QoodBlock
White Paper

--QoodBlock is the global automobile data exchange market and ecosystem supported by blockchain technology

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Contents

1 Summary

1.1 Purpose

This white paper aims at summarizing the vehicle data trading market and the ecosystem of QoodBlock. With the basic understanding of the IoT, automobile industry, IoV, automatic drive, ITS, usage based automobile insurance(UBI), travel/car sharing and blockchain technology, readers will understand the content of this white paper easily.

1.2 Scope

This white paper provides a summary of the vehicle data exchange market and the ecosystem of Qoodblock, which is designed for developing and deploying decentralized applications in global IoV field . This paper describes the industry background, business logic, ecological management, token economy design and core components as well as introduces the architecture design and the design details of the key components.
This paper provides the necessary information for the understanding of the whole system. We may modify and improve the products, architecture system or procedure mentioned in this paper without informing in advance.

1.3 Relevant Documents

Qoodlock Official Website: https://QoodBlock.io
QoodBlock White Paper: https://QoodBlock.io/whitepaper.pdf

1.4 Terminology

Internet of Things (IoT): It is an important component of the new generation of information technology as well as an important development stage of “information age”. Internet of Things is just an Internet with things interconnected. The concept has two meanings: 1) the core and basis of IoT is still Internet. It is an extended network based on the Internet; 2) the client is extended among things for information exchange and communication, that is, things are interconnected. IoT is widely used in network convergence through communication and perception technology such as intellisense, recognition technology and pervasive computing,

thus it is called the Third Wave in the world information industry development after computer and Internet. IoT is the application extension of the Internet, is a kind of business applications rather than a network. Therefore, application innovation is the core of IoT development, and focusing on user experience is the soul of IoT development.

Internet of Vehicle (IoV): IoV is a large-scale network with wireless communication and information exchange between vehicles and X (the surrandings include vehicle, road, passengers etc.) according to the agreed communication protocol and data exchange standard, which is based on the Controller Area Network (CAN), Vehicle to Everything (V2X) and Telematics. It is an integrated network that can realize intelligent traffic management, intelligent dynamic information service and intelligent control of vehicles. IoV is a typical application of IoT technology in Intelligent Traffic System(ITS) field.

Telematics: It is a combination word composed of Telecommunications and Informatics. Telematics is an integrated service system of wireless communication technology, satellite positioning and navigation technology, Internet technology and in-car computer technology aiming at connecting cars to the Internet through wireless network and provide users with related services such as driving and living.

Telematics Service Provider (TSP): It is the service provider of Telematics. The Telematics market can also be divided into After Market (AM) and Before Market (BM) dominated by automobile manufacturers. Telematics AM refers to providing Telematics services by means of installation of corresponding in-car intelligent devices after the car is released. Telematics BM refers to providing the services directly with embedded in-car intelligent devices which is installed in car manufacturing process.

Intelligent Connected Vehicle: It is the Internet connected vehicle with sensors transmitting and receiving signals , thus can perceive the surroundings and interact with other vehicles or entities.

Autonomous Vehicles: Vehicles can drive automatically. The autonomous vehicles can decrease the transportation cost and improve the convenience and safety.

Intelligence Transportation System (ITS): It is a real-time, accurate and efficient integrated transportation and traffic management system that works in large scale and all situations, which is based on effectively integrating the advanced information technology, data communication and transmission technology, electronic sensor technology, electronic control technology and computer processing technology.

2 Preface

With the development of blockchain technology till 2018, besides many basic public blockchains 3.0(with EOS as a key benchmark) aiming at solving various drawbacks in blockchain 1.0 and 2.0, such as low TPS, poor security, being user-unfriendly, ecological isolated island (cross-chain) and governance model, another key challenge for blockchain 3.0 is how blockchain plus Internet of Things (IoT) can enable industry application, which will truly reconstruct the production relations from theory to practical works. Improve industry productivity and industry application have become a significant mark and big challenge for blockchain 3.0.

The arrival of IoT era with the feature that all things interconnected enables the digitalization of physical products. IoV as one of the most important branches in IoT field having matured gradually after nearly 20-year development, and being with comparatively complete infrastructure pave the industry foundation for the introduction of blockchain technology. With the the bandwidth capacity for computing and storage in automobile enterprises' existed IoV platform, we can encrypt the vehicle data based on cryptology., affirm the ownership right and build machine trust perfectly.

The mission of QoodBlock is to establish a "**data exchange market for intelligent connected vehicle supported by decentralized blockchain technology** " , to break information isolation,to make outpouring vehicle data flow and transact safely and efficiently, which will increase the industry's productivity tremendously.

Qoodblock can help automobile enterprises, TSPs (Telematics Service Provider), insurance companies, auto financing companies, used-car dealers, rental car companies and other ecological cooperative partners to connect the existing systems and services with blockchain. helping these partners apply their existed data, users and business models into the new data-driven services supported by the QoodBlock, will make the vertically closed automotive service industry evolve towards a data-driven, people-oriented intelligent and sharing future.

QoodBlock – "**digital ecological engine of intelligent connected vehicle**".

3 Value Realization of Vehicle Data

3.1 Accelerated Development of Global IoV Industry

20 years ago, GM (General Motors) launched the first global Telematics service OnStar in December 1997 with accumulated over 7 million global users till now. As the biggest TSP in the world there are 3 million OnStar users in China market.

As one of the three-in-one network, IoV is the infrastructure of autonomous vehicles. PwC “Digital Auto Report of 2017” predicts that new vehicles in America, Europe and China market will 100% carry the Telematics service by 2022, and the car ownership of IoV around the world will exceed 470 million by 2025. The market size of car-sharing service based on IoV will be up to 2200 Billion USD by 2030, which is fivefold of the present global smart phones market, and equal to the total scale of the global e-commerce market. As the important infrastructure of strategic transformation and upgrades carried out by automobile enterprise towards “intelligent comprehensive transportation service providers”, the automobile enterprises all over the world pay high attention to and strongly promote the construction and development of IoV.

3.2 Telematics Industry Is Facing Big Challenges

Though the automobile enterprises are strongly promoting the investments of constructing IoV, most Telematics Service customers don’t become loyal users. The current situation of the whole industry is users’ low willingness of using Telematics Service and low renewal rate, and, even industry leader OnStar users' renewal rate is much lower than 20% (even lower than 10% in most areas). In conclusion, the challenges for the present IoV industry are listed as follows:

✧ **Lagging Service and Artificially High Prices**

- ✓ The services TSP can provide are lacking differentiation (which are divided into eCall, bCall and iCall) and can be replaced very easily. Even the most frequently used in-car navigation in iCall is gradually replaced by the free navigation APP in smart phones. And the service charge is artificially high. For example, service fee of OnStar in China market ranges from 499 to 999CNY per year.

- ✓ “The digital functions in Telematics service is with high price, complicated operation, user-unfriendly design and lack of attraction. A $500 smart

phone completely defeats the digital function of Telematics service in the user experience."--PwC "Prospects and Earnings of Intelligent Connected Vehicle in 2016"

✧ **Centralized Deployment and Potential Safety Hazard**

- ✓ Although the automobile enterprise designs the safety mechanism in the Telematics platform, the security of most platforms is quite weak. The hackers can destroy and tamper the information as they gain control of central routing, which will directly threaten the driving safety of intelligent connected vehicles and raise the risk of revealing the users' private data being leaked.

- ✓ Even for innovative technology companies,for example Tesla, has loop holes in its vehicle data platform. On 22nd February, 2018, digital security company Redlock revealed that hacker has broken through Tesla's access right without authorization and stolen the computation resources deployed in the AWS cloud environment and used it to mine and obtainedCryptocurrency.

✧ **Information Island and Privacy Concerns**

- ✓ Due to the highly secluded nature of the auto industry, Telematics serviceled by all automobile enterprises is based on the centralized platform to collect and store IoV data generated by users, including the data collected through CAN in car and the private data of user's driving behavior. Because of the competition, these Telematics service platform don't connect or communicate with each other, consequently forming information isolated islands.

- ✓ As the owner and contributor of IoV data, users will not only get no return, but also need to pay for high service subscription fee to TSP. Even knowing that data (including the private data) contributed by themselves are used to benefit from the third-party trading, they still can do nothing. This behavior of platform kidnapping makes users discouraged from using the Telematics service;

3.3 Necessity for Introducing Blockchain to Telematics Industry

Nowadays, the automobile industry has entered into the big data era. According to McKinsey's forecast, the data produced by the global IoV will go over 163,000PB/yearby 2020. The key of healthy development in every industry is the coordination and adaption between productivity and productive relations. Based on the IoV infrastructure, the auto industry can continuously provide vehicle and

driving data, to become “means of production” of ITS (Intelligent Transportation System). Introducing tremendous amount of IoV big data to machine learning and AI technology promotes automobile industry to march toward autonomous vehicle, which will tremendously liberate the “productive forces”. However, productive relations in IoV at the present stage have been serious distorted. Fuzziness of IoV data property right and using right directly causes the data application badly lags behind.

In the era of big data, people have increasing cognition and concerns about data privacy, data protection and data value (Facebook is facing an existential crisis- CNN: http://money.cnn.com/2018/03/19/technology/business/facebook-data-privacy-crisis/index.html). Data owner, user and consumer in the Internet world are with overlapping roles and complicated relations day by day. However, Internet itself in reality exists the inherent defects. For example, it concerns more about the information delivery instead of the information ownership, which causes “data streaking”, “information with no owner” and so on. In the field of IoV, as the investors of IoV infrastructure, the automobile enterprises naturally consider the IoV data belong to them, while the users think that the construction cost of IoV have been counted into vehicle price and transferred to the consumers as a part of vehicle equipment. As car owners, users continuously generate and contribute the data including daily private car usage and maintenance, thus the users are the owner of IoV data.

In reality, Telematics users contribute data but don’t get the respect they deserve. On the contrary, they need to worry about the privacy issues and expensive Telematics service fees. Automobile enterprise, which should have been the guardian and agent of users’ IoV data, totally controls the users’ data and even abuses its power, using users’ private data to make profits. As a result, most of users don’t pay for Telematics service renewal, which makes automobile enterprise lose their consumers. Thus, the previous IoV infrastructure investment from automobile enterprise is under-utilized, and the intelligent digital evolution of the whole automobile industry loses its foundation.

IoV industry is in desperate need of introducing the blockchain technology to reconstruct the twisted productivity relations, using cryptography to protect users’ data through asymmetric encryption and eliminate users’ worry about privacy. Machine trust being established due to unchangeability of IoV data stored in blockchain database will establish and validate the rights of users’ data. Setting up the IoV data trading market using blockchain technology, utilizing token economy, promoting fair and transparent trades between data consumers and data agents, reduce data transaction cost. With above mentioned measures and stimulating the users who contribute IoV data by returning the right back to them can really motivate the power of IoV industry.

3.4 QoodBlock’s Solutions for the IoV Development

In the design, QoodBlock considers and respects the current situation of automobile industry adequately. It provides automobile enterprise with blockchain standard API interface to support the connection between independent Telematics platform and blockchain database. Data from independent telematics platform can be stored on the QoodBlock chain, which generate multiple IoV data backups on the blockchain database. Storing IoV data in QoodBlock will become the actual solution to potential security concerns and private data leaks caused by hacker's attack.. With blockchain technology constantly evolving and maturing in the future, QoodBlock thinks that the current technical framework with vehicle data stored in a concentrated way will gradually evolve into the decentralized blockchain database framework, which shows the obvious advantages perspective from security and economy. QoodBlock is ready for this. When the time is right, it will support the transfer between the Telematics platform of the traditional automobile enterprise and the total decentralized database framework, which will immensely decrease the infrastructure investment cost of the automobile enterprise for traditional Telematics platform with much improved data security and protection..

The biggest challenge of IoV data transaction is "data ownership right". Without mutual agreement between vehicle users and auto manufactures, data trading can not be archieved. For this, QoodBlock provides the QoodShares module for data ownership rights. It is a highly flexible, highly reliable digital ownership distribution framework. Based on Qoodshares, vehicle users and auto companies can mutually agree on how ownership of IoV data would be distributed between them, then the IoV data can be traded in exchange.

IoV service providers, as authorized agents of user car data and consensus builders of data transaction links, are defined as special nodes in the QoodBlock system (blockchain "miner", see section 4.2 of this article for details), IoV service providers earn QDT rewards by providing distributed data storage on the blockchain for car data access and helping users establish consensus during data transactions. Considering the applications of some services such as eCall, bCall, P2P Car-Sharing etc., which require highly reliable real-time data and high TPS（Trade Per Second） in the Telematics Service, QoodBlock is designed specifically for this kind of business monitoring API to support the TSP to provide users with real-time response services that achieve SLA based on QoodBlock (For details, see section5.4).

QoodBlock believes that the two-level coexisting "partially decentralized topology" of users and TSP (or intelligent integrated transportation service provider) in the automotive field will persist for a long time. Therefore, in the design, the independent management and operation rights of the existing TSP have been completely reserved for the Automobile Enterprises. By participating in and matching transactions between users' data and consumers in the QoodBlock's data resource

market, TSP can transfer the business capability of the data consumer (UBI, auto finance, used-car valuation and trading, P2P shared car, etc.) to the existing IoV service through the data exchange, construct the “Vehicle Lifecycle Management” service for users, realize the rapid upgrade of traditional Telematics Service for Automobile Enterprises and promote the transformation and evolution of Automobile Enterprises to "intelligent integrated transportation service provider" (For details, see section 6).

Since 2018, more and more Automobile Enterprises have realized the value and strength of blockchain. Mercedes-Benz, Porsche and so on have devoted themselves to using blockchain technology to solve the problems of low customer renewal rate and customer loyalty in Telematics Services, , leading the trend. QoodBlock thinks “blockchain” will be the future of Telematics development and the ultimate way to solve industry issues like “how to use data considering ownership?” and “How to set price and make deals?” But both the pilot projects of Mercedes-Benz and Porsche are still the private blockchain model dominated by either company. Although it's an upgrade to the current customer loyalty program, which is based on the internal reward points, this private blockchains model can’t fundamentally break the current situation of the isolated information islands among the Telematics due to the fierce competition among the Automobile Enterprises.

QoodBlock believes that the public blockchain is the ultimate solution. In the trend of global automobile industry becoming intelligent networking and digitization, it builds ecosystem with non-profit organization, DAO (Decentralized Autonomous Organization) form, and breaks down the closed barriers of traditional Automobile Enterprises, reactivating the lost and sleeping Telematics Service users and allowing IoV data resources scattered across various Telematics Platforms to flow. And the prosperous data flow and exchange will become the engine of QoodBlock ecosystem, promoting the traffic transportation service to speed up to the digitization, intelligent and more beautiful future.

4 Platform Design of QoodBlock

4.1 IoV Topological Structure

IoT industry is globally recognized as the major field to practice and apply blockchain 3.0. However, looking through the launched designs of blockchain IoT system, most of their topological structures belong to the DUT (Decentralized Unstructured Topology), the design thought of which is mainly to support and satisfy the direct communication among single equipment of IoT. The Decentralized Unstructured Topology requires relatively complicated function of IoT single equipment. For example, the equipment needs to directly connect with the Internet, realize P2P protocol stack and has a reasonably strong capability of logical operation to achieve the relevant business needs of IoT. But most IoT equipment on the market haven't met the mentioned requirements above. The application of blockchain technology in IoT field should be broken through urgently.

Through more than ten years technology deposition and industry penetration, the practice of IoT in the automobile field facilitates the IoV industry today. When the other IoT industries are still considering how to deal with the data collection, the global IoV industry has almost finished the infrastructure construction, marched toward the rapid development and started to consider how to use IoV data and release it true value. At the present, all the in-car intelligent terminal equipment of IoV system are directly connected with the Telematics Platform of Automobile Enterprise. Though the vehicle will evolve to the period of Autonomous Vehicle (L5) in the future and be an on-demand "Intelligent Transportation Tool " at that time, it is still provided with unified service and management by the third-party board like TSP (or called as Intelligent Transportation Service Providers). Based on the insight mentioned above, QoodBlock believes that blockchain structure of IoV should be a PDT (Partially Decentralized Topology), which is a better architecture model and can satisfy the need of different business scenarios in the Automobile Industry.

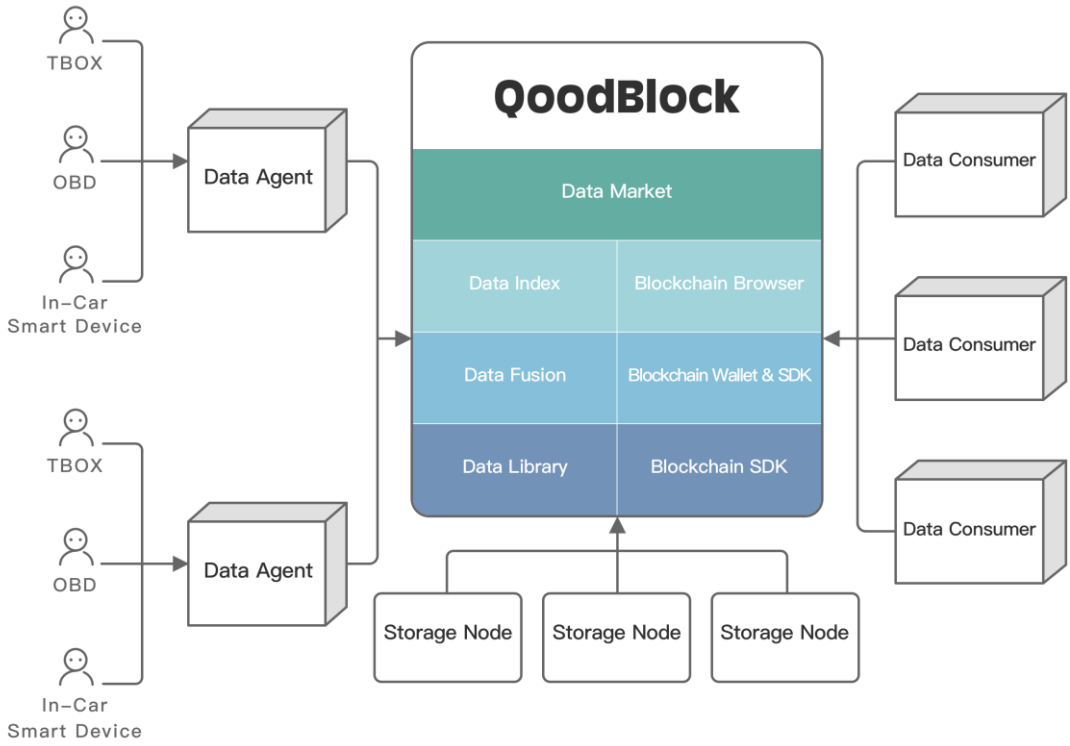
4.2 System Framework

QoodBlock is a blockchain platform used for transaction of IoV data. TSP authorized by users on the Qoodblock is in charge of the IoV data storage via blockchain database. As the IoV data agents of users, TSPs use smart contracts on the QoodBlock trading market to sell IoV data. IoV data consumers (IoV data demand side) purchase data to achieve their business demands, or provide the vehicle users with services in exchange. The automobile data transaction is completed in the QoodBlock trading market and realized through the smart contract of blockchain

technology. There are no third parties involved in the transaction, such as intermediary and middleman, which are completely based on the free choice of the buyers and sellers. The dynamic matching forms ecological autonomy.

In the QoodBlock ecosystem there are four major roles divided by the function destination: Users (IoV data owners), Data Resources Agent (generally referring to TSP), Data Resource Consumer (generally referring to Insure, Auto Financing, P2P Renter, Used-Car Dealer and other consumers with a clear demand for IoV Data) and blockchain storage node. QoodBlock systematically connects the mentioned four roles.

The basic framework of system is as shown below:



QoodBlock, as a blockchain automobile data exchange platform, provides a series of functional components to achieve this goal. Data agents and data consumers can implement fast system access based on QoodBlock's SDK and Wallet. Data Fusion can help data consumers to better extract data value; Data Library allows data agents to organize data with standard formats, in order to facilitate data consumers to implement standard data services based on different data sources; Data Index can provide tools to ensure the efficiency and safety of data sales.

✧ **Data Resource**

Data resource of IoV includes vehicle data and vehicle communication API. Vehicle communication API includes monitoring API and control API. For example, to provide the users with services based on the vehicle location, data consumer needs to purchase the monitoring API service of vehicle location from the QoodBlock data resource trading market. Besides purchasing the monitoring API service, P2P Car-Sharing Renter also need to purchase one part of the vehicle controlling API service to realize the unlock and lock functions of vehicle remote control. Vehicle communication API will be an essential part for establishing QoodBlock.

The data accessed by QoodBlock in the early stage is mainly car data, but as the business develops, other data providers can also find suitable business models on QoodBlock.

✧ Users

In this paper, users are equivalent to a vehicle entity that has the ability of intelligent connect. IoV Data is provided by the car owner/driver, based on the connection between intelligent on-board equipment on the car and TSP. The owner has an ownership of IoV data, earning rewards by commissioning the data agent to make deals in the QoodBlock data trading market.

In the current stage of the IoV industry, either the IoV equipment in the pre-installation mode or the post-installation mode occupies a certain proportion, so the QoodBlock system does not limit the source of the IoV data and the type of vehicle-mounted equipment. The car data can be collected and provided through the TBOX installed during vehicle manufacturing or can be acquired through on-board equipment such as OBD equipment and GPS Tracker installed in the aftermarket.

Under particular circumstances, some data resources can be provided to data consumers for free. For example, when the users choose the P2P Car-Sharing service, they can benefit from using vehicle to provide the external leasing service. In this case, the users have the will to provide IoV data free in order to earn rental income.

✧ Data Agent

Data Agent is anthorized by users to manage, and represent the users to make deals of IoV data. Data Agent gains award by building consensus and matchmaking data trade deals. In this paper, the physical subject of data agent refers to TSP in QoodBlock ecosystem.

✧ Data Consumer

IoV Data consumer generally refers to automobile Insurance, Auto Finance, Used-Car Dealer, P2P Car-Sharing etc.(TSP is also one of the data consumers), purchasing relevant data resource according to the business requirements itself in QoodBlock data market, to improve its service level. These services can be provided to the users, such as UBI, Auto Financial Credit, Used-Car Evaluation of trading and other relevant

services. They can also be the services that are independent and irrelevant to the specific users, for example, the AI company or Insurance company develops their own UBI algorithm or models based on the plenty of genuine and reliable data through QoodBlock, or an intelligent traffic research organization based on QoodBlock utilizes data services for ITS research, modeling, etc.. However, it's certain that all data consumers need to obtain the necessary data in QoodBlock data exchange market.

✧ **Storage Node**

Storage node refers to the physical node that takes part in and contributes to the storage resource on QoodBlock. It get rewards by storing the IoV data and providing data tranmission services in the data trading. Considering current situation and features of IoV industry, storage node doesn't take part in the construction of blockchain consensus mechanism in the QoodBlock system.

✧ **Data Exchange Market**

Data transaction is the main function of QoodBlock, and safety and efficiency are the main technical indicators of QoodBlock. Utilizing the advantages of blockchain technology, and effectively using symmetric and asymmetrical encryption, smart contracts, and public ledgers, etc., can maximize the legal interests of both parties in data transactions. For the IoV industry, QoodBlock believes that achieving a safe and efficient data transaction market is a huge challenge. In order to achieve this goal, QoodBlock has been enhanced in the following aspects:

- ✓ Use the DPoS consensus mechanism, combine with lightning Network, sidechain and other technologies to provide a high TPS transaction engine.
- ✓ Define common fields at the data dictionary level to speed up data retrieval. The data exchange market and the digital asset exchange are two completely different concepts. The commodities in the data exchange market are different, and the price comparability is not high. The digital asset exchange is more of a standard digital asset sale. The data product description and search in the data transaction market are very basic and important requirements, and the public fields of the data dictionary can be well supported to meet these application challenges.
- ✓ Data index engine based on Kademlia DHT protocol

4.3 QoodBlock Main Functions

- ✧ Using smart contract to provide the data resource agent and data consumer with a convenient, transparent,reliable and secure IoV data exchange market;
- ✧ Verified efficient consensus mechanism, DPoS

- ✧ Transaction free of charge based on the controlled technology of “Coin Day”
- ✧ Verified blockchain data storage technology solution, TrustDB Layer
- ✧ Using data dictionary to provide ecological partners with data description, data retrieval, data fusion and other technical support.

5 QoodBlock System Technical Execution

5.1 Data：

- ✧ Vehicle data: such as VIN, CAN, vehicle ID and in-vehicle data；
- ✧ Driving data: Location (GPS), historical track, driving behavior (acceleration, deceleration, braking), driving event (collision, anchor) and equal data generated by the user during the use of the vehicle；
- ✧ Fusion data: The data source of the fusion data can be acquired from the channels such as purchase or collection, etc., and then be dealt with and sold according to their target business. QoodBlock provides technical support for data fusion through data dictionary.
- ✧ Vehicle monitoring API；
- ✧ Vehicle controlling API；

5.2 QoodShares owernship rights module：

Module Structure:

Consensus types	Auto Enterprise Data	User data	Disputed Data
Encryption	Encrypted by Auto Company	User Data	Dsiputed Data
Privacy level	-	Normal data	Private Data
Agreed distribution Authorized Trade	-	Authorization granted	Authorization failure
Trading	provides the corresponding key in transacting encrypted data/ zero knowledge proof result authenticity in transacting encrypted data		
Profit Distribution	Auto Enterprise Account	User Account	

QoodShares' main features are highly flexible and reliable.
Data classification, privacy level, profit distribution is controlled by the consensus between vehicle users and automobile enterprises. The control by consensus shows

the flexibility of QoodShares. Any disagreement in consensus between the parties will result in data exchange failures.
High reliability is showed in two areas: consensus result recording and execution; the logic of data encryption.

All consensus outcomes will be recorded on the chain and changes later will also recorded accordingly on the chain. This information will be encrypted to ensure authenticity. At the same time, profit distribution agreement is already reached between parties and recorded with smart contracts, the proceeds of data trading will be deposited into the parties' digital wallet directly based on the smart contract records without the need of going through auto enterprises first.

QoodShares uses different encryption algorithm for each data classification, this means the ownership rights of data are also encrypted. As long as the algorithm is secure, the record of ownership rights is authentic and highly reliable.

5.3 Data Transaction：

The data owner owns the unique private key of the data. The private key can automatically derive a secure encryption/decryption key as needed (the private key cannot be reversed by the encryption/decryption key).

All kinds of data will be divided into blocks and encrypted by its owner and related data agents with their keys then uploading to the network for reliable and secure storage and transaction.

The segmentation method of data will be adjusted according to data type, characteristics, security requirements, etc. Each piece of data will also be stored on the network with a data description file. The data description file records the data description, segmentation mode, data hash, verification mode, encryption and decryption parameters, and so on.

The data purchaser can issue purchase orders through QoodBlock. The data agent encrypts the corresponding data key set using the buyer's public key according to the information in the purchase order. Only the purchaser can use its own private key to obtain the data key set.

Data agents can also actively share data sales orders through QoodBlock. Purchase orders and sales orders can be intelligent, that is, participants can use smart contracts to customize their own orders, including not limited to randomly requesting test data blocks, purchase in batches, staged logic verification, dynamic payment conditions, and event triggers etc..

5.4 Monitoring API

Monitoring APIs can actually be regarded as special data types, but they have characteristics such as persistence, timeliness, variability, and stability. Different Monitoring APIs may have different features and requirements.

The trade activity is initiated from the QoodBlock exchange market, and the trading session of the monitoring API is a continuous trading process. The buyer will continue to decide whether to continue to pay for the API based on the validity of the data obtained, and the seller will continue to adjust the API permissions based on the progress of the transaction and the behavior of the buyer.

This will be a complicated and changeable process that needs to be done collaboratively with smart contracts and monitoring procedures with specific business logic. We will provide SDK, monitoring program DEMO, smart contract library, general framework and so on to improve the development efficiency of all access parties.

The API data can be delivered in PULL and PUSH types, which can be implemented in conjunction with the participants' data services and middleware. At the same time, decentralized storage can be used to simulate the message distribution system to more easily interact with smart contracts. The transaction security of the monitoring API is also ensured by the combination of secure symmetric encryption and asymmetric encryption. The reliability and credit protection of transactions are continuously maintained by related parties through customizable economic rules and interaction rules.

Trading-related rules are developed using smart contracts. Factors that can be set include, but are not limited to, time granularity, renewal conditions, unilateral suspension rules, penalty rules, security parameters, and auxiliary decision mechanisms etc..

The monitoring API monitors not only vehicle data, but also information such as weather and road conditions to meet the data requirements of data fusion and other services.

5.5 Controlling API

The IoV controlling API is very similar to the vehicle monitoring API. The difference is that controlling API in the Telematics service is a requirement of higher privilege, and the data frequency is much lower than the monitoring API. Based on the above characteristics, in the design plan of QoodBlock, each execution of controlling API need a separate transcation. Users can view the invoke of the requirement of controlling API each time, and turn off the authorization to controlling API at any time.

5.6 Consensus Mechanism

A reliable, proven and efficient consensus mechanism is needed in the business scenario of IoV. QoodBlock chooses the DPoS as system consensus mechanism.

Based on the DPoS algorithm, any QDT((QDT is the native encryption digital utility token launched officially by QoodBlock foundaiton, details refer to section 7) holder in QoodBlock has the right to elect block producers through a continuous voting system. Anyone can participate in the generation of blocks, but the chance to gain such power is proportional to the votes they collect. The more votes are collected, the more likely they are to get the right of generating blocks.

EOS is a relatively mature blockchain project that uses DPoS as a consensus mechanism. Its existing design is to generate a block every 3 seconds, and 21 producers produce one by one. At the beginning of each round, 21 block producers are selected. The top 20 with the highest number of votes were selected in the last round, and the remaining producer was selected by the proportion of votes. The selected producers are disordered by taking timestamp from the block as a random number. Disordering is to ensure the balanced connectivity between these producers and the other producers.

For the business scenario requirements of IoV industry, Qoodblock has made some optimizated adjustment to EOS consensus mechanism. QoodBlock sets to produce one block every 500 milliseconds and the producers are 21 for each round.

Through the design improvements above, we believe that QoodBlock, as a public blockchain, can meet the needs of the global Telematics business requirement.

5.7 Fee Free Transaction based on “Coin Days”

The QoodBlock ecosystem will account for a large proportion of transaction based on smart contracts, while relatively few transactions will simply be token transferred without any deal. Based on the above characteristics, the two kinds of transactions are distinguished in QoodBlock system, and a fee free mechanism is designed for only token transferred.

One of the biggest obstacles to the application of blockchain technology in the industry is the "high handling fee" and "high cost of use", which has been widely criticized and today's blockchain applications are not very friendly to the users. QoodBlock believes that many basic rigid demand applications (such as the public welfare eCall services) of Telematics should not be hindered by the high transaction transfer fee of traditional blockchain. QoodBlock hopes to provide a better environment for these applications, and the free transaction fees will play a great role in promoting the construction of a prosperous ecosystem.

At the same time, considering the system's ability to resist attack, the QoodBlock will consider the "Coin Day" factor in the simple transfer transaction. If an account does high-frequency micro-trading, its coin days will soon run out. In this case, the QoodBlock system gives two designs: the transaction can not be carried out without the corresponding coin days, or the transaction needs a corresponding fee.

5.8 Data Storage

QoodBlock data storage consists of two parts: the storage of metadata and raw data. In order to solve the problem of retrieving and storing in a decentralized environment, we design a TrustDB Layer, using metadata for retrieval, and providing various storage solutions and cross-chain solutions.

Metadata includes raw data storage indexes and the data validity check. The data storage index includes, for example, the Merkle Tree Root Hash on the IPFS system and the Merkle Tree Root Hash of the data provider. The data validity check refers to the design of the IPFS (Filecoin) and mainly includes Proof of Replication and Proof of Spacetime. The TrustDB Layer is responsible for storing metadata on the block, and constructing an infinitely expandable data retrieval service by proxy to speed up the data retrieval process.

Raw data storage includes 2 ways:

- ✧ Provided by data agents. In Qoodblock's DPoS design, sufficient data agents can directly provide storage services. Qoodblock will provide standard data access interfaces. Data agents can access QoodBlock blockchain system without changing their original storage scheme.

- ✧ Qoodblock provides independent IPFS data storage service nodes or other distributed storage service nodes, and data agents can use them directly when they are willing to pay or are willing to transfer part of the automotive data revenue.

When all of the above data storage passes through the TrustDB Layer component, data encryption occurs.

5.9 Data Pull

The data pull is also implemented through the TrustDB Layer component. The TrustDB Layer component implements data access control. The main functions include:

- ✧ Data retrieval on demand;

- ✧ Single data encryption for multiple authorizations;

- ✧ Authorization for designated data;
- ✧ customized billing in Data transaction.

5.10 Data Library

Data Library is data description designed based on the understanding and accumulation of QoodBlock team to the automotive technology, vehicle connectivity, and relative data applications industries for many years. Before the data is uploaded onto QoodBlock, it needs to be organized according to the format in the data dictionary, and then the data dictionary used shall be declared in the data description section.

The data dictionary will provide basic technical support for data search engines. The common fields of the data dictionary will be important keywords for data search, such as time, location, data owner's address, vehicle VIN code. These fields are not required, but adding these fields will make the data transaction smoother. At the same time, a unified data dictionary can support data consumers to rapidly develop and deploy the same services based on different data sources.

The data dictionary is an open data format maintained by the community, data agents, and data consumers.

6 QoodBlock Application Scenarios Prospect

6.1 UBI Insurance：

According to the PwC “Intelligent Connected Vehicle Report”, the global vehicle industry market in 2015 was about 5 Trillion USD, including more than 600 Billion USD in auto insurance and 700 Billion CNY in China. As the industry operating “risks”, the vehicle insurance industry has a natural rigid demand for data. Historically, insurance companies offered UBI (Usage Based Insurance) to customers by cooperating with Automobile Enterprises like TOYOTA (G-Book), GM (OnStar), Ford (Sync) to get IoV data. The IoV data driven UBI model brings great value to the insurance company:

- ✧ Making insurance pricing more accurate and friendly by multi-dimensional data analysis, rewarding good users through differential pricing means, urging users with bad driving habits to enhance driving safety, and promoting the equality of society.
- ✧ The application of the IoV data and technology has greatly reduced the incidence and mortality of malignant traffic accidents. The UBI insurance data of **Insure The Box,** a British insurance company, shows that the collision rate of traffic accidents of young drivers has dropped by 35% to 40%.
- ✧ Accurate IoV data can support insurance companies' risk control management, identify insurance scams, and reduce payouts. According to **The Floow**, a British insurance technology company, the introduction of UBI innovation service through IoV data analysis has increased the profitability of insurance companies by more than three times.

Today, more and more insurance companies around the world, such as State Farmers, Progressive in the United States and Insure the Box in the UK, are innovating in UBI products. The industry analysis report says global UBI increase more than 77% in the first half of 2016 alone (including 115% in the UK and 97.5% in the US).

QoodBlock believes that with the continuous contributions of IoV data, storing and being traded for the insurance industry solves the problem of data source. Using AI technology and machine learning technology based on massive IoV data will make the UBI pricing model more accurate and scientific which will reshape the insurance industry model and pattern.

6.2 Auto Finance

The penetration rate of Auto Financial services in the developed world generally exceeds 50%, and the global scale of auto finance exceeded 400 Billion USD in 2015, according to the PWC industry report. As the world's largest auto sales market, China is in a period of rapid development of auto financial services. At present, there are many problems in the automobile financial market, such as information asymmetry, data fraud and so on, which lead to the high deviation of vehicle evaluation and the high transaction cost of deal-making. Based on the terms of the car loan or lease contract, the auto financing company needs to know the historical data, usage, status and scope of the vehicle in the contract period to control the assets and guard against risk.

Through QoodBlock subscription to monitor API services, auto finance companies can monitor targeted vehicles easily, and greatly reduce the risk and loss of financial assets caused by theft, destructive abuse and so on. The QoodBlock ecosystem supports and encourages the developer community to develop financial risk control and evaluation model based on data library of auto finance as the basis, , provides data products and tools to auto finance service providers, helps auto finance service providers to deliver their services supported by real data in areas like the car rental, mortgage and loans, and by doing so achieves the innovation of the auto finance service driven by the big data of IoV.

6.3 Used-car Transaction:

America market for used cars sells is more than 40 million vehicles a year, nearly four times the volume of new cars. China, the world's largest car sales market for nine consecutive years, is also entering a period of rapid growth in used car trading, with volume breaking through 12 million vehicles in 2017 and expected to exceed 15 vehicles million in 2018.

At present, there are serious problems such as information asymmetry, opacity, lack of trust and so on in the global used car trading market. Data concealment and falsification have become the biggest obstacle to the healthy development of second-hand car. According to Forbes magazine, "odometer mileage modification scams in a way that inflates false sales in the U.S. used car market is more than 1 Billion USD a year."

Through QoodBlock, the vertical fragmentation data covering the whole lifecycle of the vehicle, such as insurance company, auto finance, maintenance and so on, is gathered together to form a transaction market, and the data based on blockchain technology guarantee the real, effective and transparent transaction. This will eliminate all kinds of used car platform intermediaries using asymmetric information

to rent, fake, fraud and other acts, then realize the fairness of used car trading with "no middleman earning a difference". QoodBlock believes that the "used car evaluation report", which is based on machine trust, can support and nurture the innovative model of the transaction circulation of the used car which is P2P (or C2C) disinter-mediation in the real sense.

6.4 Shared Economy in Transportation

The cost of owning a car as a private property remains high (the average cost of owning a car in Shanghai in China is 2000 CNY per month). But with the improvement of urban public transportation and the diversification of travel services, the utilization rate of private cars is getting lower and lower (the average idle rate of private cars in terms of their time of use exceeds 90%); With the progress of society and the development of technology, the desire of Millennials to buy cars has been greatly reduced, and cars are gradually returning to the essence of means of transportation. In “Twelve Trends of Predicting the Future”, Kevin Kelly emphasized that “Access to future resources is more important than ownership, and people will replace possession of goods by access to services", which means shared economy has huge potential in the field of automobile transportation.

PwC, in its "2017 Digital Car Report," predicted that by 2030, the world's traditional "self-driving" travel pattern would fall to less than 50% of the world's total mileage and "Car-sharing" way accounts for more than 40%. The scale of Car-sharing in China, Europe, North America ,three major market, will exceed 1.5 Trillion USD, and the CAGR is as high as 24%;

Both Uber and DiDi have had early success in the field of Car sharing. But QoodBlock believes it is just the beginning. Because of the different laws and regulations in different countries and regions around the world, there are huge differences in infrastructure construction and the large number of participants in transportation (Automobile Enterprises, Digital Traffic Service Platforms, Logistics Fleets, Car Rental, Public Utilities, etc.). In the future, the field of transportation and traffic will be highly localized. The global integration operation is not sustainable. The cost of building trust and matchmaking transactions of the intermediary models realized by the centralized platform like Uber and DiDi is still very high. Privacy concerns, security risks, laws and regulations and the other restraining factors restrict the further development of Car-sharing services today.

An IoV & user database system based on blockchain architecture is formed in QoodBlock ecosystem. Through the basic tools such as real-time monitoring API and controlling API provided by QoodBlock, community developers will deploy localized application for traffic service conveniently, which will bring about revolutionary changes to the existing mode of transportation service by activating the idle resources to realize the real P2P car sharing.

7 QoodBlock Ecological Construction and Token Economic Design

7.1 QoodBlock Ecological Roles and Definitions

✧ **QoodBlock Foundation**

The QoodBlock Foundation is a non-profit organization established in Singapore in 2018. It is responsible for representing the rights of QoodBlock Token holders and organizing the construction of the QoodBlock ecosystem. After the non-official roles began to spontaneously emerge and accumulate in the ecological community, the QoodBlock Foundation mainly played the role of initial rulemaking (an important part of the system's operation, such as nodes and voting, etc.), supporting the construction of the upper application market, etc..

✧ **QoodBlock.X**

QoodBlock.X is a BVI exempt company established in the Cayman Islands. QoodBlock.X's employees and consultants are scattered around the world. As the sponsor of the QoodBlock.io project, the company is responsible for the development and operation of the free and open source blockchain software QoodBlock.io.

✧ **Developer**

An unofficial person or organization that provides new features for QoodBlock.io is an important guarantee for QoodBlock's continued expansion of technological superiority.

✧ **QoodBlock Token Holder**

QoodBlock Token, which is the QDT holder, has the right to control all the eco-efficiency of QoodBlock, and has the equal right.

✧ **Consensus Node**

It is the most important role to maintain the QoodBlock.io system in normal operation, responsible for the maintenance of full records, packaged transaction calculations, and in addition to the full implementation of the holder's decisions. In QoodBlock ecosystem it refers to the data agent mentioned in previous chapter.

✧ **DAPP Developers**

Develop distributed upper application on QoodBlock.io.

✧ **Common User**

Common DApp users can completely ignore the implementation of QoodBlock.io's underlying technology. They do not need to consider the fees and do not need QDT.

✧ **Community**

QoodBlock's community consists of all QDT coin holders and QoodBlock fans. Among them, people can spontaneously form QoodBlock sub-communities with different programs, goals, and organizational forms. QoodBlock does not limit the participants and operation forms, and tries to understand and support the operating conditions and appeals of these communities as far as possible. However, the QoodBlock community does not have any legal affiliation with the QoodBlock Foundation. QoodBlock funds have clear constraints on the use of investors, supporters, and logos.

7.2 The ODT Token

QoodBlock Token, QDT is introduced into QoodBlock ecosystem as a value scale and medium. QDT is the native encryption digital utility token launched officially by QoodBlock. The initial stage generates based on the ERC20 smart contract of ETH.

After QoodBlock.io finishes development, QDT will be generated based on QoodBlock.io, which is used as the general equivalent of the IoV data transaction for transaction settlement, smart contract fulfillment, etc. The two-phase token Token will be based on 1: 1 mapping replacement.

7.3 About QDD

Blockchain 3.0, which is the actual data transaction application that integrates IoT technology and is aimed at the automotive industry, represents the public chain project. The QoodBlock Foundation fully understands and realizes that QDT will face currency instability and frequent fluctuation after listing on the digital currency exchange. The challenge will bring real problems to both sides of the transaction using QDT to buy and sell car data. To this end, QoodBlock plans to issue a QDD backed by a legal currency (US dollar) to provide data consumers and data owners (users) with a familiar accounting unit to exchange data values in the QoodBlock trading market. The utility tool, which will be the QoodBlock ecology as a virtual reality in the blockchain 3.0 era, takes advantage of Token's economic design services to distinguish the real industry applications.

QDD is a Token scheme similar to the Tether (USDT), which is collateralized by US dollar reserves. To ensure the stability of data transaction prices, the QoodBlock Foundation will work to maintain a one-to-one reserve between QDD and its related real-world physical assets (US$). ratio. QDD is based entirely on blockchain distributed ledger, P2P communications, and smart contract technologies that can be audited and encrypted. The issuance and management of QDD will be regularly audited by a professional accounting firm hired by the QoodBlock Foundation, and an independent account will be set up for supervision in a professional bank to face the management of ecological publicity.

QDD is a "USD Collateralized" scheme that is anchored in a currency chain and aims to securely support data transactions with a stable currency value. Unlike QDT, holding QDD does not represent any ownership of the QoodBlock ecosystem.

The QoodBlock Foundation will consider issuing QDR for anchoring the RMB and QDE for anchoring the Euro in light of the actual needs of the data exchange market to fully meet the business development needs of the QoodBlock data exchange market. Looking ahead, QoodBlock believes QDT and QDD will coexist for a certain period of time before the world's major sovereign countries have completed the Tokenization and are widely used. They jointly assume the responsibility of QoodBlock's market construction and the ecosystem prosperity.