there are a number of special parameters (changing\_smart\_contracts, changing\_tables, changing\_pages) in the ecosystem parameter table, which defines the conditions for obtaining access to any specific permissions of any intelligent contract, database table and page. These permissions are set up using special smart contracts, such as voting for members of ecosystem or requiring signature of different user roles.

③ The significance of access right management

The access right management of user roles is the foundation for realizing the "sovereign hierarchical management" of the GAChain platform. GAChain is based on the actual reality. As each enterprise or department has the core data, a simple smart contract cannot completely meet actual environment. Through the management of user role access rights, the efficiency of enterprise internal, even inter departmental coordination of office work, can be able to achieve "conditional sharing, completely sharing, non-sharing". It not only protects the data information of enterprises, but also gives consideration to the level transmission of information in the same environment. Thus, the data encryption can be controlled and shared.

#### 2.2.4 Database

Management tools for ecosystem data tables can be entered from the table menu of the Molis software client management tool. The following functions are now implemented:

- Look at the list of data tables and their contents;
- Create a new datasheet;
- Add a new table column and specify a data type in the column: Text, date, role, number, etc.
- The access right to manage the input data and change the table structure.

#### 2.3 The Ecosystem of GAChain

The data space of the GAChain platform is divided into a number of relatively independent clusters, that is, relatively independent ecosystems. Each ecosystem is similar to an independent virtual machine, and enabling network users to carry out various transactions and activities. GAChain ecosystem is an autonomous software environment composed of a certain number of applications and users, and can work together in the GAChain ecosystem by creating different applications of the ecosystem. Moreover, owners of any GAChain account can create one or more new ecosystems.

#### 2.3.1 Characteristics of ecosystem

- The application on the GAChain platform is a system with data tables, contracts and user interface access rights. These applications can implement all functions or services.
- Each ecosystem creates its own database tables for the development of applications. However, this does not exclude the possibility of accessing tables from other ecosystems by specifying an ecosystem prefix in the table name. The database table is not bound in any way, nor does it belong to a specific contract, which can be invoked by all applications. A specific contract, namely smart law, can be used for access right management, and the access right to input data into the table can be set by configuring access rights.
- It is important to note that the design and creation of an application on GAChain does not require software developers to understand the network and its underlying protocols, nor to understand the formation of the blockchain of the database on a complete node, and how to synchronize the algorithm. On the Molis software client page, create the element of the application, or read the data from SHENZHEN GACHAIN TECHONOLOGY CO., LTD.

the table and execute the contract, which is very similar to the software environment module on the local computer.

- The GAChain platform application is a system composed of smart contracts, database tables, and interfaces that perform specific functions and provide dedicated services. The application is not an autonomous program module, and the only thing that is unified with application elements is the performance and data exchange of a specific function. The boundaries of applications are not necessarily strictly defined because their elements can be used in multiple applications simultaneously.
- The Molis software client is an integrated development environment that is developed using the React framework, including an interface editor and a virtual interface editor. An interface is an important component of an application, providing data retrieving and displaying from the database table, creating forms for receiving user input data, passing data to contracts and navigation between the application pages. The interface is similar to the smart contract stored in the blockchain, so that it can prevent forgery when the software client is loaded.

### 2.4 Virtual private ecosystem

In the GAChain, a Virtual Dedicated Ecosystems (VDE) can be created.

```
SHENZHEN GACHAIN TECHONOLOGY CO., LTD.
```

The virtual private ecosystem has all the functions of the standard ecosystem but working outside the blockchain can interlink the data from the outside chain to the chain data in order to play the role of cross chain.

In VDE complete application, you can use smart contract and template language, database tables, and other software client functions to create. You can also use API to invoke the contract of the blockchain ecosystem.



#### 2.4.1 Create VDE

VDE can be created on any full node (complete node) on the network. The node administrator defines an ecosystem list that allows the use of specific ecosystem functions and assigns a user with the access right of the creator of the ecosystem, which has the right to install the application, approve new members into the ecosystem, and configure access to the ecosystem resources.

#### 2.4.2 Use VDE

VDE can be used to create a registry and to send verification information to the user's e-mail or phone, store the data in a non public access server. It can write and test the work of the application and further output it to the blockchain ecosystem. In addition, in VDE, contract execution can be invoked, which allows the creation of oracles for receiving data from Web and sending it to the blockchain.

#### 2.4.3 Request Web resources

The main differences between virtual ecosystem (VDE) and standard ecosystem lie in: HTTPRequest can be used to send requests from any contract to any network resource by using the HTTP/HTTPS function.

## 2.4.4 The permission of read data

Because the data in VDE is not saved to the blockchain (but can be read), they can choose to configure the access right to read the data table. You can set read permissions for separate columns, or you can set read permissions for any rows that use special contracts.

# 2.5 Consensus mechanism

## 2.5.1 DPoVE consensus mechanism

Delegated Proof of Value of Ecosystem (DPoVE) (authorized ecosystem value certification mechanism): It is the consensus algorithm of the GAChain, as an important verification node of the platform ecosystem (the ecosystem with the value proof mechanism), which is confirmed in the allocation of voting. The algorithm ensures the maintenance of the normal operation of the network. The ecosystem is entrusted to prove that it satisfies some formal indicators such as the number of transactions, the number of members, and so on, thus forming a valuable ecosystem. In order to avoid the activities generated by BOT in counterfeit ecosystem, it participates in the verification of approved nodes. The system is implemented by GAChain token GAC owner to vote.

# 2.6 Smart contract processing mechanism2.6.1 Smart contract

A smart contract (hereinafter referred to as "contract") is the basic element of an application that initiates and executes a single operation from the user interface through a user or another contract, which is usually added, modified, or queried in the database table. All operations that use data in an application are formed through a contract system and interact with each other through function calls in database tables or contract bodies. The contract system in the GAChain is written by G Language, which is developed by the GAChain team, and compiled into bytecode. The language includes a set of functions, operators, and constructs, which can be used to implement data processing algorithms and database operations.

The contract can be edited, but if the false information is added to the contract, it cannot be edited. The data operation in the blockchain is executed by the latest (current) version of the contract. All historical records of the contract changes are stored in the chain and can be viewed from the software client.

#### 2.6.2 Contract structure

contract MyContract {
 //data section
 data {
 FromId address
 Told address
 Amount money
 // The data used here to declare the input includes (name and
type of variable)
 }

```
//condition sction
    func conditions {
       •••
       // This is used to validate the data.
    }
    //action section
    func action {
       •••
       // The action part of a contract is usually a operation of the
database table.
    }
}
```

#### • Data section

In the data part, we describe the data entered in the contract and

the parameters used to receive the data form.

contract my {

data {

Name string



• Conditional part

The data is verified by the preset condition. If a mistake is produced, such as: "Serious errors, warnings and information errors" stop contract operation.

```
if fuel == 0 {
    error "fuel cannot be zero!"
}
if money < limit {
    warning Sprintf("You don't have enough money: %v < %v",
    money, limit)
}
if idexist > 0 {
```

.
```
info "You have been already registered"
```

}

Behavioral part

The operation part contains the main program code of the contract, which is used to retrieve additional data and record the result value to the database table.

Contract variable

The contract declared in the data part is passed to the other parts by the data name of the \$symbol, so as to realize data input. The \$symbol can be used to declare additional variables; these variables are global in this contract and all nested contracts. Contracts can access predefined variables that contain data about transactions that invoke the contract. For example:" Time, ecosystem ID, block numbers including this transaction, contract name" and so on.

• Nesting contract

Nested contracts can be invoked from the conditions and parts of the closed contract. Nesting contracts can be directly invoked using the parameters specified in parentheses after the name (NameContract (Params)) or using the CallContract function (using string variables to pass the contract name for them).

- Contract signature
- Suppose there is a contract TokenTransfer:

If TokenTransfer ("Recipient, Amount", 12345, 100) is signed in a contract initiated by a user, the 100 pass (Token) will be transferred to account 12345.Under such circumstances, the user identity of signing an external contract will no longer appear in transaction processing. If the TokenTransfer contract requires additional user signature when it invokes the contract, it may avoid the above situation. The following steps are as follows:

 Add a field named Signature in the data part of the TokenTransfer contract, which contains "optional hidden".Parameters, because signature fields contain signatures, there is no need to directly invoke additional signatures in the contract.

contract TokenTransfer {
data {
Recipient int
Amount money
Signature string "optional hidden"
}
}

② Add contents presented blow to the signiture table(the signiture of GAChain Client):

TokenTransfer contract name;

The values of the field names will be displayed to users, their text descriptions.

Text information is displayed after confirmation.

In the current example, it will specify two fields, Receipient and Amount:.

- Title: Do you agree to send money to the recipient?
- Parameter: Addressee: Account;
- Parameter: Amount of money: Amount (qGAC).

Now, if the TokenTransfer ("Recipient, Amount", 12345100) contract is invoked, the system error "Signature is not defined" will be displayed. If the contract is called in the following way: TokenTransfer ("Recipient, Amount, Signature", 12345, 100, "XXX... Xxxxx"), the system error will occur when the signature is verified. When the contract is called, verify the following information: Time of the initial transaction, user ID, the value of the, value, and so forged signature will not happen.

In order to see remittance confirmation when the user calls the TokenTransfer protocol, you need to add a field with an arbitrary name and type string, with an optional parameter signature: contractname. After calling the closed TokenTransfer contract, you only need to forward this parameter. It should also be borne in mind that the data part of the external contract must also describe the parameters of the guarantee contract (they may be hidden, but will still be displayed after confirmation).For example:

```
contract MyTest {
    data {
        Recipient int "hidden"
        Amount money
        Signature string "signature:TokenTransfer"
    }
    func action {
        TokenTransfer("Recipient,Amount,Signature",$Recip
    ient,$Amount,$Signature)
    }
}
```

When sending a MyTest contract, the user will ask for additional confirmation of the transfer to the designated account. If other values such as TokenTransfer ("Recipient, Amount, Signature", \$Recipient, \$Amount+10, \$Signature) are listed in the accompanying contract, an invalid signature error will appear.

# 3. The technical features and advantages of the GAChain

# 3.1 Programming languages independently developed by GAChain

• G language

The contract in the GAChain is written in native scripting language, developed by the GAChain team, called G Language, and compiled into bytecode.The language includes a set of functions, operators and construction, which can be used to implement data processing algorithms and database operations.

• Chain Language

In the platform of GAChain, the page template language (Chain Language) is a function language, which can nested multiple callable functions to each other without destroying the compatibility of the original template to add and call new work modules.

### 3.2 Sovereign level management

In GAChain, we can create an independent ecosystem environment with absolute sovereignty, which can achieve various operations and applications, and can make flexible permission division.Set administrator permissions, visitors, user privileges, etc.

## 3.3 DPoVE consensus mechanism

- Avoid 51% force attacks to protect the authenticity of each user data in the GAChain.
- The self-built trust system in the GAChain.

## 3.4 Exchange information between ecosystems and other ecosystems.

- According to the Rule that define access permission, should any expression in the G Language input to the permission field. If the request is passed, the access will be granted.
- If the permission field is not authorized, it is automatically set to false and prevents the execution of the related operations.

## 3.5 Smart transaction processing mechanism

- Configure the transaction content flexibly;
- The smart contract mechanism is connected to the national legal system, and all the eligible transactions are automatically monitored in real time.
- Multi node concurrent processing

## 3.6 comparison of the popular concepts between GAChain and existing blockchain

The GAChain is different from the existing conventional blockchain from the actual social rules. It has different characteristics compared with the popular concept in the conventional blockchain, but it also has a certain similarity.

#### 3.6.1 The concept of subchain and side chain

In traditional blockchains, subchains or side chains are the derivatives of the main chain (parent chain), usually packaged and verified by the blockchain of the parent chain, and then forming multiple independent subchains or side chains, from the height of the chain, in accordance with the diversity of the participation of the business entities, business relevance, business performance requirements and privacy requirements. It is now separated to improve the parallel processing capability of the entire blockchain, and is also a way of blockchain parallel processing transactions.

But in GAChain, each account can create one or more ecosystem with independent management authority, and multiple applications can be freely deployed in the ecosystem .From an implementation point of view, each application is equivalent to an independent function, and each application is equivalent to a side chain, that is, it can be understood that each account can create multiple side chains which all of which belong to an ecosystem, and the environment belongs to the public chain of the GAChain.

Therefore, we can understand the more powerful functions of the GAChain than the traditional conventional blockchain.

Regular blockchain chain = side chain 1 (function 1) + side chain (function 2) +... + side chain n (function n)

Government chain public chain = ecosystem 1 (ecosystem 1= function 1+ function 2+..... + function n) + ecosystem 2 (ecosystem 2= function 1+ function 2+... + functional n) +...+ ecosystem n (ecosystem 1= function 1+ function 2+... + functional n)

### 3.6.2 Cross chain concept

There are various blockchains in the world. Each independent blockchain maintains its own independent value economy system. The cross-chain function of the blockchain is the center of the independent

SHENZHEN GACHAIN TECHONOLOGY CO., LTD.

blockchain, which carries the function of the value exchange of different value system blockchains, and each value trading market on the cross chain blockchain is a cross chain contract service.

In the traditional blockchain, there are two main types of chain composition in cross chain blockchain. One is the main chain, the main chain of the cross chain is only one, the other is the adaptive sub chain, and the adaptive sub chain has at least 2. The main chain is connected by the main chain of the cross chain, and there is no trust relationship between the sub chains, but the transfer is trusted by the main chain. The aptamer chain and the main chain interact in accordance with the set protocol to achieve the purpose of trust transfer and transaction delivery.

From the above, cross chain blockchain itself needs to have the same blockchain platform services as independent blockchains, such as contract compliance, security control, chain consensus, chain service management, chain management, and development and maintenance. It shows that the cross chain is built on the blockchain that solves cross chain functions to solve the problem. The plan is "to design a wheel suitable for a car," which greatly reduces the effect of implementation.

From the technical point of view, the GAChain is a blockchain underlying operating system. Since it can be called an operating system, it shows that any programming can be carried out, either decentralization or centralization of the application, which can be implemented in the GAChain.

So, what are the essence of various blockchains? And what is the value of the circulation on the blockchain?

The nature of the various blockchains is nothing more than a different computer algorithm. No matter which algorithm, the value of the chain is different account number (purse address), and the account is generated by the algorithm. Then, if the corresponding account address is generated according to its algorithm, can it bear the value of the blockchain?

Since values are retained on the main chain of the blockchain, the main chain has the value of "post" and "get". If there is a system that has "post" and "get" functions and has the same account address generated by the same algorithm, the problem can be solved.

The answer, of course, is yes!

The GAChain has the ability to create various applications in an independent ecosystem, and the application is composed of multiple database tables, intelligent contracts and interface pages in the GAChain. More importantly, the VDE (virtual private ecosystem) in the GAChain has the "post" and "get" chain outside the chain. The function of information shows that the information that the GAChain can interact with not only in other centralization data, but also contains the "value" in other blockchains, so in an independent ecosystem of the GAChain, the corresponding account address (wallet address) is generated according to the algorithm of different blockchains, and it is carried out by VDE outside the chain. The transmission and exchange of value can achieve the function of cross chain.

The GAChain is so simple and convenient that we need to design cross chain to solve the problem.

#### 3.7 block bloated and node concept

Whether it is a bitcoin, the ether workshop or all the existing conventional blockchains, each application on a blockchain (DAPP) must synchronize all the data of the blockchain. Such as the need to use its application, and must synchronize the whole blockchain data, which is bound to cause the inconvenience of the users and developers of the DAPP and cause each other. The time in which the wallet needs to synchronize data is greatly increased.

In order to solve the above problems, and to provide a friendly production environment for the developers of each project. GAChain takes the main node and the sub node. The main node needs to synchronize all the data of the whole network, and the authorized main node is responsible for the verification of the package block, which is generally responsible for the large data centers in various places and the sub nodes. It is only necessary to synchronize the data of this project, set by each project developer, thereby greatly reducing the data storage cost of the project developer.

#### 3.8 Isolation verification

Isolation verification first appeared in the bitcoin area transfer, its intention is to achieve the realization and confirmation of bitcoin transfers without touching the bitcoin network. Later, it is widely used in various "payment class" blockchain projects.

The question is, is the biggest role of isolation verification in order to complete "offline payment" ? Will the isolation verification function play a greater role when the blockchain has been extended to various scenarios?

We have repeatedly stressed that the GAChain is a blockchain operating system based on actual scene reality of real society, and isolation verification is a very important function, which is used in the LAN environment that is not often connected to the Internet. Such as egovernment environment, enterprise internal production management ring, and so on.

GAChain is used to verify that the packaged authorized master node is located in the big data centers all over the country. Apart from being responsible for packing verification, it also has the functions of disaster recovery and tampering. In the production environment that is not often connected with the Internet or needs to be connected to the Internet through a special VPN, its sub nodes use the database built by the GAChain to store the data temporarily, ensuring normal production and synchronizing the raw data to the main node when the sub nodes are connected to the Internet.

The production environment is sovereign, and the premise is that the terminal users trust the sub node (such as government office), and because the internal data is stored in the database, it does not need the primary node to package and verify immediately. The speed of its concurrent transaction is not limited to the speed of the network, so it can be applied to the interaction of data quantity in a large system.

#### 3.9 Token usage and zero rate

In the conventional blockchain, token is the value basis of the blockchain project and exists in the way of fuel (Gas), that is, if the blockchain is to be used, it must be purchased as the use fee.

In order to use some kind of function, will you open a digital currency exchange, authenticate, recharge, purchase and return to the blockchain account? Will such a way be recognized and popularized by the public?

The answer, of course, is no!

In the GAChain, all the ecosystem created by the account can issue one or more token, which is used for the circulation or fuel of the environment. In some special circumstances, there is no need to issue the evidence, such as the e-government system, the enterprise internal production management system and so on. No matter what kind of ecosystem, in the event of the transaction (transfer or transaction), there is no need to use the foundation of the GAChain to verify the GAC and achieve zero rate, which ensures the ground and popularization of the application of various blockchain projects.

Where is the role of GAC in the foundation of the GAChain?

In the GAChain, each application is composed of multiple data tables, multiple smart contracts, and multiple interface pages. When developers are developing applications, data tables, intelligent contracts, and interface pages are needed to be injected into the GAChain blocks, and each data table, smart contract, and interface pages need to be consumed a certain number of GAC. This is the use of GAC.

GAC is spent by developers, B users, and has no relationship with end users.

#### 3.10 Operation interface

In traditional conventional blockchains, a blockchain project is usually a unified client interface, which has no unique features and cannot adapt well to different scenes and customers.

In the GAChain, the technical implementation of the separation between the frontend and backend is adopted, that is, the client takes a

SHENZHEN GACHAIN TECHONOLOGY CO., LTD.

lightweight client. The end user can use the project application to implement different terminals and different styles of applications. That is, the client takes a lightweight client, and the end user does not need to synchronize the sub node. The point data can be applied to the project, and the client can be made up of various modes, such as Windows, Mac OS X, Linux, Android and apple iOS. Not only that, but also the light client can be integrated into various social networks, such as WeChat applet, etc.

Light client interface design can be designed into different styles and interfaces according to different application scenes. Such as light clients facing the public tax application, light clients of a amusement park, light clients of an enterprise production management system and so on.

Friendly and customizable clients can adapt to the needs of all walks of life.

#### 3.11 High performance TPS

In the consensus mechanism of GAChain, because 101 complete nodes are packaged, and the mechanism of "isolation verification" is used breakthroughs. The High performance TPS concurrent processing in GAChain is incomparable to other existing blockchains.

## 4. Industry vertical subdivision areas

## 4.1 Tax supervision and audit

**In the governance framework,** we rely on sovereign economies for total value interaction rather than value interaction identified by the non-governmental network community.

On the basis of the cooperation of the public sector, we should pay more attention to the inclusive consensus algorithm and rules system, rather than just the efficiency first consensus algorithm and rules system. In the field of data mining, we pay more attention to the integration of data on the chain based on blockchain data and the data under the chain to achieve the information symmetry between the government, the tax authorities and the taxpayers. For the traditional tax collection, the blockchain technology improves the transparency and mutual trust of the information data, and makes up for the previous tax authorities to the taxpayer's palms. Insufficient information and inaccurate information will lead to tax evasion and tax evasion of some taxpayers.

In terms of credit contracts, the sovereign blockchain is an automation rule under the national legal framework, rather than a code of laws.

**From the point of view of regulation,** the decentralized chain can not be supervised, and the chain of sovereign blocks can be supervised by government departments.

**From the incentive mechanism**, we should pay attention to the balance between social value incentives and material wealth incentives rather than material wealth incentives. At the application level, we should pay attention to the application of integration in various fields, not limited to the application of an industry.

Therefore, the tax department, as an important part of the GAChain under the state sovereignty, the concept of the sovereign blockchain has the characteristics of independent, safe and controllable, which is more in line with the demand of tax governance.

#### 4.2 Financial services

#### 4.2.1 Banking system

The GAChain based on blockchain technology can interact with the external system and use the virtual machine (VDE) connection to pay the near path to achieve traceability, security, and privacy protection.

The first is the integration of cross chain. Financial services is a relatively professional field. The system achieves high cohesion and low coupling through the collaboration of two blockchains of administrative examination and approval and financial services. In the future, financial services blockchain will become a common system for commercial banks to build and share.

The second is cross industry cooperation. Because the first form of poverty alleviation fund is relatively simple. The basic level has a project fund demand to give you money. In the future, there will be an industrial form of funds put on it which all are projects, the final determination is not the internal approval of the government, because it may operate according to the mode of production fund needed the bank to evaluate and conduct professional analysis, which further extends the scope of collaboration to banks.

#### 4.2.2 Internet Finance

Internet Finance refers to the traditional financial institutions and networking enterprises, relying on Internet technology, information and communication technology and other, with the aid of advanced and convenient tools and financial related functions such as Internet and mobile Internet, and relying on the financial technology (Fintech) platform., such as cloud computing, big data, intelligent technology and so on. This technology supports financial intermediation, payment, investment, information intermediary services in emerging financial formats and leisure services system.

In July 2016, the "national information development strategy outline" specifically referred to "guiding and standardizing the Internet financial development", indicating that the Internet finance is truly the track of legalization and standardization of development.

Blockchains reduce financial risks: Settlement risk, counterparty default risk and system risk.

• Blockchain greatly reduces transaction costs in optimizing investment and financing environment.

Because of asymmetric information, enterprises and enterprises, enterprises and individuals, individuals and individuals will produce huge credit costs and low transaction efficiency. Blockchain technology can not only reduce the cost of pre transaction credit, but also effectively reduce the cost of the transaction process, such as simplifying liquidation, clearing process, and shortening the clearing window.

• Solve the financing difficulties of small and medium-sized enterprises

The small and medium-sized enterprises are in trouble, and the state has issued support policies many times, such as encouraging commercial banks to develop micro finance and carrying out supply chain finance. Because of the lack of credit rating system in small and micro finance, the financial information asymmetry of supply chain, the impact from the policy is very small.

The field of financial services is a technology stack formed by a legacy system, and each improvement must be compatible. As an open source technology, blockchain technology can be constantly innovated, iterated, and perfected on the basis of network publicity (visas, cost reduction, speed, and risk reduction. Innovation value, accounting audit, venture capital, credit rating).

• Further optimizing the credit system

Reducing the cost of credit and management.Blockchain
 technology can use and share trust data indefinitely, realize the
 automatic operation and management of the whole process of credit
 evaluation, pricing, transaction and contract execution, which effectively

reduce the cost of credit collection and the management cost of credit products, and greatly improve the scale of credit business processing.

(2) Expand the coverage of credit evaluation.Blockchain technology can cover the customer groups that can not be taken into account by the traditional artificial collection of information. For example, such as some people does not have bank account (or little information content in the account), but these people can contact the special group of the Internet. Thus, the service object of the credit product is further expanded by blockchain.

③ Improve the ability of credit creation. The technology of trusted code under blockchain makes the whole process of credit products have dynamic programming ability, which greatly expands the innovation space of credit products. For example, the "smart contract" mode is highly adaptable to various financial scenarios.

④ Effective mining of credit customer resources. The blockchain makes the banking industry embedded in the real industry operation process, and the degree of integration will be greatly improved. The applicable scene of the credit resources will be further expanded, and the efficiency of the use of credit resources will be greatly improved.

• Breakthrough regional restrictions and improve investment and financing environment in less developed areas

The whole network bookkeeping mode of blockchain can establish a "global" credit, which is expected to form the basic agreement of global "credit", and automatically eliminate the credit information such as "false information", "fraud information", "double payment" and so on, by providing basic "credit" resources and low cost value transfer channels for the global market. At the same time, the blockchain can innovate the lending model, and achieve C2C (individual to individual), B2B (enterprise to enterprise), B2C (enterprise to individual), or even C2B (individual to enterprise) through contract account.

The wide application of blockchain technology will break through regional restrictions, provide the credit basis for the trading parties of different regions and different attributes. Blockchain achieves point to point real-time transaction across regions and space-time, and establish transaction relations with developed areas, domestic and foreign countries, enterprises and individuals. To expand the less developed areas, wide investment and financing channels will optimize the investment and financing environment has become a major positive.

Since the First Conference on digital currency in 2016, the central bank has actively explored and promoted the application of blockchain technology several times. At the end of 2016, blockchain for the first time became the country "thirteen five" focus of information planning; In May this year, Premier Li Keqiang first time raised blockchain technology, and proposed new technologies such as blockchain and big data, cloud computing, Internet of things, AI and so on.

### 4.3 enterprise financing service platform

The financing service platform created under the GAChain is a place where financial investment can be carried out. The platform can access relevant government regulatory authorities, banks, Public Security Bureau and other authoritative institutions' data, to conduct comprehensive supervision of the financing service platform. Through the integration of these data (legal person, the basic information of the enterprise, credit degree and capital flow and so on), the analysis and supervision are carried out to ensure the effectiveness and legitimacy of the financing behavior.



## 4.3.1 The overall process of financing

SHENZHEN GACHAIN TECHONOLOGY CO., LTD.

#### supervision

① After the user is registered to enter the basic identity information, the financing service platform will obtain all the information, qualifications, and bad records of the user (enterprise and individual) relate to financial investment.So the user is fully evaluated and supervised.

②Tthe identity information and relevant financing information of the investment team must be examined through the supervision platform before the financing items can be disclosed on the trading platform.

The supervision index and rules are strictly close, the whole financing process will be regulated in real time, including the launch time, the end time, the financing data, the bank transaction flow and so on.



#### 4.3.2 User management

The type of registration of the front desk is divided into:Ordinary users, financing parties, funds.After the user registration application is examined and approved, the basic operations such as report inquiry, investment application, and password modification can be carried out.As a public sector chain, GAChain can integrate the information provided by different supervisory departments, banks and the Ministry of public security to the chain to realize the stratified sharing.Such an identity authentication technology enables the financing supervision department to obtain detailed personal and enterprise financing related information.



## 4.4 Supply chain

Based on the integrity of blockchain technology trust model and time series data, it is difficult to track the cross region of the supply chain, because of the lack transparency of information between the supply chain, the fragmented information flow, the hidden security hidden danger and the poor timeliness.

The blockchain technology is the further deepening of the Internet technology. It combines the blockchain technology to record and share the operating information of the ID information, waybill, carriers, middleman, vehicles, drivers, and so on, to create the credit system of the output user in the freight logistics industry. It is better to make the credit system of the output user in the freight logistics industry. To solve the trust problem based on the historical behavior of freight transport, blockchain provides the industry with more sufficient information, more convenient means to improve the conditions of the industry integrity system, in order to increase the efficiency of the logistics reduction.

## 4.4.1 supply chain finance

Supply chain finance is an interdisciplinary field in supply chain, finance, logistics and other fields. According to the different scenarios of supply chain, the supply chain finance business derives different modes:

- Receivable financin
- Typical products include accounts receivable transfer (factoring), accounts receivable pledge financing and so on.
- Prepaid financing
- Typical products include order financing, channel dealer financing, confirming warehouse financing and so on.
- Inventory financing
- Typical products include chattel mortgage financing, warehouse receipt pledge financing and so on.

## 4.4.1.1 Current problems in the traditional supply chain industry:

- In the field of trade finance, information is scattered in every system of the supply chain, and information is repeatedly verified and inefficient in circulation and financing.
- Limited by the information flow of each supply chain, the twoway choice of SMEs and financial institutions is limited.
- Lack of uniform and reliable credit reporting system for SMEs, financial institutions are difficult to control and wind control costs are transferred to financing enterprises.
- Credit information records of suppliers (financing enterprises) are incomplete, and banks can not effectively define their risk level.
- Inventory financing and advance payment financing are limited to traditional mortgage loans. Suppliers and distributors with more than two level are hard to obtain financing.
- The approval process of artificial credit is cumbersome, and small and micro enterprises are hard to obtain credit.
- There is lagging behind in the change of credit line, quota and surplus amount.
- After the completion of the financing, there are difficulties in timely performance and liquidation.

Blockchain can urge supply chain participants to jointly create and maintain a unified certificate approved by all links, and ensure that it is true and effective, without tamper. In addition to the sharing of vouchers, the process of project / contract execution can also be fully recorded and tracked to reduce the difficulty of wind control in financial institutions. It improves the feasibility of financing for small and medium-sized enterprises and reduce the cost of financing. We should weaken the inherent circle of the supply chain to expand the scope of credential credit, become the entrance of asset securitization and digitalization, and enhance circulation. The recording and accumulation of chain information is also the process of enterprise self credit. Based on these credit data, various financial services can be launched. With the use of blockchain, separate single centers can be promoted to a unified multi center with multi participation, and the various links of the trade and downstream can be reached. The efficiency of trust transfer is improved; The transaction cost is reduced; The benign ecological construction of trade finance is promoted.

## 4.4.1.2 Makes use of the advantages of blockchain technology:

- Unified voucher ensures the only authenticity and greatly reduces the cost of verification.
- Process can be seen to enhance transparency of performance and improve financing management capability.

- Data recording helps to promote credit rating system and reduce risk control cost.
- It is helpful to solve the problem that the core enterprises are unwilling to provide credit endorsement by writing every transaction record to the blockchain.
- Based on the blockchain technology, supply chain financial participation agencies can establish an alliance platform for information sharing among all parties.
- According to the historical record of the blockchain, the remaining available amount can be adjusted intelligently.
- Realize payment and liquidation on time through the smart contract.
- The supply chain financial platform based on blockchain can provide services to all participants and processes in the supply chain finance.

#### 4.4.1.3. Supply chain financial credit process

Credit includes two types: core enterprise credit and bank credit.The supplier submits the credit application to the core enterprise and the bank. The core enterprise and the bank will judge the credit information according to the information, and return the final credit line according to the rules. The platform will write the number of credit, the date of the letter of credit, the maturity date of the credit, and generate these data which to be written into the blockchain.Generating data requires platform private key signature, supplier private key signature, core enterprise private key signature, bank private key signature, and verifying signature by platform.

From cloud platform portal, user completes registration, enterprise certification, and submits the application of credit on line, and checks the progress of the application. After the credit, it can submit the financing application, the loan query and the return query. The cloud platform business personnel can carry on the real name authentication to the enterprise, maintain the financial institutions, the core enterprise, the supplier, the user, the authority and so on. It maintains the core enterprise white list and the supplier list, inquires the core enterprise and the supplier transaction detailed data, inquires the credit application and the bank approval progress, and updates the home page content . The bank staff can query the supplier list of the core enterprise and the basic information of the supplier, which confirms the credit quota to the supplier on the platform, and confirms the financing and the loan.

The application of supply chain credit based on blockchain greatly simplifies the tedious paper application process and improves the security of core data such as credit lines. The multi-party digital signatures of the core enterprises, suppliers and banks in the process of

68

credit guarantee the authenticity of the identity of the main body of the transaction, and put an end to the false and deception risks in the financial business to enhance the security of the system. The source of raw materials, stock, production, product sales, logistics, finance and other links of the whole supply chain can not only enhance the traceability of the important security materials, but also promote the credit and efficiency of the related financial links; enhance the social and economic benefits of the system.

#### 4.4.2 Tracing the source of supply chain

The support of the blockchain to the characteristics of the supply chain makes the information of each item static (inherent characteristic) and dynamic (circulation, credit and so on) that can be shared and consensus in the manufacturing enterprises, warehousing enterprises, logistics enterprises, distributors, retailers, consumers and government regulators.Blockchain platform can link the supply chain ownership relationship and upstream and downstream relationship, but also effectively link the upstream and downstream enterprises with indirect relationship.

The ledger of the blockchain is tamper-resistant. All parties on the chain participate in the maintenance of the book information together, and ensure the real-time, orderly and true non-forgery of the data in the blockchain.The application layer supports a variety of physical scanning or coding entry methods for tracing the origin of goods, eliminating the fraudulent and malicious imitation of the identity of goods, and amplifying circulation.

## 4.4.2.1 Advantages of Technology

- Records information :The key information of each item is recorded in blockchain by plaintext or encryption, and the nontampered blockchain property is disclosed to prevent data forgery.
- Information tracking:Commodity code information is the only encrypted string that identifies an item in the platform, also known as "one object, one code".Through the use of smart phones, portable or large radio frequency, sensor equipment and other goods code for automatic identification, it achieves the transparent sharing process, connection of commodity ownership and relations exchange.
- Multiparty participation:Based on the open, consensus, and multi-center network trust characteristics of blockchain, enterprises can reliably grasp the situation of upstream and downstream enterprises; establish transaction relations; track the status of transactions, and understand the situation of indirect links until the end of the consumer.At the same time,

providing regulatory interface is conducive to government / market supervision.

 The ultimate realization: To protect the value of quality goods and works; Protection of circulation channels and final consumers; The value transfer and rebirth of the credibility.

## 4.5 Internet of things

## 4.5.1 The data security of the blockchain of the Internet of things

The core defect of the security of the Internet of things is the lack of mutual trust mechanism between equipment and equipment. All the equipment needs to check the data of the center of the Internet of things. Once the database collapses, it will cause great damage to the whole Internet of things. The distributed network structure of blockchain provides a mechanism to keep the consensus among the devices, without the verification of the center, so that even if one or more nodes are broken, the data of the whole network system is still reliable and secure.

The blockchain technology can provide point to point direct interconnection for the Internet of things to transmit data, rather than through the central server, so that distributed computing can handle hundreds of millions of transactions. At the same time, we can make full use of the computing power, storage capacity and bandwidth of large amount of idle equipment distributed in different locations for transaction processing, and greatly reduce the cost of computing and storage.In addition, blockchain technology superposition smart contracts can transform each intelligent device into an independent network node that can self maintain and adjust. These nodes can perform functions such as exchanging information or verification of identity with other nodes on the basis of predefined or implanted rules.No matter how long the equipment life cycle is, the Internet of things products will not be out of date, saving a lot of equipment maintenance costs.

The main part of the data generation in the Internet of things is the sensing network. Through the sensor network, we can learn a lot of information about the equipment of the Internet of things, including the ID information of the object itself, and the related attributes, state, position, and ability.We can use blockchain for ID, image, sound, environment data, location data, status information, capability information and so on.

In order to ensure the data security in the shared public accounts of each node, we introduce the technology of homomorphic encryption to solve the security problem of interoperable information between objects and the blockchain public accounts. The data content,

72
interactive data, and the state capacity data of the object are homomorphic encryption.By using the homomorphic characteristic of encryption algorithm, the information interaction can be completed without decrypting plaintext when object information is stored and interacted with objects.For example, you can track items ID and location information on the supply chain, or record environmental data and other important machine state data in the insurance field to provide falsification when you need to verify the scene information.

## 4.5.2 Homomorphic encryption

Homomorphic encryption is a form of encryption that allows people to perform a specific algebraic operation of ciphertext as a result of encryption, and the result of the decryption is the same as the result of the same operation for the plaintext. In other words, this technology allows people to carry out operations such as retrieval, comparison and other operations in encrypted data to get the correct results, and no need to decrypt the data throughout the process. The significance is to solve the problem of confidentiality when data and its operations are entrusted to the third party.

The general encryption scheme is concerned with data storage security. That is, when data holders to send other people an encrypted thing, or to store the same thing on the computer or other servers, it is necessary to encrypt or store the data.Without a key, it is impossible to get any information about the original data from the encrypted result, so only the user with the key can decrypt correctly and get the original content.We notice that in this process, the user can not do any operation on the encryption result, but can only store and transmit.Any operation of the encryption result will lead to erroneous decryption, or even decryption failure.Homomorphic encryption is concerned with data processing security, providing a function of processing encrypted data. That is, others can process encrypted data, but the process does not leak any original content.At the same time, the user who owns the key decrypts the processed data, and the result is exactly the result after processing.

### 4.6 Intellectual property services

China is in the process of transforming from traditional extensive manufacturing to fine creation, and the strategy of building a powerful country with intellectual property rights has put forward higher requirements for intellectual property services. The current intellectual property services in China also developed slowly, while intellectual property affected by the "Internet plus", risks and opportunities.

## 4.6.1 The existing problems of

# 4.6.1.1 The exclusiveness of intellectual property is more difficult to achieve

The determination of intellectual property rights determines the monopoly of intellectual property rights. That is, the law strictly protects the monopoly of intellectual property owners on intellectual property rights.But in today's Internet era, the realization of monopoly of intellectual property rights is becoming more difficult. In the international intellectual property legislation, the difference of the time limit for the protection of rights, the characteristics of the transmission of the efficient transfer of information and the invisibility of the carrier of intellectual property in the network environment all bring difficulties to the ownership of intellectual property, the right to use, the right to return, and the protection of the intellectual property. In the category of shared economy, data information is open and free of information in the network. The information is not dependent on the physical carrier in the process of communication, which can not be effectively controlled by the right person.

# 4.6.1.2 The invisibility of intellectual property is more obvious

The main body of intellectual property is inventor, and the living room is intellectual achievement. The carrier of the traditional intellectual property is the physical property, and the physical carrier plays a certain role in many links, such as the right, authorization, power, transfer, and protection of intellectual property. But in the era of Internet of things, the carrier of intellectual property rights is mostly the existence of data information. If the intangible property of the object of intellectual property has brought more complex problems to the cognizance and protection of intellectual property rights infringement, the intangible and uncertainty of these resources increase the difficulty of the protection of intellectual property in the network age.

# 4.6.1.3 the territoriality of intellectual property is more vulnerable

The protection of traditional intellectual property has obvious regionality, and the effect of intellectual property right is not infinite in space. It is protected by the law in the country or region which is confirmed by law. If a country or a few countries need to protect its intellectual property, it must be applied according to the laws of these countries.But there is "no borders" in Cyberspace. There was a huge impact from the "Regionalism" of traditional intellectual property rights. In cyberspace, intellectual achievements can be rapidly spread around the world. The boundaries between countries are blurred and desalinated, and intellectual achievements are more easily accepted and used by the subjects in different legal environments.The transcendence of regional intellectual property rights in cyberspace leads to the difficulty of determining the infringement of cyberspace and the difficulty of law enforcement subjects.

76

# 4.6.2 Based on the GAChain of intellectual property services

The combination of intellectual property and blockchain technology plays a positive role in promoting the protection of intellectual property rights. The introduction of blockchain technology can greatly improve the operation efficiency of the intellectual property service industry, and solve the long and complex problems of industrial chain from three links: establishing right, using right and maintaining rights.

# 4.6.2.1 Registration management of application for intellectual property rights

The application registration of intellectual property is the basic guarantee for intellectual property rights. Therefore, it is extremely important to apply for registration of change. It plays the role of public display to the society, and let the potential transaction subject understand the specific state of ownership. By applying the right to apply for the change of registration, the security of the benefit is determined and the transfer of the rights and interests is also recorded. The unique identity account system of the blockchain, the recorded intellectual property information as the electronic voucher for the application of the registration of the change, makes full use of the safety and transparency of the blockchain technology, which can not be tampered with, easy to track and so on, and records the intellectual property rights and the history of change.

# 4.6.2.2 Circulation of intellectual property rights

The circulation of intellectual property rights is an important link to promote the operation of intellectual property. It can stimulate the activity of the market and promote the creation and development of more copyright works and patent technology. At the present stage, the mainstream of intellectual property rights, especially the rights of copyright, is dominated by centralization, with high intermediate costs, less audience groups, rampant piracy, and lower profits for the rights and interests of the rights and interests. The decentralization mechanism of blockchain technology will greatly reduce the transaction cost, reduce the intermediate link, increase the audience group, improve the income of the rights and interests and promote the transaction of intellectual property.

# 4.6.2.3 Intellectual property service platform and data sharing

The transformation of intellectual property rights is not accomplished by one or a few unifying platforms, but is done by a large number of independent companies, colleges, research center and individuals. The intellectual property information platform based on blockchain can bring together these scattered users and information to form a joint distributed information transaction and transformation center. The biggest crisis in the construction of unified information, information and trading platform comes from trust. The mechanism of centralization trust and participation by the whole people, constructed by the blockchain, is naturally suitable for building a unified sharing platform. The trust of blockchain technology is not transferred by the will of individual, and still can guarantee the normal operation of the system and business under the premise of no trust between each other. Each user becomes a node of the blockchain unified platform, and has its own public key and private key to participate in the verification and recording of information.



### 4.6.2.4 Intellectual property service smart

SHENZHEN GACHAIN TECHONOLOGY CO., LTD.

### contract

An intellectual property service contract is signed by different parties involved in intellectual property services, and the responsibilities and obligations of all parties are stipulated. The contract is stored in the blockchain in the form of smart contract, and the blockchain technology ensures that the contract can not be tampered with in the performance.

# 4.6.2.5 Implementation architecture of system

The blockchain intellectual property service platform can be composed of three levels of architecture. The bottom layer is a blockchain network, which constructs a service centralization, information storage weakly centralization and trust sharing to participate in distributed ledger. Through the business logic and the blockchain consensus mechanism, the middle layer establishes the account center, the intellectual property registration, the intellectual property display, the intellectual property transaction and so on through the intelligent transaction mechanism to realize the intellectual property service function. On the top, there is the service provided by the participants of the various intellectual property rights.

## 5. GAChain token: GAC

### 5.1. How to generate a block?

To realize the high concurrent transaction, GAChain generates and sign block nodes with DPoVE (Delegated Proof of Value of Ecosystem). In the early stage of GAChain operation, large data centers of Chinese governments and departments will be delegated as fullnodes (main-node) for block generation validation. These main-nodes are determined by voting (1 time a day) from all full-nodes (at least 100 full-nodes). The voting-weights is proportional to the volume of GAC token in their account. In the future, a new department can be approved by the recognized voting among the organizations. Authorized organizations can also determine the number of nodes that will have the right to create new blocks. These nodes will be used as back-up nodes.

<u>A node with the right to sign will generate blocks in order. If the</u> <u>node does not generate a block on time, the right will move to the next</u> <u>node accordance to the list. Therefore, if any node of organization (big</u> <u>data centers) is breakdown, GAChain still can maintain the operation</u> <u>regularly even there is only on node left.</u>

### 5.2. Incentive award from blocks generation

Each main-nodes will receive rewards from a new node generation.

Also, there will be charged for the development of application, data table, smart contract and interface, and part of those expense will be rewards for main-nodes.

To ensure the efficiency of GAchain, the rewards of transaction transactions are used for maintenance cost of each node only (each data center), such as function maintenances, transaction maintenances and blockchain data maintenances.

### 5.3. GAChain system authentication GAC

When the GAChain network is activated, 500 million token GAC will be issued. The main propose of GAC is to protect the network from attack, such as database operation (create new tables, new columns, data transport, utilize smart contracts and smart laws, etc.) and payment operation. The token price setting is to ensure basic use for users while protecting the network from interruption by big movement. At the early stage, GAC also will be used for forming the node list and generating delegated representative for blocks.

## 6. Common problems

### 6.1. Briefly describes the blockchain platform?

The GAChain is a distributed public blockchain underlying protocol platform. It is also a blockchain operating system platform. Any account can create an independent digital ecosystem with hierarchical management access rights. The ecosystem integrates the development environment of data management, user interface and smart contract, which can develop any type of application. Applications can exchange data between multiple applications, and independent digital ecosystems can exchange data with others as well.

6.2. Does the development of GAChain platform based on the underlying protocol of bitcoin or Ethernet?

GAChain platform is a self-developed, unique blockchain underlying protocol, which is the same level as the underlying protocol such as bitcoin and Ethernet.

6.3. What are the main differences between GAChain platform and other public blockchain platforms? Does the built-in mechanism for smart contracts implementation matter?

The GAChain platform has some unique features:

• <u>An independent client server that integrates a software</u> application development environment;

- <u>A special user interface design language, which is consistent</u>
   <u>with the smart contract development language;</u>
- <u>A hierarchical management system used for managing data,</u> <u>smart contracts and user interfaces, which can grant different</u> <u>access rights to respective members, roles and smart contracts.</u>
- <u>The sovereign software environment can create various</u>
   <u>blockchain applications</u>, which users data can interact with each
   <u>other</u>.
- <u>A unique legal system can be set up by smart law with a special</u> <u>smart contract, to set up a complete set of rules to regulate the</u> <u>relationship between the users of the platform. The smart</u> <u>contract defines the rule modification of protocol parameters,</u> which can solve the related policy and supervision issues.

### 6.4. Does the GAChain platform have its own cryptocurrency?

The GAChain platform uses GAC as its own basic cryptocurrency, and each independent digital ecosystem can issue its own token, which can be set to circulate in its own ecosystem or the GAChain general network.

### 6.5. What is a validation node?

A validation node can verify transactions and generate blocks is.

### 6.6. What are the requirements for network nodes to be

### qualified as verification nodes?

<u>A verification node requires a much higher hardware infrastructure</u> and software security.

### 6.7. Who can maintain the nodes?

Any network node with sufficient processing power and fault

tolerance can become a verification node for voting in the ecosystem if

they are the GAC token owners which are ecosystem certified investors.

### 6.8. What is an ecosystem platform?

An ecosystem that can create blockchain applications and virtual

sovereign software environments for user operations.

### 6.9. who can create an ecosystem?

Any user of the platform can create new ecosystems.

### 6.10. How a user become a member of the ecosystem?

A user can apply in the ecosystem, not limited to the standard client

(Wallet) or customized client (the project client based on the GAChain).

According to different ecosystem policies, the registration process will

be different.

### 6.11. Can one user create multiple ecosystems?

Yes, any user can create multiple ecosystems and become members of any ecosystem.

### 6.12. What is the platform application?

The platform application is a software product that integrates functions and services. The application consists of data table, contract and interface.

## 6.13. Which programming language is used to create an application?

The contract is written in G Language.The language is developed by the GAChain platform team. Please refer to the contract language description section for more details.

The template is written in Chain Language that is a unique interface template language. Please refer to the template language description section for details.

## 6.14. How to create application and user interaction functions? Applications are written and executed only by Molis.

## 6.15. Can the platform contract use the third-party API interface to access data?

No, the contract can only access data stored in the blockchain. A specific oracle is only used for accessing outside data sources from contracts inside of the chain.

## 6.16. Can a contract save temporarily in the blockchain and edit later?

Sure. The access right for editing contract is managed by the creator, who can deny or grant a specific access right to a person to

modify contracts or to configure a complex set of conditions in a specific smart law.

Moils software can access various contract versions.

### 6.17. What is smart law?

Smart law is a law or regulation that can create, control, and restrict conventional contracts to standardize the behavior of ecosystem members. A set of smart laws is the legal system of the ecosystem, and all affairs are operating under the laws.

### 6.18. Can a contract call or execute another contract?

Yes, a contract can directly access another contract and provide

other parameters or links to call other contracts. For details, please refer to the contract language section.

### 6.19. Does an application operation require to call contracts?

No, a contract is a sovereign application procedure module to

perform some functions. Each contract configuration receives specific

data, performs operations and records in the database.

### 6.20. Does the application have multi-language support?

Yes, the application has built-in multi-language support.

### 6.21. Can I create pages without using Chain Language?

If you don't use the client Molis, you can use the API platform, such as WeChat mini program.

### 6.22. How to store an interface page date in the blockchain?

The interface pages and smart contracts modify through the client and store in the blockchain to avoid tampering. If using other terminal, such as WeChat mini program, the interface pages will not store in the blockchain.

### 6.23. What type of database does contract operations require?

The Moils client contains tools to create a database, (currently using PostgreSQL, and will change in the future) to write and read data in G Language. The Chain language template language contains functions to read data from data tables.

### 6.24. How to access table data?

Members of the ecosystem, roles, specific contracts have the right to add columns and rows or edit data.

6.25. How to exchange data of applications from one ecosystem to other ecosystem?

Data exchange can be managed through a global data table. All ecosystems can exchange data with other ecosystems.

6.26. Do I need to develop all applications from scratch in a new

### ecosystem?

No, every new ecosystem has an optional universal application

module: It represents a mechanism for managing members and roles in

an ecosystem, such as an application for configuring and issuing Token;

a voting and polling system; a social news and article system and an

encrypted communication tool for ecosystem members. These applications can be edited and configured to meet the specific requirements of any ecosystem.

### 6.27. What is the cost for using these applications?

You need to spend tokens for node validation.

### 6.28. Who needs to pay for the application?

In the GAChain, each application is composed of multiple data

tables, smart contracts, and interface pages. When developers are

developing applications, they need to pay GAC to inject data tables,

smart contracts, and interface pages into the GAChain blocks.

Hence, GAC is consumed by developers, Business users, but not end users.

### 6.29. What are the new functions planning to implement on the

### platform in the future?

Visual interface designer, which has been developed;

Visual smart contract designer has been partially developed;

Support hybrid (SQL and NoSQL) databases;

Supporting multi thread parallel processing of transactions from

different ecosystems;

Resource intensive computing on the client;

Ecosystem hosting and computing capacity exchange;

Some nodes are only stored on some blocks on the server.

Unified operation and semantic reference of data in the platform.

### **6.30.** How to prove the operability of the platform?

In the past few months, a number of conceptual proof of projects and cases have been implemented on GAChain, such as the tax collection, electronic invoice generation, circulation system, medical device supervision, anti-counterfeit tracking system, financing and supervision system, voting / polling system, business registration, financial trade tools, asset registration/contract management system, etc.

### 6.31. Is there any deficiency in the platform?

Compared to the Ethereum, the biggest shortage of the GAChain platform is that it is still in the initial stage, but this deficiency will be transformed into a great advantage over time by the expansion of the ecosystem and global community.

### 6.32. What is the future of GAChain?

The design of the GAChain platform is based on all scenarios. There are many blockchain networks that cannot coexist eventually. In the future, we believe GAChain is a platform for the unification of all information data, sharing and exchange, which can run all the affairs and activities of the government, business and individual globally.

## 7. Terms and definitions

# 7.1 The main terminology of blockchain technology

- blockchain an information system that stores data, secures this data from falsification and loss, transfers and processes data inside the system while preserving data reliability; the protection of data is achieved by: (1) writing the data into a chain of cryptographically linked blocks, (2) decentralized storage of copies of the chains of blocks on nodes of a peer-to-peer network, and (3) synchronization of chains of blocks on all full nodes using a consensus algorithm; preserving data reliability when performing operations with data within the network is ensured by storing the algorithms of data transfer and processing (contracts) inside the blockchain; the chain of blocks itself is also referred to as the blockchain.
- peer to peer network a computer network, consisting of equally privileged nodes (without a central server).
- block a collection of transactions grouped by a validating node into a special data structure after their format and signatures are verified; a block contains a hash pointer as a link to the previous block, which is one of the measures that ensure the cryptographic security of the blockchain; a block is added to the blockchain after

the consensus with other validating nodes on the network is achieved.

- <u>hash a uniquely reproducible cryptographic representation of a file</u> or any other set of digital data; it ensures the invariability of data – any modification of data changes its hash. It guarantees the invariance of data, and any modification of data will change its hash.
- <u>block validation verification of the correctness of a block' s</u> <u>structure, its creation time, its compatibility with the previous block,</u> <u>the transaction signatures, and the correspondence of transactions</u> to the data in the blockchain.
- <u>validating node a node on the network that has the right to create</u> and validate blocks.
- <u>consensus an agreement between validating nodes on the</u> <u>procedure of adding new blocks to the blockchain or an algorithm</u> <u>of such agreement.</u>
- <u>transaction a single operation of data transfer on a blockchain</u> <u>network, or a record of such transaction in the blockchain.</u>
- token a unit that represents a share of rights, fixed as a set of identifiable numerical records in the register that includes a mechanism for exchanging shares of rights between these records.
- identification a cryptographic procedure for recognition of a user in the system.

- <u>unique identification a procedure that links a user with a unique</u> <u>person; it requires legal and organizational efforts to implement</u> <u>biometric or other procedures for association of usernames with real</u> <u>persons.</u>
- private key a string of characters kept in secret by its owner and used for accessing this person' s Virtual Account on the network and signing transactions.
- public key a string of characters which can be used to check the authenticity of a signature made with a private key; public keys can be uniquely derived from private keys, but not vice versa.
- <u>digital signature an attribute of a digital document or message,</u>
   <u>obtained as a result of cryptographic data processing; a digital</u>
   <u>signature is used to check the integrity (absence of modifications)</u>
   and authenticity of a document (verify sender' s identity).
- <u>contract a program that performs operations with data stored in</u> the blockchain; all contracts are stored in the blockchain.
- transaction fee payment to a validating node for execution of a transaction.
- double spend an attack on a blockchain network with the purpose of using the same tokens for two different transactions; this attack is implemented by forming and maintaining a fork (alternate version) of the blockchain; such an attack can be executed only in the event

the attacker controls 50% or more of the network' s validating power.

- <u>encryption transformation of digital data in such a way that only</u> <u>the party that possesses the appropriate decryption key is able to</u> <u>read it.</u>
- private blockchain a blockchain network where all nodes and access rights to data are under the centralized control of a single organization (government, corporation, or private individual).
- public blockchain a blockchain network which is not controlled by any organization, all decisions are made by reaching a consensus among the network' s participants, and data is available to everyone for read access.
- <u>delegated proof of stake (DPoS) a blockchain network consensus</u> <u>algorithm, where validating nodes are assigned by delegates</u> (usually, token owners), who vote using their shares of rights.

## 7.2 GAChain platform terminology

- testnet a version of the network that is used for testing software.
- <u>mainnet main version of the network.</u>
- <u>Platform token tokens of the platform, which are used for</u> payments for the use of network resources (fees).

- <u>Platform transaction commands that call contracts and pass</u> parameters to them; the result of execution of a transaction by a node is the update of the platform' s database.
- <u>fuel a conventional unit used to calculate the fee for execution of</u> <u>certain operations on the network; fuel to exchange rate is decided</u> <u>on by the voting of validating nodes.</u>
- account a storage record for tokens, which can be accessed with a pair of keys – a private and a public one.
- <u>address a character-coded identifier of a user on the network,</u> regarded as the name of this user' s virtual account.
- <u>associated virtual account a virtual account from which the</u> <u>payment for execution of a contract is debited; an association of a</u> <u>contract with a virtual account is established upon contract creation</u> <u>and can be changed at any time; by default (before an association is</u> <u>established) payment is debited from the virtual account of the user</u> who executed the contract.
- Molis a software client used to connect to the network; Molis enables users to work with their virtual accounts, build ecosystems, and create applications in an integrated development environment (creating and editing tables, interface pages, and contracts).
- web-Molis a fully-functional software client that works as a webapplication.

- platform ecosystem a relatively closed programming environment, which includes large numbers of applications and users who create and/or use these applications; ecosystem members can initiate the emission of the ecosystem' s own token, use a system of smart contracts to establish the rules of interaction between its members, and set members' permissions to access the ecosystem' s elements.
- ecosystem parameters a set of configurable ecosystem attributes

   (name, description, logo, name of the ecosystem' s token and its
   emission parameters, etc.); these attributes are stored and can be
   edited in a dedicated configuration table.
- ecosystem members users who have access to functions and applications of a particular ecosystem.
- <u>dedicated ecosystem an ecosystem that has all the functions of a</u> <u>standard ecosystem, but works outside the blockchain (no data is</u> <u>saved in the blockchain); in dedicated ecosystems contracts are able</u> <u>to access any web resources over HTTP/HTTPS protocols, and rights</u> to read data can be configured.
- <u>delegated Proof of Value of Ecosystem (DPoV(E)) consensus</u> <u>algorithm, where validating nodes are assigned by the voting of</u> <u>ecosystems whose significance to the platform is confirmed (Valued</u> <u>Ecosystems), since it is in their best interest to maintain the smooth</u>

operation of the network; the approval of ecosystems that satisfy a number of formal indicators (number of transactions, number of members) to become Valued Ecosystems is implemented by the voting of token owners (in order to avoid fake ecosystems with botgenerated activities from taking part in the approval of Validating Nodes).

- <u>The script for the G Language to edit the contract;G Language</u> <u>includes functions to handle data received from interface pages and</u> <u>to perform operations in values in database tables.You can create</u> and edit contracts in the editor of the Molis software client.
- <u>Chain Language, a template language, includes the functions</u> required to obtain values from the database table, as well as the <u>conditional statements or operators that are used to build interface</u> pages and forward the user's input data to the contract.
- integrated development environment a set of software tools used for creating applications; the Molis software client' s integrated development environment includes a contract editor, pages editor, tools for work with database tables, language resource editor, and application export and import functions; the integrated development environment will soon be complemented with visual editors based on semantic tools.

- <u>interface designer a tool in the Molis software client used for</u> <u>creating interfaces of application pages by arranging basic</u> <u>application elements (HTML containers, form fields, buttons, etc.)</u> <u>directly on the screen.</u>
- <u>\*visual interface editor \* a tool in the Molis software client used for</u> creating interfaces of application pages, which includes an interface designer and a generator of page code in Chain language.
- <u>visual contract editor a tool in the Molis software client used for</u> creating contracts using a visual interface.
- <u>language resources a module of the Molis software client used for</u>
   <u>localization of application interfaces; it associates a label on a page</u>
   <u>in an application with a text value in a selected language.</u>
- <u>export of applications saving the source code of an application</u>
   (any set of its tables, pages, and contracts) as a file.
- <u>import of applications uploading an application (all tables, pages,</u> and contracts included in an exported file) into an ecosystem.
- <u>smart law a record in the blockchain that contains regulatory</u> <u>information, which is used for controlling the operation of contracts</u> <u>and management of access rights to registers; smart laws are</u> <u>specialized smart contracts.</u>
- <u>legal system a set of regulations established in smart laws; a legal</u> system regulates the relations between the platform users, defines

procedures for changing protocol parameters and includes mechanisms that provide solutions to various challenges.

- <u>application a functionally complete software product created in</u> <u>the Molis software client' s integrated development environment;</u> <u>an application consists of database tables, contracts, and interface</u> <u>pages.</u>
- <u>application interface page a program code, written using the Chain</u> <u>template language, that forms an interface on the screen.</u>
- <u>interface block a program code, written using the Chain template</u> language, that can be included in application interface pages.
- <u>contract association linking a contract with a Virtual Account, from</u> which the fee for performing contract operations will be debited.
- <u>access rights conditions for obtaining access to creating and</u> <u>editing tables, contracts and interface pages; access rights to tables</u> <u>can be specifically set for adding rows and columns, and for editing</u> <u>values in columns;</u>
- <u>full node a node on the platform network that stores the full up-</u> to-date version of the blockchain.
- partial node a node on the platform network that stores only the blocks with data related to one ecosystem.

 <u>concurrent transactions processing - a method for increasing the</u> processing speed of transactions by simultaneously processing data
 <u>from different ecosystems.</u>

## 8. Conclusion

### 8.1 The Internet Spirit and blockchain value

After years of the Internet development, the original Internet spirit has been gradually forgotten. Linux has become a world-famous open source operating system, and Wikipedia has built the largest knowledge platform in the human history. These are the spiritual source of Internet. And today, blockchains allows us to pursue this kind of source again.

<u>The latest product of "the age of smart contract" in GAChain v3.0 is</u> <u>also the hybrid public chain platform. GAChain is not try to replace all</u> <u>the centralized authority, but support with the underlying decentralized</u> <u>data technology.</u>

<u>The development of the blockchain makes us gradually realize that</u> <u>this society is multi-centralized. Only in this way, cooperation has the</u> <u>basis of trust, and the cost of social operation will be greatly reduced. In</u> <u>principle, all enterprises and individuals in the state have centralized</u> <u>trust providers, that is the national law. The smart contract mechanism</u> <u>of the GAChain is embedded into the electronic country law - smart law,</u> <u>which can simplify the process of handling civil disputes and</u> <u>commercial disputes. The law is the "last barrier" of the country and</u> <u>social order, thus greatly improving the efficiency of the society.</u> Smart law is a scene algorithm, that registers the national legal provisions into GAChain. For instance, in the tax law operation, it records the execution for a certain type of transactions and automatically executes legal acts (tax deductions), such as a special smart law that control how to create smart contracts, and how to implement them effectively, which automatically prohibits the inclusion of violations of the law without intermediate institutions. Also the smart law can be updated, amended and go into effect immediately.

The GAChain has made a lot of modification about the decentralization concept which other blockchains project focused about, and develop a public blockchain that can create a sovereign ecosystem. This "sovereignty" represents the multi-centralization society of the country. The creator of each chain has its own "sovereignty", which can protect user's information security and improve the convenience of date sharing and transaction processing. In general, GAChain complies the need of the current conditions and administration in China, and protects the interests of people.

[2] https://mp.weixin.qq.com/s/pGScqSyJ3Sag1rLCbyNuCg (GAChainis the innovation of blockchain, and also the inheritance of "Internet spirit").