

CONTENTS

1. Introduction of its Design.....	1
1.1 Role-Players	1
1.2 Consensus.....	1
1.4 Cross-chain protocol	3
1.5 Cross-chain Transactions	5
1.6The QOS Dual-Layer Token System	8
2. Economic model	12
2.1 token issuance mechanism	12
2.2 dual token mechanism and mint	14
3. Type of QOS nodes.....	17
3.1 light-client	17
3.2 full-node.....	17
3.3 Validator	17
3.3.1 Statuses of validators	18
3.3.2 Voting power	20
3.4 Delegators	20
3.5 Validation/Delegation mechanism in QOS network	21
4. QOS Ecosystem Business Scenarios.....	22
4.1 Consumption.....	22
4.2 Credit Financing	24
4.3 Media	27
4.4 Data service.....	28

5. User Interfaces	29
5.1 Light Client.....	29
5.2 Wallet System	31
5.3 Unified Identity	33
5.4 The Blockchain Explorer of QOS Public Chain.....	35
6. Roadmap.....	35
7. Contact Information	37

1. Introduction of its Design

The purpose of QOS is to establish underlying public chains suitable for enterprise applications and to ensure independence and interactivity of various scenarios in the industry. Therefore, we are not designing basic protocols in blockchain but instead focusing on equity records and transfers.

1.1 Role-Players

There are three types of role-players in the QOS network: business participants, service providers, and QOS basic authentication verifiers.

- Business Participants

Business participants are a group of equity owners who enjoy consortiumchain-based services provided by service providers.

- Service Providers

Service providers provide equity owners with a wide range of services that are offered in the form of business chains.

- The QOS Basic Authentication Verifiers

QOS basic authentication verifiers pack new blocks in QOS basic chain. Each verifier must run a QOS node on a machine with high-availability and highbandwidth.

1.2 Consensus

The business chain mainly provides services in the form of consortium chains or private chains, adopting the Byzantine Fault Tolerance Consensus Algorithm (BFT).

The QOS basic chain draws on the Tendermint consensus protocol and

adopts the BFT+DPOS consensus algorithm. A verifier in the basic chain must serve as a super node dedicated to submitting blocks. He uses QOS tokens for equity authentication and incentives and avoids single-node malfunction by running the BFT algorithm.

1.3 Dual-Chain Architecture

QOS is a scalable dual-layer chain system, which is divided into independent business chain and QOS basic chain that handle inter-operability between different business chain.

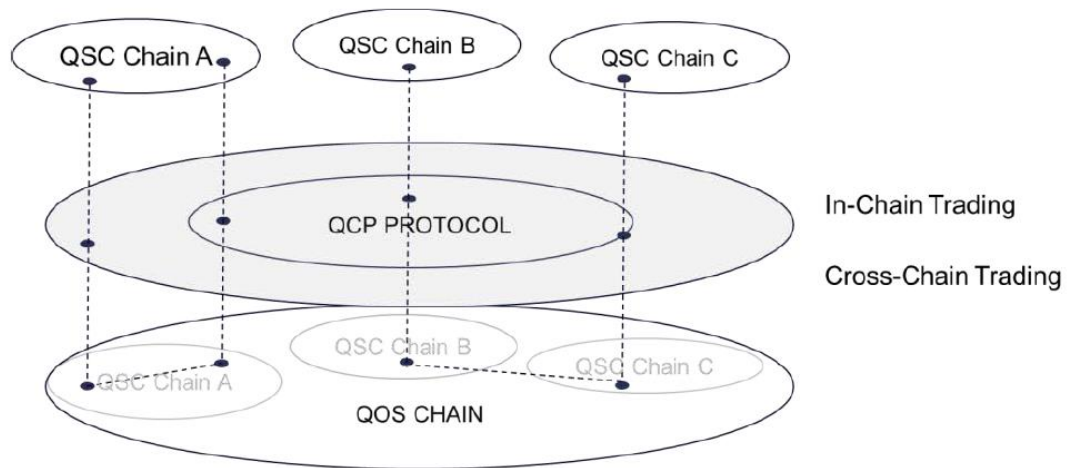
QOS basic chains provide services including the identity system, the consensus algorithm system, the smart contract system, the basic token and business token issuing and operation system, the file system, etc.

The business chain can be run through a Byzantine Fault Tolerance (BFT) consensus algorithm using consortium chain or private chain when each business chain can record token status in its own ledger.

QOS basic chain supports the interaction of each business chain through a relay protocol to ensure fast and safe value exchanges. QCP, a trans-chain protocol, represents QOS Constellation Protocol and is based on the queuing mechanism and Merkle Proof.

The QSC protocol is a token-issuing-and-operating protocol based on smart contracts. It also conforms to QOS public chain standards. Developers can come up with their self-run organizations on QOS based on the QSC protocol.

Since they follow the unified QSC protocol, safe value exchanges could be achieved as a result.



The QOS basic chain is run in the form of a relay protocol, which carries a multi-asset distributed ledger. Its status information includes the QOS basic chain status and token status of each business chain.

The QOS basic chain supports the deployment of public-chain smart contracts based on the QSC protocol. It also includes special contracts (consensus contracts, verifier contracts, cross-chain contracts, etc.) to support cross-chain consensus transactions, and cross-chain management contracts to support upgrading of the cross-chain protocol. The cross-chain contracts are packaged as gRPC services to simplify cross-chain transactions in business chain calls. Business chain are independent blockchains, they are accessible to QCP protocol communications through QOS basic chains.

1.4 Cross-chain protocol

The condition of realizing cross-chain transactions between a public chain and consortium chains is that they both agree on one protocol, which QOS community has sorted out as QCP cross-chain protocol. Cassini is an implementation of it.

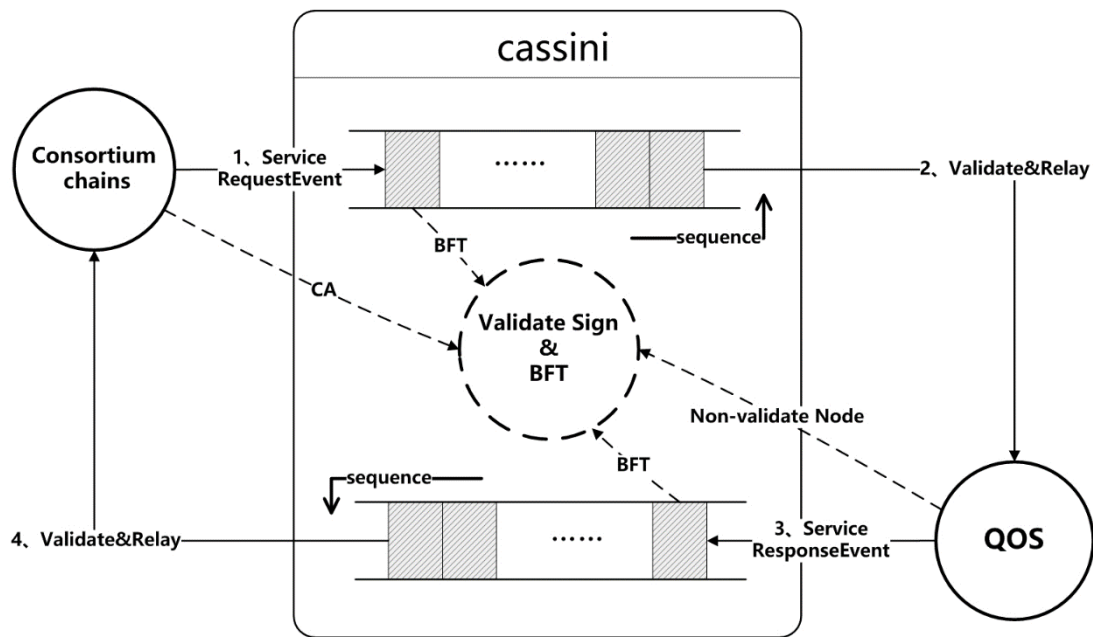


Image 2.2 QOS double-layer blockchain communication mechanism

A group of Cassini nodes connects to a public blockchain(QOS) and its consortium chains. Each Cassini node holds all CAs of consortiums, while consortiums have Cassini' s public key to carry out the verification. Among Cassini nodes BFT consensus is applied to prevent cheating.

QCP protocol includes:

QOS and any blockchain abiding by QCP protocol connect to the common Cassini relay;

Cassini subscribes to cross-chain events, fetches transaction abstract, carries out the 2/3 consensus, picks a trusted node to further obtain the transaction;

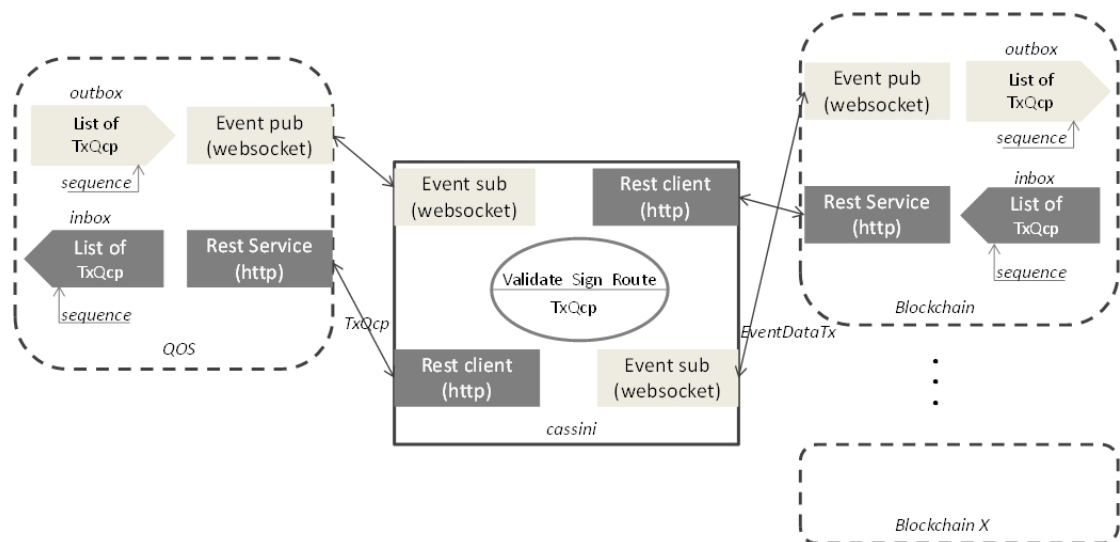
Once there is a new cross-chain transaction included in a block on QOS, it is placed in an outbox in an increasing order, the largest number is called sequence. Blockchain mechanically ensured the numbers is

continuous.

Blockchain stores transactions received from Cassini in an inbox;

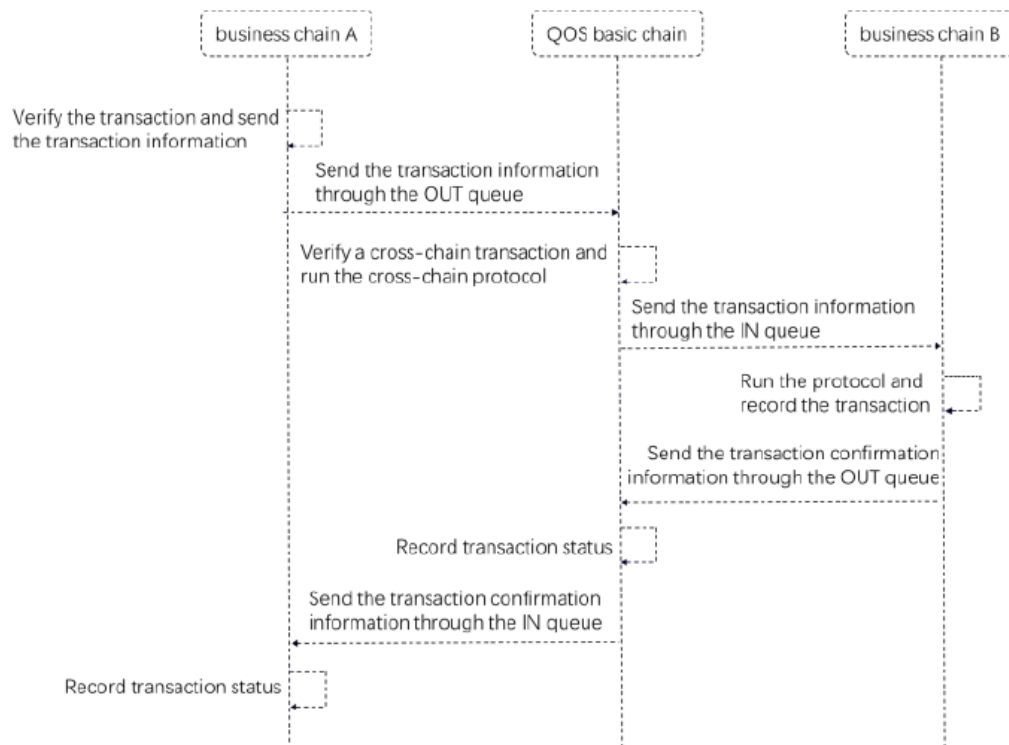
Cassini queries the sequence in this inbox, which is seq1, and reads transactions in QOS' s outbox whose number is larger than seq1. One or more transactions could be consumed each time;

Cassini nodes verify the transaction(s), perform 2/3 consensus and so on then route it(them) to the target blockchain(s).



1.5 Cross-chain Transactions

Cross-chain transaction is achieved by adding two FIFO queues to a business chain. The queues guarantee authenticity of data by adopting Merkle Proof.



Cross-chain trading detailed steps:

Cassini listens to cross-chain events on-chain;

The chain appends key-value 'qcp.to=xxx' to structure ResponseDeliverTx's Tags field. xxx is the name of the target chain;

Cassini then carries out 2/3 consensus on receiving this event;

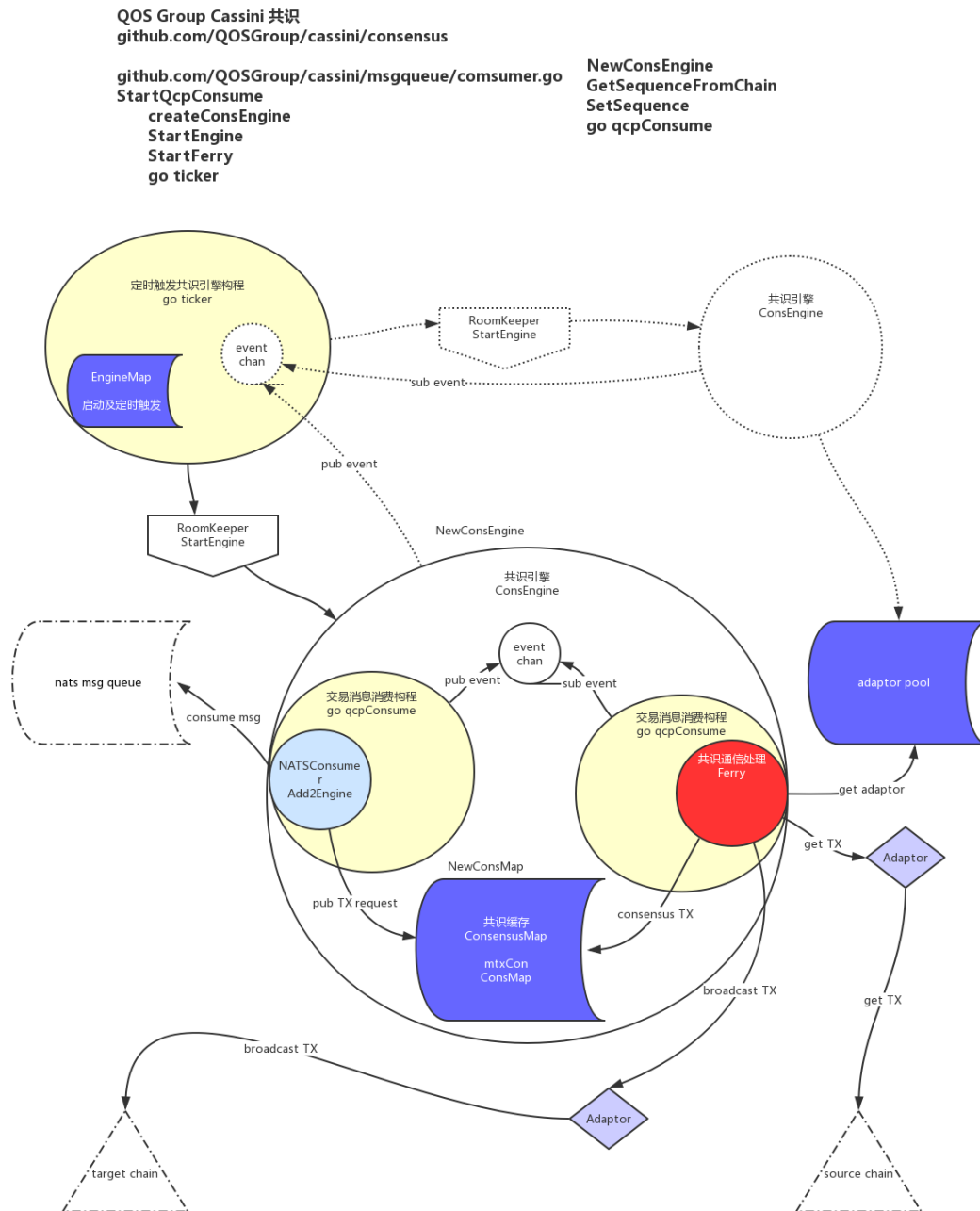
Once 2/3 consensus is achieved, Cassini will call restful API(ABCI query) to query the transaction data;

With transaction data obtained, BFT consensus takes place among Cassini nodes, then the transaction will be submitted to the target chain through restful API(ABCI BroadcastTxAsync/BroadcastTxSync). After this, the whole cross-chain process is done.

Cross-chain transactions return results are the same as step a,b,c and

d.

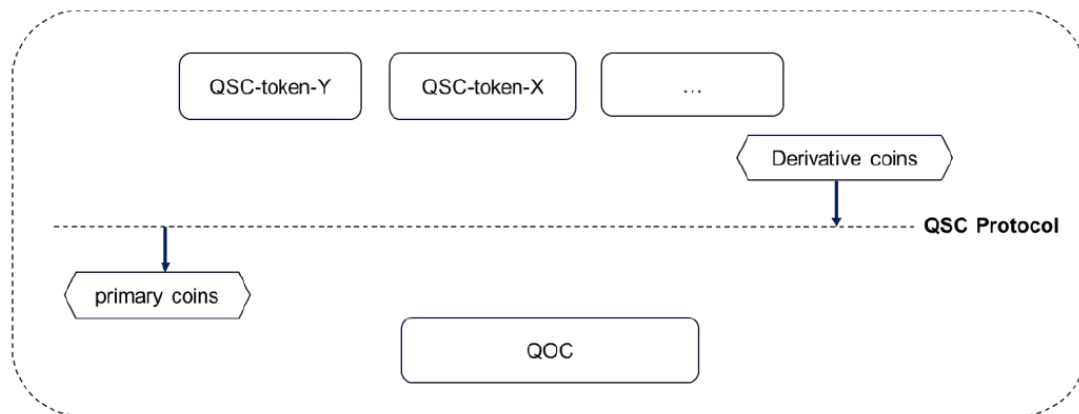
Framework of Cassini:



This framework applied adapter pattern, hence can be extended to and compatible with other chains, including future blockchains, if only they support QCP protocol.

1.6 The QOS Dual-Layer Token System

The primary coin QOS is used in the QOS public chain, which also produces derivative coins through smart contracts. There can be only one type of primary coin and many types of derivative coins. Derivative coins fit the QSC protocol standards.



Codes for derivative coins:

```
struct token{amount uint,id uint}
```

QSC Standards:

```
contract QSCInterface {  
    string public constant name = "Token Name";  
    string public constant symbol = "SYM";  
    uint8 public constant decimals = 0;  
    function totalSupply() public constant returns (uint);  
    function balanceOf(address tokenOwner) public constant returns  
    (uint balance);  
    function allowance(address tokenOwner, address spender) public  
    constant returns (uint remaining);  
    function transfer(address to, uint tokens) public returns (bool  
    success);  
    function approve(address spender, uint tokens) public returns (bool  
    success);  
}
```

```

function transferFrom(address from, address to, uint tokens) public
returns (bool success);

function frozenAmount(address tokenOwner) public returns (uint
frozentokens);

function frozen(address tokenOwner, uint tokens) public returns
(bool success);

function unfrozen(address tokenOwner, uint tokens) public returns
(bool success);

    event Transfer(address indexed from, address indexed to, uint
tokens);

    event Approval(address indexed tokenOwner, address indexed
spender, uint tokens);

    event Frozen(address indexed tokenOwner, uint tokens);

    //option. the contract owner use this function to pause the contract

function pause() public returns (bool success);

    //base on QCP protocol, implement info exchange between chains

function qcpExchange() public returns (bool success);

}

```

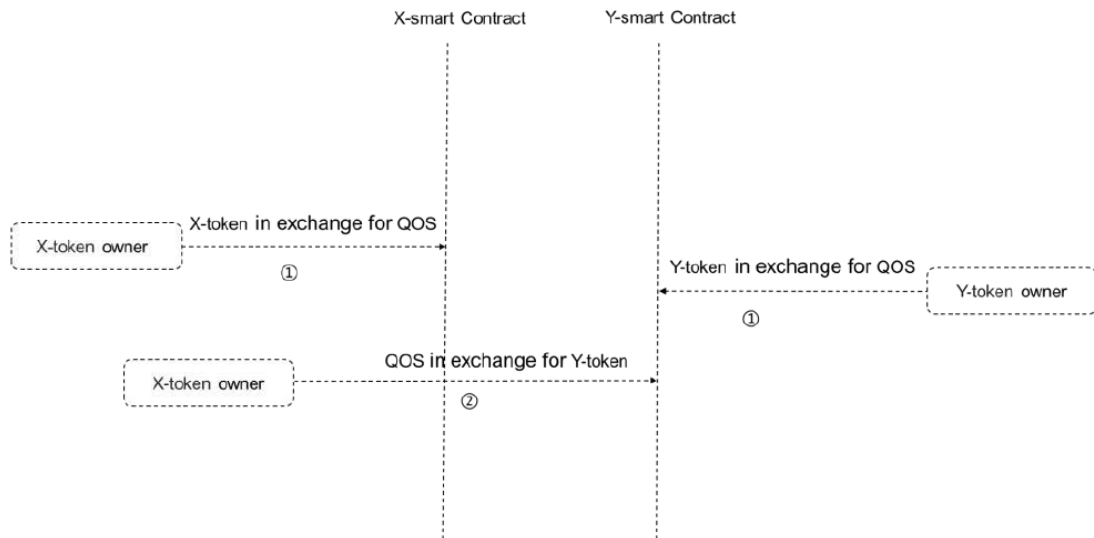
Explanation on QSC standards:

Type	Name	Explanation
Static variables	name	Full names of tokens.
	symbol	Symbols of tokens, for instance QOS and ETH.
	decimals	Decimals
Functions	totalSupply	Total supply of tokens
	balanceOf	Get the balance about one address
	transfer	Use the “transfer” function to transfer tokens from one address to another. Value represents number of the transfers.
	approve	Allow a “spender” account to transfer tokens in quantity of the “value” from one’s own account. The transfer can repeat for several times.

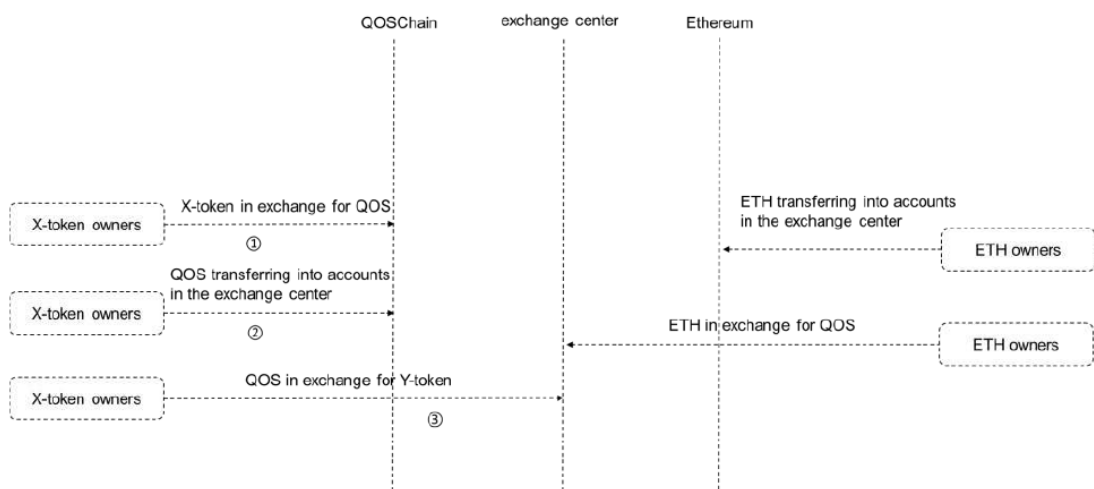
	transferFrom	This function is used together with the "approve" function. The the latter function approves a certain transaction, the "transferFrom" function will be used to transfer tokens.
	allowance	Number of tokens when one goes back to the "spender".
	frozen	To get a certain amount of tokens frozen.
	unfrozen	To get a certain amount of tokens unfrozen.
	frozenAmount	Get access to total amount of tokens that are frozen in a certain account.
	pause	Pause any action about the protocol. The owner could use this function in special occasions to get rid of bugs and stop losses.
	qcpExchange	Achieve cross-chain information interaction based on QCP protocol.
Events	Transfer	Trigger the event "Transfer" when tokens are successfully transferred.
	Approval	Trigger the event "Approval" when the function is activated.
	Frozen	Trigger the event "Frozen" when the function is activated.

The QSC protocol is compatible with the ERC20 standards, which means that QSC token technology could be applied in places where ERC20 tokens circulate. In this way, QSC tokens enjoys better liquidity.

For instance, the exchange between two types of QSC tokens --- X-token and Y-token --- takes two steps:



In the QOS public chain, for an X-token to be exchanged into a token that's not used in the QOS public chain, such as Ethereum, the transaction takes three steps:



2. Economic model

2.1 token issuance mechanism

The number of QOS public chain tokens is 10 billion, of which 49% are generated in the issuing of ERC20 tokens in the genesis block during the QOS public chain initialization, and 51% are mined by the super nodes on the QOS public chain. The coinage speed is halved every time cycle, and the coinage can be completed in 7 time cycles. Coinage speed for the sixth and the seventh time cycles is the same and the threshold for each block generation is preset to be 3 seconds.

The total amount of QOS coins produced by mining in T time $\approx \frac{100\text{billion} * 51\%}{2^\mu}$

$\mu =$ take the integer for $(\frac{\text{current time} - \text{initial time in QOS Chain}}{T})$

When T is 4 years, the QOS coins could be dug out in around 28 years.

Time	1 st 4 years	2 nd 4 years	3 rd 4 years	4 th 4 years	5 th 4 years	6 th 4 years	7 th 4 years
Number of new QOS coinages (unit: 10 billion)	25.5	12.75	6.375	3.1875	1.59375	0.796875	0.796875
Number of New block reward QOS	60.64	30.32	15.16	7.58	3.79	1.895	1.895

QOS public chain is a double-layer blockchain infrastructure based on DPOS and BFT consensus algorithm. We define every 4-year as an inflation phrase, including an end time, a total amount to plan a total inflation the end time, and an applied amount to indicate the tokens has already been distributed in the current phrase. Once the end time is reached, the next phrase will be on gear. The detailed inflation phrases can be found in the genesis file, looks like:

```

"inflation_phrases": [
  {
    "endtime": "2023-01-01T00:00:00Z",
    "total_amount": "2500000000000",
    "applied_amount": "0"
  },
  {
    "endtime": "2027-01-01T00:00:00Z",
    "total_amount": "12750000000000",
    "applied_amount": "0"
  },
  {
    "endtime": "2031-01-01T00:00:00Z",
    "total_amount": "6375000000000",
    "applied_amount": "0"
  },
  {
    "endtime": "2035-01-01T00:00:00Z",
    "total_amount": "3185000000000",
    "applied_amount": "0"
  }
]

```

QOS plans to enable modification of existed and planning new inflation phrases with on-chain community governance.

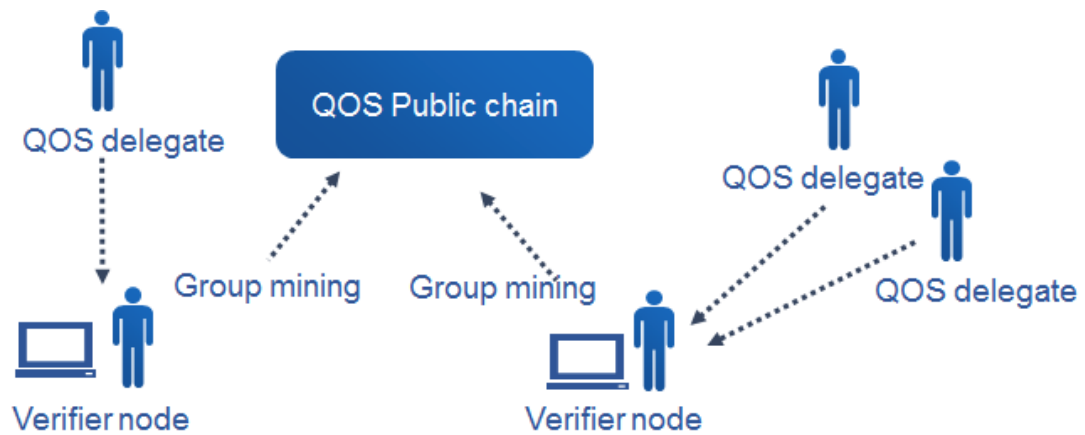
In every block, the QOS inflation would be:

$$\begin{aligned}
 \text{total mined tokens per block} &= \frac{\$total_amount - \$applied_amount}{\left(\frac{\$end_time - current\ time}{average\ block\ time}\right)} \\
 &= \frac{\text{tokens about to create in current infalation phrase}}{\text{number of blocks left in current infaltion phrase}}
 \end{aligned}$$

Every block is produced by a proposer, who will get 4% of the block inflation as an extra income:

$$\text{proposer extra revenue} = \text{total mined tokens per block} \times 4\%$$

The chance for a validator to propose is according to the QOS it bonds, so that proposers' extra income doesn't influence validators' voting powers.



2.2 dual token mechanism and mint

QOS will build a dual token mechanism with QOS the public blockchain token and QSC the protocol token. QOS is a public blockchain token and a value exchange medium and a transaction fee payment tool. Whereas QSC smart contract is aligned with QOS public chain standard, it is based on smart contract coin offering and operating agreement. QSC as the protocol token will be issued by each scenario operator based on their own systematic needs. QSC holders will be the ultimate owners enjoying the rights and interests of each scenario, with gain sharing rights within the scenario.

Corresponding to the dual token mechanism, QOS public chain will establish the dual layer mining mechanism. The 21 super nodes on the underlying public chain will compete for mining, and we encourage each scenario to exchange value, namely do the mining. Specifically, it can be

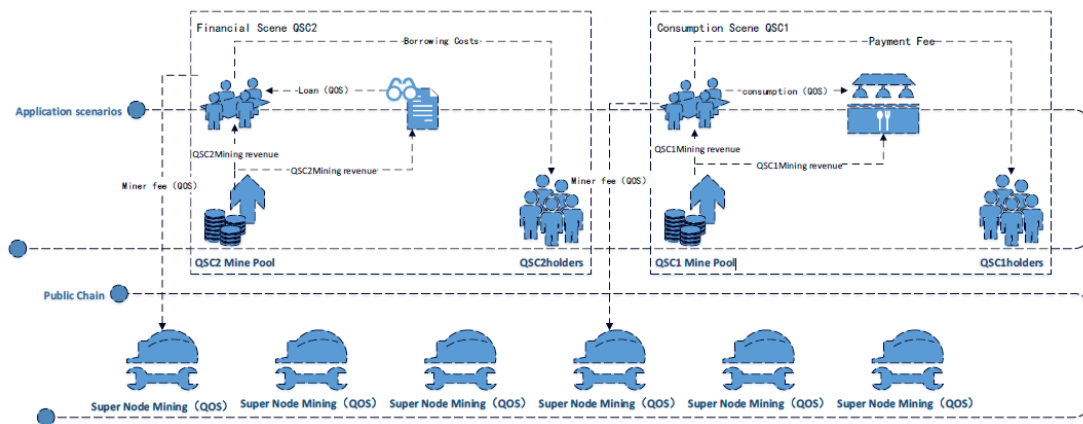
mining by transaction or mining by borrowing or lending capital.

1) Public chain super nodes mining mechanism, initiator of each transaction should spend a certain QOS token as for miner transaction fees, the amount of which will depend on transaction amount, complexity, promptness of paying transaction fees, and the platform will provide a reference value.

2) Details on specific application scenario mechanism of value exchange by mining. Take scenario of consumption for example, the service provider issue QSC1 token as their scenario interests representative, and in this specific scenario the value exchange lies in consumption, therefore it is mining by consumption. Both payer and payee would receive the corresponding QSC1 as mining rewards, that is each side receive half of the QCS1 spent as transaction fees. Settlement period of mining is calculated by day, while the exchange rate between QSC1 and QOS will depend on the average exchange rate within the settlement period. For each transaction payer will spend a certain amount of QOS as commission, which will be divided into two parts, 80% of which will be allocated to QSC1 holder and the rest 20% will be used to QSC1 community development and operation, the settlement period for this part is by day also.

The scenario operation platform is able to reserve some proportion of QSC1 on team motivation, and cover operation fees, but the reserved

part should be unlocked together with the value exchange in the system.



QOS promotes mining by value exchange, and it can be tangible like buying or selling products, service consumption, financial load or the intangible page view or attention degree. So long as there is a buyer, advertisement agency or other institutions or individuals who is willing to pay for user' s attention and browsing a certain content, QOS will deem that value exchange and that is a act of mining.

At the early stage QOS will cooperate with token exchange to provide a digital assets management service for our community users, it would be a two-step procedure.

1) User conversion. Before QOS main net is up, we use ERC 20 token to ensure all users in the community enjoy digital asset service at ease. We will lead our hundreds of thousands QOS users to the exchange, create a complete digital capital wallet system then convert the traditional community user to blockchain based QOS community user.

2) User activation. Cooperate with all scenario service provider to do

QOS airdrop. We plan to carry out a series of digital marketing to QOS community members by designated sign in activity, inviting friends over, consumption and money management to help cultivate the habit of using digital assets.

After QOS main net is up we will adopt mining by transaction, mining by borrowing or lending capital to bring feedback to the community.

3. Type of QOS nodes

3.1 light-client

A QOS light-client can execute every transaction and query that a QOS CLI can carry out, not needing to download the full ledger, by verifying a small number of headers and transactions, requires little resources, may applied to mobile clients and ordinary users.

3.2 full-node

Like other blockchain networks, a QOS full-node holds a full ledger.

A QOS validator must be a full-node, while a full-node must send a create-validator transaction and meets certain conditions to become a validator.

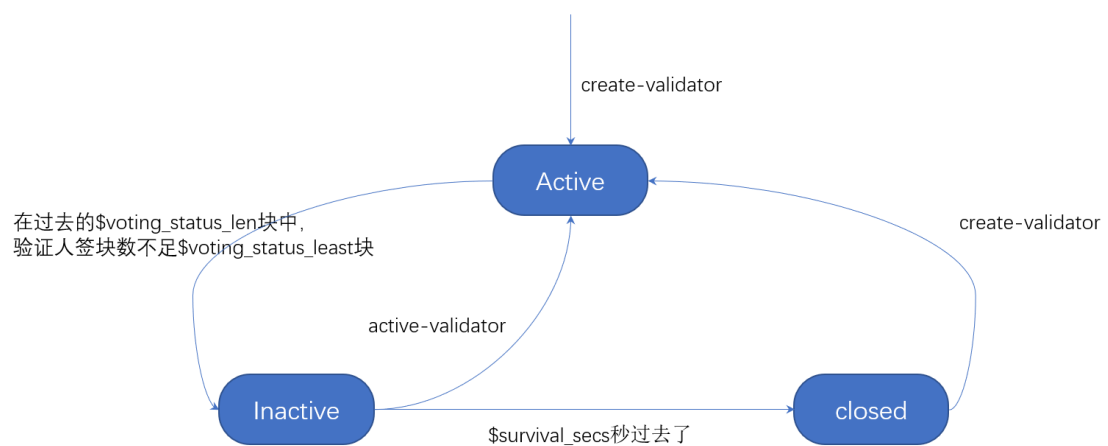
3.3 Validator

There is a validator set in QOS chain, who carries out BFT consensus, for every block must be produced by collecting 2/3 of validators

signature. Every block contains zero or more transactions, validators verify them, sign with their private key, and broadcast them in the network.

By bonding a certain amount of QOS, validators also reflect DPOS. They are paid mining profits by verification of transactions described above.

3.3.1 Statues of validators



- Active status

In which a validator verifies transactions in blocks, signs with private key and keeps broadcasting continuously. An ordinary full-node may, but not necessarily can, become an active validator by sending create-validator transaction, for the network has a restriction of maximum validator number.

QOS marks if a validator is active by the number of its signatures included in last past \$voting_status_len blocks, it must be above \$voting_status_least to keep the very validator alive. We name last \$voting_status_len blocks as validator keep-alive window.

`$voting_status_len` and `$voting_status_len` can be found in genesis file. If a validator can't reach this threshold, it will become inactive compulsively.

An active validator can verify/propose blocks, gain mining profits and transaction fees, and increase its voting power by delegation.

- Inactive status

Not meeting the requirement of the necessary number of verifications in a keep-alive window, or having sent revoke-validator transaction on the initiative, active validator may become inactive. Inactive is an intermediate status between active and closed.

The status of inactivity will last at most `$survival_secs` seconds. If an inactive validator does nothing, it will be closed automatically, that is to say, lose its validator identity, after `$survival_secs` seconds.

An inactive validator can't verify transactions, can't propose new blocks, can't be delegated nor gain mining profits or transaction fees. Its delegator can only get their QOS back to their account once the `$survival_secs` seconds' observation window is over.

- Closed status

Delegators' investment will return to their own account automatically when their validator gets closed. Self-bonded QOS will be back to the account of the closed validator's owner, as well.

A validator is nothing more than an ordinary validator once it becomes closed.

3.3.2 Voting power

As a DPOS blockchain network, validator owners will have to bond some QOS to represent their stakes. QOS stipulates that any full-node must have some self-bond tokens to initiate a validator node. Being created successfully, validators can then add more self-bond QOS, or receive delegated tokens to increase their voting power.

- Mining profits

Every block produced, voting power of a validator decides the profit it gets from inflation, which is:

$$\text{validator's revenue per bloc} = (\text{total mined tokens per block} - \text{proposer extra revenue}) \times \frac{\text{validator's bonded token}}{\text{summed bonded token of all validators who verified this block}}$$

- Discourse and voting power in community governance

Like other DPOS network, a validator's voting power also plays a part in governance votes. Ordinary delegators who does not run a validator also have their right to vote. The right of delegators is the same as validators——in proportion of their amount of bonded tokens. Validators can only make sure to speak for their self-bonded tokens, when their delegator decided to speak in a governance vote, delegators' will overwrite their validators' .

3.4 Delegators

For a QOS holder who doesn't have the ability or desire to run a validator node, but still hope to get a share from inflation, delegating

QOS to a validator to constitute its voting power, hence getting the share of its profit according to the proportion of bonded token, is an alternative choice.

Delegators can operate their transactions by light-client without a full-node.

Delegators taking part in sharing their validators' profit, means that their also shares their validators responsibilities. When a validator gets slashed by misbehaving, delegators will be punished also by their share.

Delegators' bonded tokens have the same right as validators.

Although not running a full-node, as the primary of QOS network, delegators still play an active and important role, which is, choosing a stable and reliable validator to increase its voting power, keeping an eye on their validator closely. Security and stability of QOS network are based on all these activities.

3.5 Validation/Delegation mechanism in QOS network

A validator's bonded tokens constitutes of two parts: self-bond, those from the owner of validator itself, and delegation-bond, those from its delegators' delegation.

$$\text{validator's total bonded tokens} = \text{self-bond} + \sum \text{delegation-bond}$$

A validator can get mining profit according to its total bonded tokens' proportion of the whole network. Every time it verifies a block,

it gets its share from the very block's inflation.

$$\text{validator's revenue per bloc} = (\text{total mined tokens per block} - \text{proposer extra revenue}) \times \frac{\text{validator's bonded token}}{\text{summed bonded token of all validators who verified this block}}$$

For a delegator, it gets its share from its validator's profit according to its delegation-bond. However, validators may get a certain ratio as commission fees from their delegators' share, which is reasonable, for validators have invested a great amount of resources to validate with safety and stability. We define this ratio as \$validator_commission_rate in genesis file.

$$\text{Delegator's profit per block} = \frac{\text{Tokens delegator bonded to a validator}}{\text{total bonded tokens of the validator}} \times (1 - \text{validator's commission fee ratio})$$

4. QOS Ecosystem Business Scenarios

4.1 Consumption (Providers in the ecosystem include: Qianbao card, Qianbao Parking)

Over 85% of retail transaction in China happens offline, which equals to a 33trillion CNY worth of trading market. However, those transaction data are scattered around in the operating system of small and medium sized merchants, in one's personal bank accounts, and in the hands of third party service providers. This attributes to two main issues, on the one hand citizen's identity information would not be restored and used,

also one's privacy is posed to invasion as the data dealer is always trying to steal the data.

The popularity of the various cryptocurrencies reveals public recognition of blockchain technology, but the essence of cryptocurrency is payment. However, most of the existing cryptos only function and apply online whereas their corresponding offline scenarios are rare, leaving no agency able to integrate them. Given the users holding several cryptos in hand, it is of great urgency for the blue oceans to solve the issue on how to combine cryptos with the vast offline payment system.

Therefore the first application scenario of QOS community is offline consumption, as our partner in payment service also realized that the tradition centralized exchange is prone to potential data lost, privacy invasion, thus they are proactively promoting merchants, users and scenarios acceptance of transformation towards blockchain empowered model. The first partner in the ecosystem is Qianbaocard, it is a shopping platform that targets the local markets, it will provide the POS machine, QR code for payment, promotion services for the local small and medium sized businesses. It also provides the quick pass and IOU services for consumers. Covering over 300 cities now, it is now boasts of over 400,000 businesses providing services ranging from foods, entertainment, exercise and fitness, life services, beauty and supermarkets, with a over 6billion CNY transaction flow, over 30million

transactions with over 10million users each month.

Another payment service provider in our ecosystem is Qianbao Parking, taking car parking service as the entry point, it provides service for car-owners, parking lots, advertiser (local small and medium sized businesses). With the integrated hardware and software parking lot management system, they would provide the car-owners with non-inductive-payment and target the ads to potential clients. This project is now available and fully covered 23 cities, in 1,000 operating parking lots with over 300,000 parking space, serving over 10million car owners.

4.2 Credit Financing (Providers in the ecosystem include: ChangzhiBank, PinjamanGo)

The process of credit financing comes down to the recognition of user' s identity then the pricing on it. The traditional financing is indeed the liquidation of resources such as (plates, data, low-cost capital) which breeds much money brokers, leaving the vast small and medium sized enterprises and those people without credit record extreme high interest rates, while basically they are not able to enjoy due service. The recent years have witnessed the high speed development of Internet finance, and we have seen the past disadvantaged group is eager for new forms of financing. The market for loaning is still vast in China, number of social financing stock reached 156trillion CNY including 2.2trillion CNY of Internet finance. We believe that blockchain technology will transform

the traditional financial services in multiple fronts.

1) Blockchain technology guarantees use of funds and transaction consistency, whereas in traditional finance the signed loan contract alone is not able to track the use of funds when the borrower received the loan and they may embezzle funds on other purposes. This will pose potential threat to the accommodator. Therefore the traditional finance do not provide an effective solution on use of funds and consistency of transaction, instead they settle for solution on borrower' s load repayment capacity, collateral and repayment willingness. This partially reveals the use of funds is uncontrollable. However, in this era with blockchain, smart contract and cryptocurrency, we are able to monitor the use of funds effectively by shared digital signature system, which requires signatures from all the involved parties before settle with cryptocurrency. The borrower do not have the sole control after he received the cryptos, effectively prevent against any misappropriation.

2) Information on one's identity is thorough, safe and controllable, and in blockchain technology era, the credit and loan industry will evolve towards a P2P credit and loan time, the traditional finance service providers will turn to credit information providers. People with borrowing needs and lending needs could be able to carry out credit and loan as well as investment based on the professional credit data services.

Based on above mentioned viewpoints, QOS attaches great importance to the development of finance markets, and achieved the intention of

cooperation with various financial institutions since we built this community. Together we would push forward the evolvement of Fin tech towards the next generation.

- Commercial Banks

Commercial banks are the main force in China's credit financing. Individual credit report issued by Credit Information Center of People's Bank of China is the most authoritative proof of citizen's credibility in the pre-blockchain era. The joining of commercial bank at the early stage of community building will greatly promotes the establishment of citizen's credit system. Changzhi Bank is a local joint-stock bank that embraces emerging industries, and it will be an important credit financing service provider at the early days of QOS community.

- Oversea market

While operated in the local area, the QOS team has set its sights on the global market with the open spirit of the blockchains and established strategic cooperation with PinjamanGo, which is the most powerful credit company in Indonesia.

Indonesia, a total population of 254 million, stays in a using cash society, which young labor (low-middle class) accounts for 67% of the total population, and the overall income level is low (just about 2,000 RMB). Residents generally have consumption in advance habits, and the annual compound growth rate of consumer credit reached 30%.

PinjamanGo is a technology finance company invested by Indonesian

largest consortium Jinguang Group. Its business scale ranks second in Indonesia. It adopts fully automated credit approval method and has provided credit services to more than 400,000 users.

4.3 Media (Providers in the ecosystem include: Duduapp, Shanghai Star. V Data Technology Co., Ltd and others)

User contribute to the community by effective browsing, commenting, forwarding information and stay active on the media platform, which process signals their unique taste and interests. So at the beginning of establishing the platform there should be corresponding service providers for that. QOS has chosen powerful partners in both new media and traditional radio and television media for business implementation.

QOS's new media partner Duduapp is the largest new media service provider in third-tier and fourth-tier cities in China, providing attracting fans, editing contents and operation solutions for local new media; Membership, stores, Merchandise management systems, Finance, Advertising, and other valueadded services such as game realization. Supporting the localization team through the regional operation center, Duduapp has established a new media matrix in 800 cities across the country, serving more than 100,000 merchants, and more than 6 million trading users. Unlike most blockchain projects that are used in the field of Internet advertising in the media direction, the QOS community will be used in the field of television broadcast media because there are two flaws in the Internet advertising business model: the first is the value of user identity on this Internet advertising platform is narrowed down inappropriately; the cash realizable value by analyzing user's browsing history is not large

enough. Second, radio and television boast numerous users with great influence as a powerful terminal play an important part in people's life and in advertisement marketing channel. However, its underdeveloped infrastructure leaves this business mode out of the development plan.

QOS's partner in the field of TV media, Star. V built a leading domestic data service platform with TV screen as the entrance and integrated three screens (television screen, mobile phone screen, computer screen) into one. The platform now has access to and gathered family viewing behavior data and DPI Internet flow data from over 20 provincial level network operators, covering over 70million users. We provide data gathering and analysis service for 15 broadcast television network operators such as Beijing, Tianjin, Shanghai, Chongqing etc. Our branch media company has gained digital tv advertisement agency qualification in 37 cities across China, with service coverage in 23 provinces and over 500 cities. We are the largest in scale, the most extensive in coverage digital tv ad network.

4.4 Data service (Providers in the ecosystem include: Minivision Technology, etc.)

Millions of users are engaged in consumption, finance, and social activities in the QOS community, accumulating a large amount of valuable user data. QOS plans to incubate and introduce a group of professional data service providers to help community citizens avoid data privacy violations. Then, generate data reports according to different scenarios, so that community citizens can more effectively realize the value of data.

The first professional data service provider in the QOS community is Minivision Technology. Minivision Technology is an AI company based on

machine learning technology. The company has built an open and comprehensive artificial intelligence platform, continuously provided service for various scenarios, and it is the first to present the face as a unique ID and provides users with comprehensive data analysis for various industries.

Up to now, Minivision Technology has the data label reserve of hundreds of millions of natural persons and the number of annual interface calls exceeds 1 billion. The number of accumulated services clients is more than 1400 customers, such as Alibaba, Didi, SF, Jingdong, Zhongan Insurance and Vipshop.

5. User Interfaces

5.1 Light Client

Under the discipline of abiding to BFT consensus algorithm to verify transactions, QOS provides light client for mobile usages, introduces special data structure to store headers. As executing transactions, mobile clients will compare headers received with local ones, to be precise, comparing the validator set in a block header. According to BFT, only if at least $2/3$ majorities can reach consensus. It's the same case that if the change of the validator set in headers is less than $1/3$, the verification of headers will pass. If the change is more than $1/3$, verification will fail, another round of half-interval verification will be necessary: the local header would be replaced with the one in the middle of the local and received, then compared with the received...and so forth.

Detailed in steps :

Alice sent a transfer transaction at 6:00 in the morning, got off-line after the transaction is submitted on the blockchain. At this time the validator set in the local header stored in her mobile is (A, B, C, D);

Alice queried her account on the blockchain at 12:00 am, the result blockchain returned to her was with validator set (A, B, E, F). The mobile client started to verify. Since the change of validator set was more than $\frac{1}{3}$, a second round is needed;

The light client on her mobile would ask for a block earlier, for example, at 9:00 am. This block header contains (A, B, C, E), comparing to its local set (A, B, C, D), the change was less than $\frac{1}{3}$, verification passed. Mobile client then updated its local header to (A, B, C, E), comparing with recent query result (A, B, E, F), the change was less than $\frac{1}{3}$, was convinced the new result's safety and reliability, and then update the local header to (A, B, E, F).

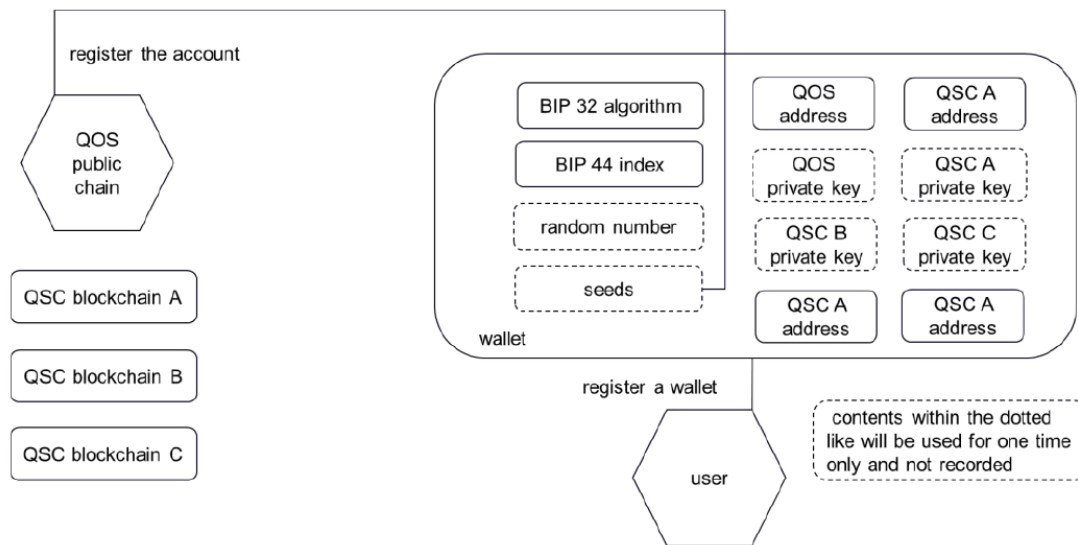
Light client will fetch the latest block header to compare with its local one every time it is about to do the verification in order to send a transaction.

The diagram below shows the process of this technique :

The wallet of QOS public chain will become an open-source project for QOS. When a user applies for a public chain wallet, the wallet app generates a true random number. The mnemonic seeds for generating a HD Wallet are set by the user. The true random number and mnemonic seeds can be used, based on the BIP32 and BIP44 protocols, to generate an address for use on the QOS public chain. The user's address will be registered on the QOS public chain as a unique identity of the user.

The wallet of QOS public chain does not keep the user's private key. At the beginning of the project, the true random number and the mnemonic seeds are kept by the user. When performing transaction signature, the wallet obtains the real random number and the mnemonic seeds through the encrypted channel, and calculates the private key to complete transaction signature.

The QOS public chain wallet is used on the QSC service chain. The wallet, according to the BIP44 protocol, generates an address on the service chain and the QOS public chain wallet will release a hardware wallet in due course to address the security issue concerning the storage of private keys. The overall structure of the QOS public chain wallet is shown below.



5.3 Unified Identity

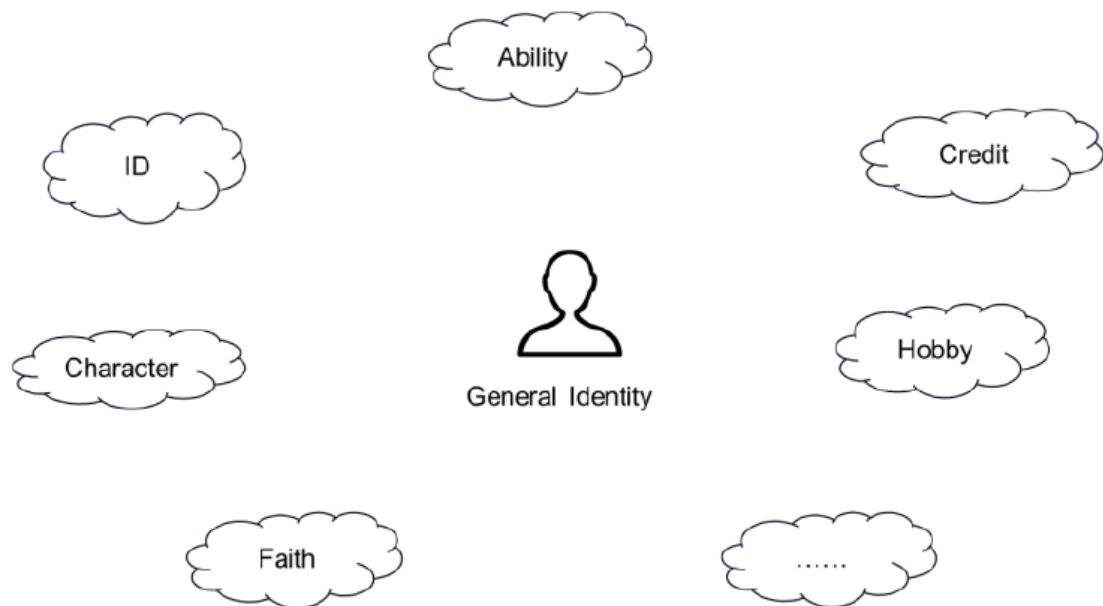
The identity of a person is usually based on the person's biological features and government-acknowledged identification data. As more social and economic activities move from offline to online, online fraud where perpetrators use virtual identities to deceive others has become increasingly prevalent. The unified identity of users on various online platforms has increasingly become the focal point of industries.

QOS holds that identity is not just an identifier, but carries wide connotations.

In the QOS community, identity contains multiple meanings including:

- 1) A unique identifier in a certain scenario, such as passports needed to travel abroad, ID cards in China, and IDs in a certain online community. These identifiers are often difficult to get unified across scenarios due to technical, political and commercial reasons.
- 2) Region, race, religion, and belief. For instance, blockchain brings together people with a shared dream of building a distributed and decentralized community.

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- 3) Social roles and positioning, such as employees and employers, father and son, and colleagues. A certain relation with others has made a citizen who he/she is.
 - 4) Capabilities. Economic status, spending power and physical conditions are part of one's identity, for example, the Olympic championship is a glorious identity of the title holder.
 - 5) Credit, undoubtedly one of important identities of a citizen and reflected in the history of his/her borrowing and agreement honoring.
 - 6) Interests. A community glued together by the same interests tends to be long-lasting and dynamic. Individuals tend to have a stronger sense of belonging to the community. Thus, one's interests are one's unique identity.



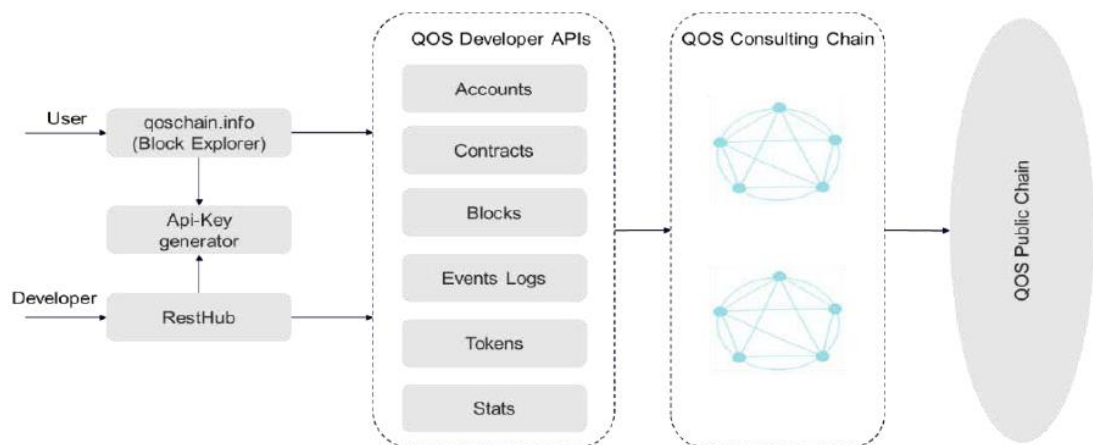
QOS defines the above-mentioned characteristics of a citizen as general identity. Beyond nation, language and the Internet, general identity becomes the unique identifier of each individual.

As a general community for corporate operation, QOS enables countless

scenario providers, data service providers, wallet providers, exchanges, etc. to provide services through a unified underlying platform to citizens in the community. QOS is expected to become a trillion-dollar community economy which is governed by its own citizens, and where a citizen's identity is unified and the identity information of the citizens is comprehensive, accurate, and controllable.

5.4 The Blockchain Explorer of QOS Public Chain

QOS public chain provides developers with APIs in the form of community services, enabling them to view the information on the operation of the chain. Meanwhile, QOS operation team have developed a [block explorer](https://qoschain.info) for the public chain through using these APIs. The explorer, whose address is qoschain.info, enables ordinary users to browse the information on transaction status in the QOS public chain and sub-chains. The architecture of the QOS developer API and block explorer is shown below:



6. Roadmap

2018Q2	Project Preparation
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2018Q3	ICO Completed; Release Whitepaper; Sign with Strategic Partners; Core Community Building
2018Q4	Release Public Chain Testing Environment and QOS Wallet; Set up QOS Ecosystem Foundation
2019Q1	Develop Public Chain Supporting Services Tools; Investment and Cooperation in the Continued Application Scenario
2019Q2	Release Public Chain Production Environment

7. Contact Information

Official website

<https://www.qoschain.io>

Contact email

contact@qoschain.io

Facebook

<https://facebook.com/QOS.Foundation>

Twitter

https://twitter.com/QOS_Foundation

Telegram

https://t.me/QOSOfficial_EN

https://t.me/QOSOfficial_CN

Sinaweibo

<https://weibo.com/u/6310001987>

validator step by step(video)

https://v.youku.com/v_show/id_XMzk4NzM3MTEyOA==.html

WeChat group

Scan QR code or add QOS-Official assistant to join our WeChat group

