White Paper of Odin Chain

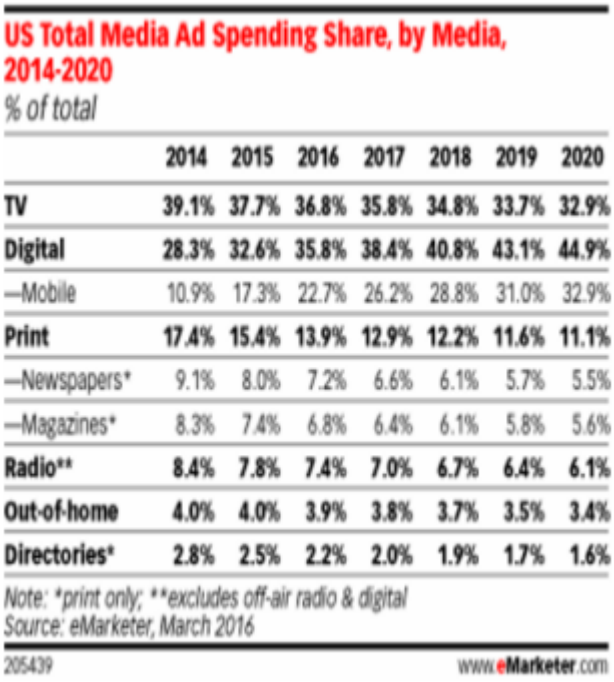
Foreword:

1. The Enterprises or organizations without having improved the social benefits should be eliminated.
2. The unscrupulous oppression of the monopoly enterprises is one of the motive forces for commerce progress.
3. Fairness and transparency are the most basic guarantee for the participants.
4. Blockchains not only need to guarantee that all the participants can obtain the incentive according to their contributions, but also need to punish fraud and raise the cost of fraud.
5. Application landing is the foundation for the benign development of blockchains.
6. The solid and steadfast blockchain landing does not require a platform, as the more the platforms are, the emptier the connotation is.
7. We don't use any consultants or disclose the information of early investors, and we won't unreasonably deliver the benefits to any third party.

Contents

1. Background

As predicted by Magna, a market research firm, half of the world's advertising expenses will flow into the online advertising markets by 2020, the expenses are comparable to those spent for TV, printing media and advertising boards (Fig. 1.1). Magna predicts that the digital advertisements in the world will account for 44% of the total shares in the market by 2018, with a scale of US$ 237 billion. The share of online advertisements will reach 50% by 2020, with a scale of US$ 291 billion. At present, the digital advertisements in various forms are in an increasing trend, and the share of search advertisements is the largest. It is predicted that the marketers' expenditure for search advertisements will reach US$ 113 billion by 2018, with an increase of 12% compared with that in 2017. Most of the expenditure for search advertisements will be spent in mobile terminals, accounting for 63%. Magna also predicts that the mobile advertising expenditure of all types will reach US$ 147 billion by 2018, with an increase of 27% compared with that in 2017. At present, the methods for brands to contact with consumers are more than ever before, and some companies are distributing most of their advertising expenses to online advertisements.



US Total Media Ad Spending Share, by Media, 2014-2020

% of total

	2014	2015	2016	2017	2018	2019	2020
TV	**39.1%**	**37.7%**	**36.8%**	**35.8%**	**34.8%**	**33.7%**	**32.9%**
Digital	**28.3%**	**32.6%**	**35.8%**	**38.4%**	**40.8%**	**43.1%**	**44.9%**
—Mobile	10.9%	17.3%	22.7%	26.2%	28.8%	31.0%	32.9%
Print	**17.4%**	**15.4%**	**13.9%**	**12.9%**	**12.2%**	**11.6%**	**11.1%**
—Newspapers*	9.1%	8.0%	7.2%	6.6%	6.1%	5.7%	5.5%
—Magazines*	8.3%	7.4%	6.8%	6.4%	6.1%	5.8%	5.6%
Radio**	**8.4%**	**7.8%**	**7.4%**	**7.0%**	**6.7%**	**6.4%**	**6.1%**
Out-of-home	**4.0%**	**4.0%**	**3.9%**	**3.8%**	**3.7%**	**3.5%**	**3.4%**
Directories*	**2.8%**	**2.5%**	**2.2%**	**2.0%**	**1.9%**	**1.7%**	**1.6%**

*Note: *print only; **excludes off-air radio & digital*
Source: eMarketer, March 2016

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Fig. 1.1 Market Share Proportions

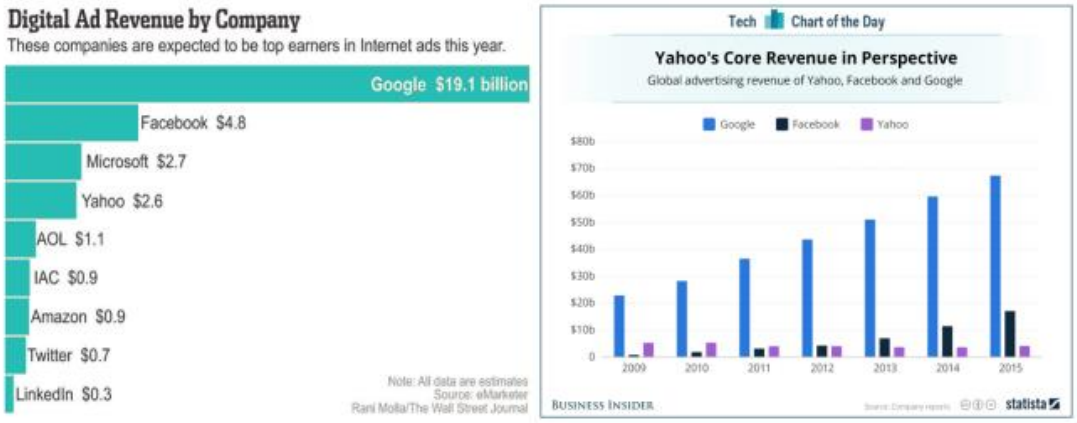

Fig. 1.2 Income and Its Changes of Major Online Media in the United States

Benefiting from the investment increase in the media advertising field by the advertisers, the global media advertising scale will grow to US$ 552 billion or so by 2017, with a year-on-year growth of 3.7%, although this figure is lower than that predicted earlier by eMarketer, the scale of advertisements is still growing. It is predicted that the market share of online advertisements will exceed 50% of the total quantity of the advertising markets by 2020, if it's combined with other marketing services, the expenditure for online marketing services in the world will break through US$ 1 trillion as predicted.

At present, almost all the internet giants obtain incomes from online advertisements. The incomes of search engines represented by Google and social media represented by Facebook increase year by year (Fig. 1.2). Google, Microsoft, Facebook and Yahoo, etc basically monopolize over the online advertising markets in the United States, accounting for 1/5 or so of the global advertising incomes (Matchcraft 2016, Statista 2016). Google, Microsoft, Facebook, Yahoo and other giants basically obtain all their incomes from online advertisements. Facebook and Google nearly occupy 77% shares of the online advertising markets in the United States, which is in the absolute monopoly position. The profits from online advertisements of internet giants in Chinese markets, such as Baidu, Weibo, Sina and Sohu, etc account for more than 50% of their total incomes. It can be seen that the market capacity of online advertisements gradually increases, the existing market capacity is enormous and the total available markets are expanding sharply.

Since 2014, the global advertising markets have been developing steadily, with a growth rate of 5%-6%, and it is predicted that the advertising markets will sustain this growth rate to 2018. The global advertising markets mainly concentrate in North America, Asian-Pacific regions and Europe (Emarket2015). In a short term, North America will still be the major advertising market, but there is a downward trend in the growing scale and speed compared with that in the Asia-Pacific markets. In the future, Asian-Pacific regions will be the major market for advertisements in the world (Fig. 1.3).

Total Media Ad Spending Worldwide, by Region, 2014-2020

billions and % change

	2014	2015	2016	2017	2018	2019	2020
Total media ad spending (billions)							
North America	$184.95	$192.81	$202.38	$212.00	$223.20	$234.48	$245.93
Asia-Pacific	$147.34	$158.30	$171.51	$185.78	$202.61	$219.39	$235.48
Western Europe	$93.23	$95.44	$97.88	$100.22	$102.56	$104.80	$106.99
Latin America	$28.81	$31.02	$34.02	$37.06	$39.41	$41.14	$42.54
Middle East & Africa	$20.62	$21.85	$23.10	$24.25	$25.35	$26.44	$27.49
Central & Eastern Europe	$13.53	$13.65	$13.67	$14.04	$14.57	$15.22	$15.81
Worldwide	**$488.48**	**$513.07**	**$542.55**	**$573.36**	**$607.70**	**$641.47**	**$674.24**
Total media ad spending growth (% change)							
Latin America	12.6%	7.7%	9.7%	8.9%	6.3%	4.4%	3.4%
Asia-Pacific	9.5%	7.4%	8.3%	8.3%	9.1%	8.3%	7.3%
Middle East & Africa	6.9%	6.0%	5.7%	5.0%	4.5%	4.3%	4.0%
North America	3.3%	4.3%	5.0%	4.8%	5.3%	5.1%	4.9%
Western Europe	2.2%	2.4%	2.6%	2.4%	2.3%	2.2%	2.1%
Central & Eastern Europe	7.4%	0.9%	0.2%	2.7%	3.7%	4.5%	3.8%
Worldwide	**5.7%**	**5.0%**	**5.7%**	**5.7%**	**6.0%**	**5.6%**	**5.1%**

Note: includes digital (desktop/laptop, mobile and other internet-connected devices), directories, magazines, newspapers, out-of-home, radio and TV
Source: eMarketer, March 2016

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Fig. 1.3 Changes of the Global Advertising Markets

2. Odin Chain Digital Advertising Platforms

2.1. Problems of internet advertisements

The current forms of network advertisements mainly include text, diagram, audio, video, hyperlink and virtual reality, etc. Network media deliver the advertising information through such methods as displaying advertisements, rich media advertisements, text contextual advertisements, e-mail advertisements, text-link advertisements, sponsored advertisements, classified advertisements, implanted advertisements, social media and video websites, etc. Although network advertisements have been widely accepted as the main minion in the market, and their shares increase year by year with a great market potential, there are still some problems for the network advertisements (Fig. 2.1) (Aksu et al., 2018).

Characteristics of Network Advertisements		Sector Weaknesses
• Consumers' ignoring of advertisements • False and deceitful advertisements • High advertising prices Lack of efficient assessment mechanism • Unsound advertising evaluation and monitoring mechanism • Lack of originality and characteristics • Mandatory promotion	Advertiser	• The advertising investment is quite high, but more than 50% investment will not bring in effect. • The advertising resources are held by network media. • The advertising chains are too long. • The advertising value can't be evaluated.
	Consumer	• Useless information is in overrun. • Advertisements are omnipresent. • Advertisements are passively accepted. • Phishing and other fraudulent advertisements emerge out endlessly. • Consumers' values can't be embodied.
	Content Creator	• Content creation and benefits do not match. • The copyright can't be guaranteed. • The values of the contents for advertising transmissions can't be evaluated.

Fig. 2.1 Characteristics of Network Advertisements and Sector Weaknesses

(1) Consumers ignore advertisements. Consumers are accustomed to watching advertisements on TV, hearing advertisements on the radio or reading advertisements in magazines, they have bad feelings about advertisements of various forms. The same is true for online advertisements, the consumers can avoid clicking the banner advertisements and bypass the advertisements in online videos, once the advertisements appear on the screen, they will close the pop-up advertisements. The clients control the advertising information to be clicked and responded to.

(2) False and deceitful advertisements are prevailing. In the management of traditional advertisements, there are certain market access conditions for the operation of advertising business, it's necessary to get the advertising industry certification and business license, which makes the regulation of advertisements have laws to follow. However, in the virtual environment of the network, due to the lack of the access system, almost any enterprises, other economic organizations or persons who have the right to use the network can engage in the advertising business, which results in that it is difficult to manage the network advertisements. Besides, the lack of legal norms for network advertisements provides a loop-hole for false and deceitful advertisements, causing the chaos in the online advertising industry and seriously damaging the public trust of network advertisements.

(3) The advertising prices are high. The prices of network advertisements are generally determined according to CPS, CPA, CPC and CPM, etc. (Miralles- Pechuán et al., 2016). For example, if CPA is used for pricing, the average price for each click is US$ 2.5, if the advertisements are released on such popular websites as New York Times, the advertising cost in each month can be thousands of dollars. The advertising costs differ according to the websites, flux received by blog and different readers. Online advertisements with pay-per-click activities on social media sites can also seriously damage the company's marketing budget and there may be no investment return.

(4) There's a lack of the effect assessment mechanisms (Miralles- Pechuán et al., 2016). CPM and CPC, as two important indicators for the advertisers to measure the internet advertising effect and pay advertising costs, are somewhat one-sided in the era of Web2.0, because the advertisers want

to accurately know which consumers are concerned about their products and services, or which parts of their products and services they are interested in. They hope to understand the whole process and features of consumers' psychological changes from perception to recognition so as to guide the perfection of the network marketing system. Furthermore, the users' impulse to click is related to many factors: the novelty of creative expressions, inflammatory styles of the advertising commentaries, interest in the product, prize setting for activities and product spokespersons, etc can affect the click amount.

(5) There's a lack of originality and characteristics, and the promotion is somewhat mandatory. In the intelligent three-dimensional structure model, which is proposed by J.P.Guilford, an American psychologist, the information contents are divided into five categories: V (Visual), A (Auditory), S (Symbolic), M (Semantic) and B (Actional) (Guilford 2011). Compared with the other three big media, only the fourth media can realize the integration of various information content presentation modes of V+A+S+M+B, which provides a powerful release platform for network advertisements, but the expression forms of the network advertisements in China are monotonous due to the network bandwidth shortage and low level of creation and production, mainly including the traditional banner-type and button-type advertisements and emails, the compulsory means of information push is usually adopted and this causes a poor experience for the network audiences.

(6) Some websites are doing evils. The indicators, such as the clicks numbers, are counterfeited to realize the flux deceit and cheat the advertisers out of high advertising expenses.

(7) The advertising evaluation and monitoring mechanisms are unsound. Professional evaluation includes two aspects. The first is the evaluation of the amount, comparing the amount differences between planning and implementation. The second is to study the exhausting process of advertisements, connect the line for the daily click rate of synchronous advertisements on the coordinate plane and confirm the exhausting time of each creativity so as to provide the basis for the design advertisement creativity to replace intervals. Therefore, the network advertising evaluation is the basic means to measure the advertising effect and the main basis for advertisers to release mid-and-long term advertisements.

2.2. Odin advertising public blockchain ecology

In order to solve the above-mentioned problems existing in internet advertisements, we have designed the Odin advertising public blockchain based on the blockchain technology and the smart contract. On its basis, the decentralized browser application can be developed, the advertisers can release advertisements on the browser, the browser users can select whether to browse the advertisements or not, and both parties realize the organic combination through the smart contract.

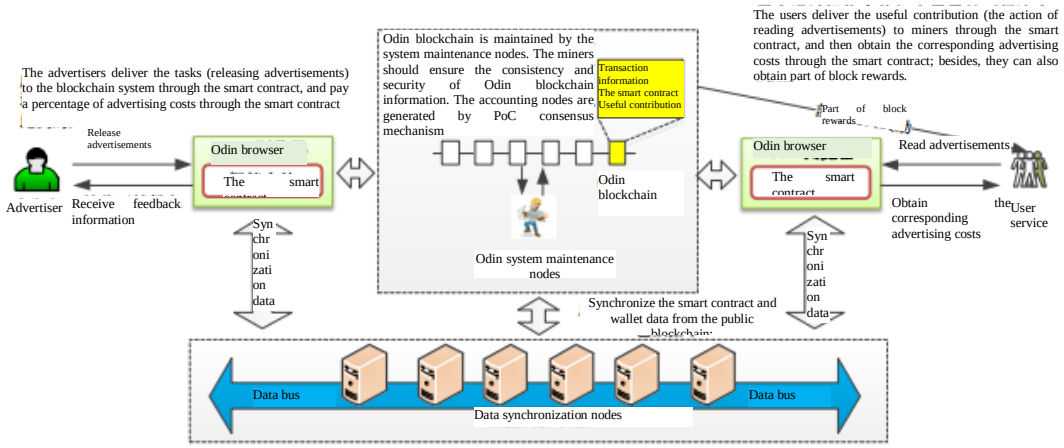

Fig. 2.2 Odin Advertising Public Blockchain Ecology System

As shown in Fig. 2.2, the advertisers and the users firstly register as public blockchain users and obtain a pair of public keys and private keys, and then they register as the browser users. The advertisers set the contents of the smart contract (advertising release and the reward distribution agreement based on advertising page views) on the browser, sign it with the private key and then issue it to the public blockchain, the browser users can select to sign the smart contract with the advertisers or not after synchronizing data from the public blockchain. If a user needs to sign the contract, what he or she needs to do is signing the contract with his/her own private key, and then the browser will broadcast the contract to the Odin system in the form of the function call. After receiving the contract, system maintenance nodes will analyze the contents of the smart contract and encapsulate them into a new block. After being established, the new block will be broadcast into the Odin system, and then added to the blockchain when the majority of mining nodes reach a consensus. The main parameters included in the smart contract are as follows: the geographic coverage (Range) of the advertisement, the release cycle (Cycle) of the advertisement, the advertising fee (Bonus), the parameters needed to be returned by the advertisement (Returns) and the incentive distribution agreement based on advertising views, etc. If the smart contract is expressed by adSmartContract, it will be distributed to the Odin system with parameters. The system maintenance nodes in the Odin system will analyze the smart contract and create new blocks, the expression form is as follows:

The Odin system maintenance nodes < adSmartContract (Range, Cycle, Bonus, Returns)

Different characters can actively choose their own intention conditions to transmit different parameters to the Odin system through the smart contract after confirming the validity of the smart contract, and the Odin system maintenance nodes will reach a consensus to create new blocks. The execution of the contract within the block enables the transmission of information among users. The whole process is open and transparent, and can’t be altered.

The blockchain will record the transaction information, the smart contract and the information of the advertising view data, etc, and guarantee the consistency and safety of the information. The Odin system maintenance nodes are the guardian of the system data, and it’s responsible for the consistency and safety of the information.

2.3. Project advantages

Odin Advertising Public Blockchain: a digital advertising platform based on the blockchain technology.

Odin Browser: a decentralized browser researched and developed on account of the Odin advertising public blockchain, which is the glass-breaker of the current flux monopoly institutions.

Compared with the traditional network advertising platform, the Odin project has the following advantages:

- As the operators of the Odin browser, users will enjoy the right to screen or read the advertisements and gain relevant Token rewards if they choose to read the advertisements actively.
- The bad advertisements will be screened out, which enables the users to surf on the internet under the safety protective screening.
- The plug-in implementation mechanism is adopted to the screening and replacement of advertisements, and the mechanism which has flexible expansion abilities is provided by the third-party developer.
- The advertising circulation is open and transparent, so the advertisers will be quite clear about where each amount of the advertisement fees is spent.
- The data are true and trustworthy, so it is conducive to the evaluation of advertising fees. In order to obtain Token benefits, users will show the data of advertising reading actions to the advertisers. After gaining the relevant data of users' advertising reading actions, the advertisers will conduct in-depth analysis and then evaluate the effect of the advertisements.
- Each person can be an advertising operator, as long as he or she has the ability of advertising operation, he or she can obtain the Token benefits according to his or her performances.
- The management mode of decentration and the independent public blockchain system shall be adopted to ensure the fairness of benefits.
- The Odin browser sufficiently safeguards users' privacy and ensures the authenticity and traceability of information through the software.

3. Odin Advertising Public Blockchain System:

3.1. Design ideas

(1) The reliability and consistency of the data. Data consistency is a concept in the database system, which can be simply interpreted as correctness or completeness. In the distributed system, however, it usually refers to whether the data are complete and identical in different data nodes due to the duplication of data.

(2) Transferable mechanisms. The Odin nodes are added, transferred and quitted with the mobility of users. When adding the Odin nodes, the system shall ensure that the boundary of the system is enlarged and the system is normally operated, it’ll also distribute relevant equities according to the contributions of the Odin nodes in an accounting cycle. Similarly, when the Odin nodes are removed from the system, the functions such as transmission and accounting, etc of the information shall not be affected so as to ensure the retractability of the system.

(3) Light clients. In order to reduce the working power of the Odin nodes, the clients are divided into two categories: Odin data synchronization nodes and Odin browser nodes. The Odin data synchronization nodes are responsible for the real-time synchronization and update of data. The Odin browser nodes call the data in the Odin data synchronization nodes which are the closest to themselves so as to realize the quick response.

(4) Delayed settlement strategy. The problem of the distributed transaction system is that it's very hard for the payee to confirm whether the previous asset owner has conducted double payment (double-expenses) or not. The common solution is to introduce a trustworthy third party, such as a bank, to certify each transaction so as to avoid double payment. If the third-party organizations are excluded, the transaction information shall be open and all the participants in the system shall be equipped with the only recognized historical transaction sequence. Therefore, the delayed settlement transaction mode is adopted to eliminate double payment through the balance of account of the accounting nodes and ensure that it's for the first time that the transaction shows up in the transaction cycle.

(5) Equity locking. In order to eliminate the accounting nodes and the negative influence brought by the Odin system and maintain the reliable operation of the system, the equities of the accounting nodes will be locked after they obtain relevant equities. In a certain cycle, these equities can't be transacted. When the accounting nodes have served for such a certain cycle that the normal Odin operation isn't influenced, the locking will be removed. After removing the locking, users can freely transact the equities. During the locking cycle, the accounting nodes are also able to obtain relevant interests.

(6) Rapid consensus. The problem of the distributed transaction system is that it's very hard for the payee to confirm whether the previous asset owner has conducted double payment (double-expenses) or not.

(7) Value consensus and incentive. As long as the Odin nodes contribute their capacity to other nodes, they will gain equipotent equities. The longer the Odin nodes stay on the line, the more equities they will gain.

3.2. System survey

Although there are still some flaws in the blockchain technology (Eyal 2015, Eyal and Sirer 2013, Nayak et al. 2016) (AZURE 2016, CACHIN 2016, ROSS and SEWELL 2015), as a machine creating trust, the blockchain technology (Garay, Kiayias, and Leonardos 2015, Nakamoto 2008) (2016) has many advantages, including the distributed structure, trustfulness, openness, transparency and non-altering sequence, etc, so it has attracted the attention of both the financial sectors and the industrial sectors. It also begins to be used in the reshaping transaction system, and it also plays an important role in reducing the transaction cost and improving transaction efficiency.

Proof of work (PoW) (Nakamoto 2008) is the most reliable consensus mechanism in the current decentralized encryption algorithm. PoW is mainly used in selecting consistent leadership nodes and giving suitable rewards to participants. In the blockchain system, as the participant in the consensus mechanism, the system maintenance nodes are able to be selected as leadership nodes according to their computing powers. With the constraint of computing power costs, the attackers with large computing powers disguised into multiple nodes can be avoided, and the relevant costs are the consumption of a large amount of computing powers. Consumption of computing powers is the problem of the blockchain system established based on Proof of Work (PoW). The consumption of a large amount of computing resources and electricity hinders the expansibility of the system.

In the early cycle of 2011, the concept of Proof of Stake (PoS) was brought up (Houy 2014). Intuitively speaking, PoS is a form owning the proof of the Token amount. Zero Token consumption is a kind of PoS. Therefore, PoS is used in ppcoin for reducing the consumption of electricity in the PoW working mechanism, and it is hard to be forged. In 2014, Ethereum designed the Ethereum PoS structure, and it's called Casper the Friendly Ghost (Houy 2014), which is a PoS mutant of the PoW contract. In the Ethereum system, the signature of the person being verified won't be meaningful unless he or she pays the deposit. The client intelligently depends on the block of the person being verified with the current locking deposit. If the person being verified with the locking deposit is known, the commonly recognized chain can be identified. The clients who have no idea of the list of the persons being verifier who pay the deposit now must firstly obtain the list through other information channels. This limitation solves the problem of "remote attacks" through demanding everyone to identify the consensus with current information.

In order to solve the problems of low mining efficiency of PoW and resource consumption, etc, we combine the browser users' visiting actions of the browsers (which can be recognized as the users' useful contributions to the Odin system, abbreviated as contributions) and the blockchain technology to design and construct the Odin system. The contributions of browser users are fully considered in the process of PoW, so that the algorithm of users' contributions+ PoW is realized. In order to reduce the workload of the system, the method of browser voting is used in the node selection (Fig. 3.1).

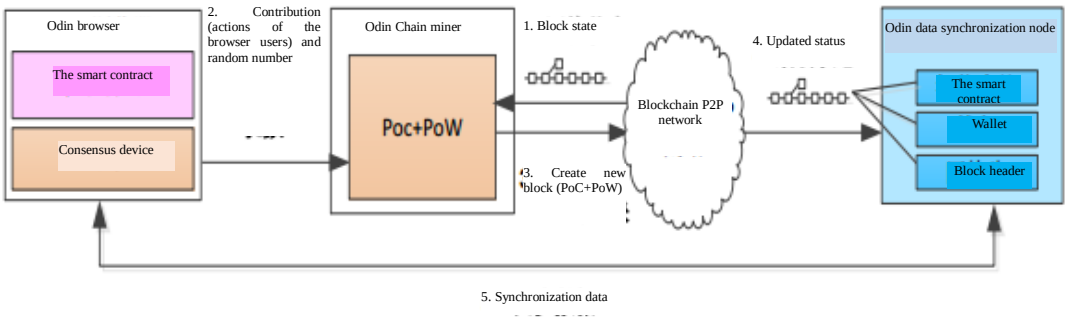

Fig. 3.1 Odin System Structure Overview

The Odin ecological system includes the browser users, advertisers, Odin system maintenance nodes and Odin data synchronization nodes.

- Odin browser nodes: namely user nodes. Users sign and issue the smart contract with the

private key, and distribute their action data to the Odin system to prove their contributions to the system so as to obtain relevant rewards according to their contributions (including the advertising fees paid by advertisers and the mining rewards). The smart contract will encapsulate the users' action data and the random number, package them into a block, and then broadcast it to the blockchain system after encryption, waiting for verification of the system maintenance nodes.

- Odin browser nodes: namely advertising nodes. Advertisers distribute advertisements on the browsers with the smart contract, and then send the encapsulated contract information to the Odin system maintenance nodes. The Odin system maintenance nodes will analyze and verify the information. After the verification, the information will then be encapsulated into a new block and broadcast to the network.
- The Odin system maintenance nodes: namely the Odin Chain miners. The Odin system maintenance nodes are the important nodes to verify the browser users' contributions. They use the mechanism of Proof of Contributions (PoC) + Proof of Work (PoW) to verify the contributions of the Odin browser nodes, and then broadcast the newly-produced block to the P2P network to realize the system consensus. In addition, the Odin Chain miners will encapsulate the transaction and the smart contract which have been sent to the public blockchain into the new block.
- Odin data synchronization nodes: Usually, the small-sized PC synchronously downloads the latest smart contract data and the user wallet data from the public blockchain to the nodes, so as to make it convenient for the client users nearby to synchronously download relevant data.

3.3. Odin browser nodes: user nodes

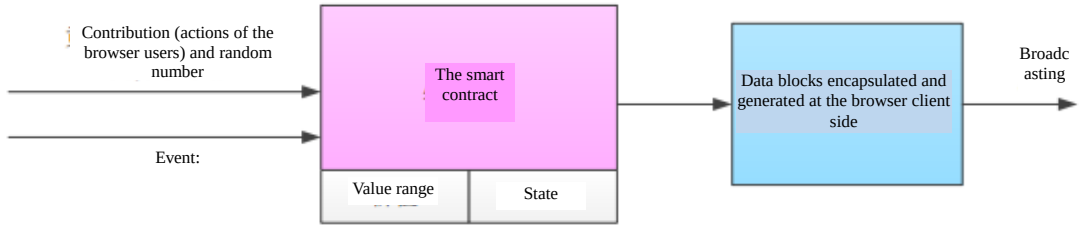

Fig. 3.2 Odin Browser Overall Frame Diagram

User nodes become the contributor of a certain advertisement through reading the advertisement and triggering the smart contract signed between the user and the advertiser. Users can use the Odin browser nodes to encapsulate their contributions and random number produced by the browser through the smart contract, and then broadcast the generated block through encryption and encapsulating to the network, waiting for the statistics of the system maintenance nodes, the return of incentives and partial block rewards of the certain advertisement. Supposing that the random number is expressed by RandNum, and the contributions is UC, then the Odin browser client will encapsulate these parameters, sign the smart contract and broadcast it to the blockchain system. The form is as follows:

Step1: Call the smart contract and encapsulate contributions, and return to SC, SC<-SmartContract(RandNum, UC)

Step2: Send the encapsulated information through the browser client, for example, SendtoBlockchainsevers(SC)

Step3: Continuously monitor the date of data synchronization nodes through the browser client so as to upgrade the information like the wallet, etc.

3.4. Odin browser nodes: advertising nodes

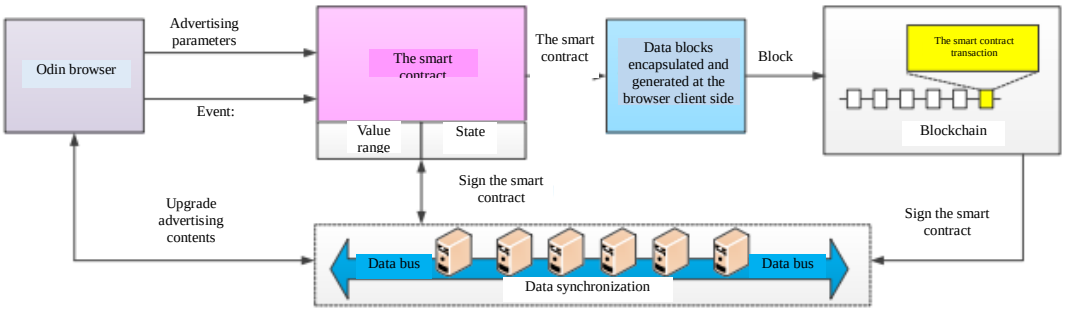

Fig. 3.3 Odin Browser Node System Structure and Its Module Calling Procedures

Advertisers become the employer of advertising transmission through distributing advertisements to trigger the smart contract signed between the user and the advertiser. Advertisers release advertisements through the browser, and then encapsulate the parameters, including the distribution cycle, scope and advertising rewards, through the smart contract, and then generate the data block and broadcast it to the network through the browser, and then use the system maintenance nodes to write advertising information into the blockchain system. When the advertising information is written into the block, it then will be broadcast to data nodes, which will sign the smart contract with the advertiser to synchronize advertising contents and wait for the view of browser users. On the condition that advertisers need to pass on the parameters including the cycle, place and price when distributing advertisements, the smart contract will encapsulate those data. Then, the smart contract will be signed and broadcast to the blockchain system. The form is as follows:

Step1: Call the smart contract to encapsulate advertising parameters, return to SC, for example, SC<-SmartContract(RandNum, cycle, place, price)；

Step2: Send the encapsulated information through the browser, for example, Send to Blockchain severs (SC)

Step3: Add the block and verify the validity of the block, for example, AddBlock( ) and Validation( )

Step4: Data synchronization nodes sign the smart contract with the advertiser, (SignSmartContract( ))

Step5: Advertising data synchronization (DataSynchronization( ))

3.5. Odin blockchain system maintenance nodes

The Odin blockchain system maintenance nodes build a system consensus to ensure the consistence and safety of data. In order to ensure the equity of the Odin system maintenance nodes and make sure that they can fairly participate in the distribution of accounting rights and the generation of blocks, the useful contributions produced by all the Odin browser users shall be broadcast to the network together with the random number. After capturing the contribution information of browser users, the Odin system maintenance nodes will analyze the random number given by the Odin browser to judge whether there is a need or not for the nodes to calculate the contribution value. The random number produced by the Odin browser is expressed as RandNum (Useful Contributions), the form is as follows:

Odin system maintenance nodes address= hash (RandNum)

Only when the hash operation result of the random number is the same as the Odin system maintenance nodes address, can the node obtain the node data statistics power.

At the same time, in order to empower contributions to influence the mining ability of the system maintenance nodes, the parameter of contributions is also introduced besides the PoW. On the condition that D (Difficult) means mining difficulty, UCs (Useful contributions) means the total contributions calculated by the system maintenance nodes. When and only when UCs of the current system maintenance nodes are higher than 80% of other maintenance nodes (in order to let 1/5 of the computing power participate in mining, while the rest 4/5 continues in synchronizing data so as to avoid the waste of computing power) in the system, are they qualified to conduct PoW, that is,

OdinProof (UCs, D, hash, 20%)

The same is with PoW, when and only when the hash value is solved in the shortest time, will it gain the right to create the new block and keep accounts.

3.6. Odin blockchain

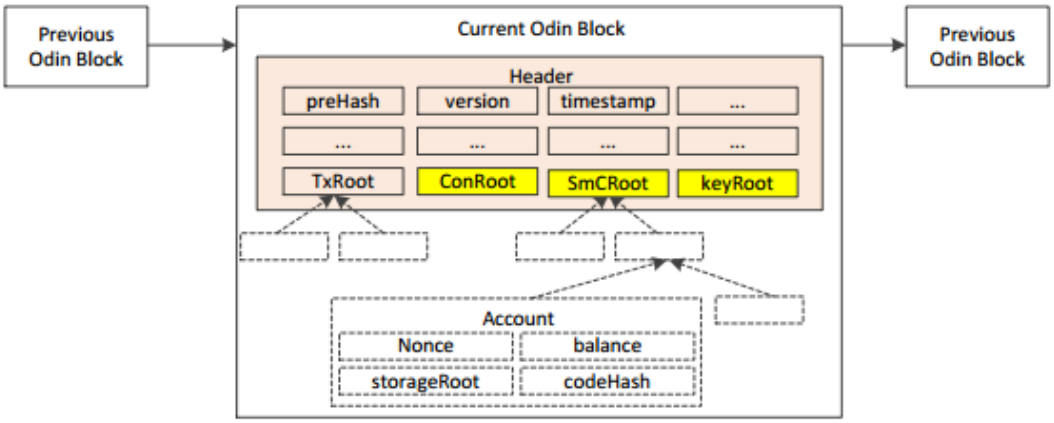

Fig. 3.4 Block Forms of Odin Chain

The block headers of the Odin Chain (Wood, 2014) are designed through referring to the block headers of Ethereum. The block headers of Odin have encapsulated the information of the parent block hash, version number, system maintenance node address, block S/N (height), bloom filter, current Token total amount, Token using amount, difficulty degree, additional data, mixed abstract, random number, transaction root, state root and the receipt root, etc. The transaction root, contribution root and the secret key root are respectively the root node hash values of the transaction tree, useful contribution tree and the smart contract tree. The transaction tree, contribution tree and the smart contract tree are made up by the Merkle Patricia tree. The transaction list saves the Odin Chain transaction information, and the contribution tree saves the contribution data information of the Odin Chain, which is similar to the block structure of Bitcoin and Ethereum (Nakamoto 2008, Wood 2014).

The Odin system maintenance nodes have different demands for the historical blockchain information compared with the Odin data synchronization nodes. The Odin system maintenance nodes need all the information of the chain in mining (accounting) process, they will synchronously download the whole Odin Chain from the genesis block to the current block, and execute or verify all the transactions, contributions and the smart contract in the chain. The Odin data synchronization nodes only download the headers of the Odin Chain (from the genesis block to the current Odin block), the smart contract, wallet state data and advertising content data, etc, instead of executing any transactions or searching any related state. As the Odin data synchronization nodes have access to the head of data blocks, and the head contains the hash of 3 trees, all the Odin data synchronization nodes can still easily generate and receive the verifiable answers about the relevant information of transactions, contributions and the smart contract.

The Odin system maintenance nodes with the accounting right will connect the current Odin block to the previous Odin block, forming the latest block main blockchain. Each Odin block is connected in sequence, forming the longest main blockchain from the initial chain to the current block, which records the complete history of the Odin Chain data, for which the function of data traceability and positioning of the Odin Chain are also provided. Any data (including the transaction information) can be traced to its origin through this chain structure. In short time, if there are two Odin Chain nodes calculating two new Odin blocks at the same time and try to link, the main blockchain of the Odin Chain may encounter a temporary "fork" phenomenon. Its solution is that the appointed Odin Chain nodes always choose the Odin Chain that has the highest cumulative contribution rate.

4. Main Technology

4.1. Calculation process for contributions

4.1.1. Node types

In the Odin Chain, nodes are divided into light and heavy nodes according to the roles of the nodes in the network. Light nodes include the Odin browser nodes and Odin data synchronization nodes, while heavy nodes include the Odin system maintenance nodes. The Odin browser nodes are the client ends installed with the Odin browser. Users can contribute advertising reading action data through the Odin browser. The Odin data synchronization nodes are responsible for synchronizing the latest the smart contract, wallet data and advertising data. The Odin system maintenance nodes are responsible for calculating the contributions of the Odin browser nodes and recording the transactions between nodes. It is a server with certain calculating abilities.

4.1.2. Accounting cycle

The contribution accounting cycle refers to the cycle of the statistical contribution in the Odin Chain. Starting from the initial operation of the Odin Chain, one or more Odin system maintenance nodes will be selected every other contribution accounting cycle to count the contributions of the Odin browser nodes and distribute the Odin equity to the Odin browser nodes. The contribution accounting cycle should not be set to be too short, for it will make the nodes in the system frequently count the contributions, which will consume a lot of calculating resources. And the contribution accounting cycle should not be set to be too long, for it will reduce the initiative of contributors, which is not conducive to the construction of the Odin Chain.

The transaction accounting cycle refers to the cycle for the transaction accounting in the Odin Chain. Since the operation of the Odin Chain starts, one or more Odin Chain nodes will be selected to count the transaction data between the Odin nodes to ensure there will be no double payment every other transaction accounting cycle. The transaction accounting cycle is shorter than the contribution accounting cycle. The excessively long transaction accounting cycle will make the transactions in the system unable to be confirmed quickly, which is detrimental to the circulation of the Odin Token.

4.1.3. Calculation of contributions

(1) The calculation process of Odin browser node contributions

The Odin browser nodes contribute the reading action flux and broadcast the flux to the network. The Odin system maintenance nodes capture the flux data broadcast by the Odin browser nodes, and then calculate the contributions of each Odin browser node according to the flux, and distribute advertising fees and block rewards to the browser nodes according to the proportion of contributions. During this process, the Odin system maintenance nodes will encapsulate the contribution information into the new block and record it in the blockchain.

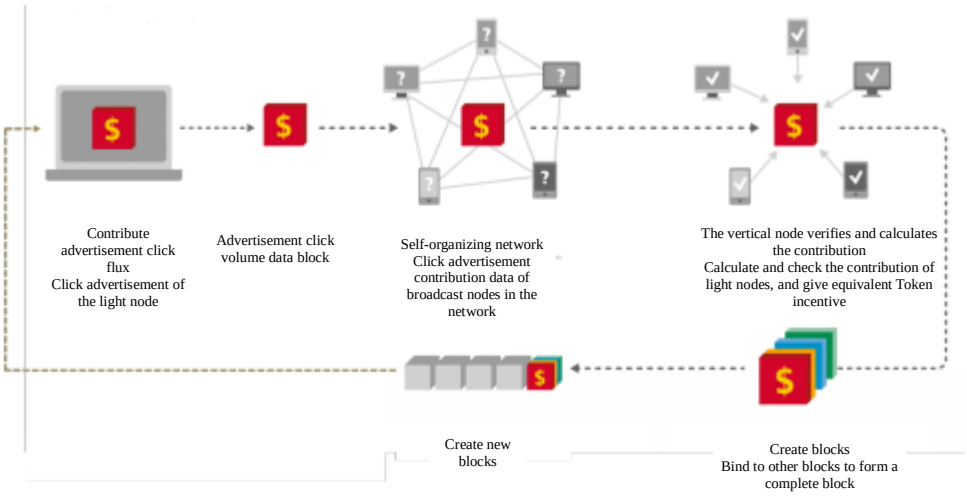

Fig. 4.1 Calculation Process of Odin Browser Node Contributions

Fig. 4.1: Clicking on the advertisements in the browser is a user action, and its data will be recorded by the Odin browser as well as encapsulated and broadcast to the P2P network, waiting for the mining of heavy nodes. After the information is captured by the heavy nodes, the user's contributions to the advertisement is judged according to the user's actions, and the advertising fees will be paid, and the system incentive will be carried out at the same time.

(2) The calculation of Odin browser node contributions

Assumption 1: The Odin browser nodes' advertising reading actions are the artificial, active and real advertising reading actions instead of the machinery, passive and deceptive advertising reading actions.

Assumption 2: After the Odin browser nodes read a certain number of advertisements, their information obtained through reading the advertisements will decrease marginally, and the effect of reading advertisements will decrease marginally, too.

Supposing that both Assumption 1 and Assumption 2 are true, we can calculate the contributions of the Odin browser nodes according to the advertising reading actions (actions) within an accounting cycle and define the utility function concerning the contribution actions, which is used to calculate the contributions of the Odin browser nodes at the T-moment:

$$\text{Contributions}(T) = U(\text{actions})$$

Contributions are a function concerning the advertising reading actions or the flux.

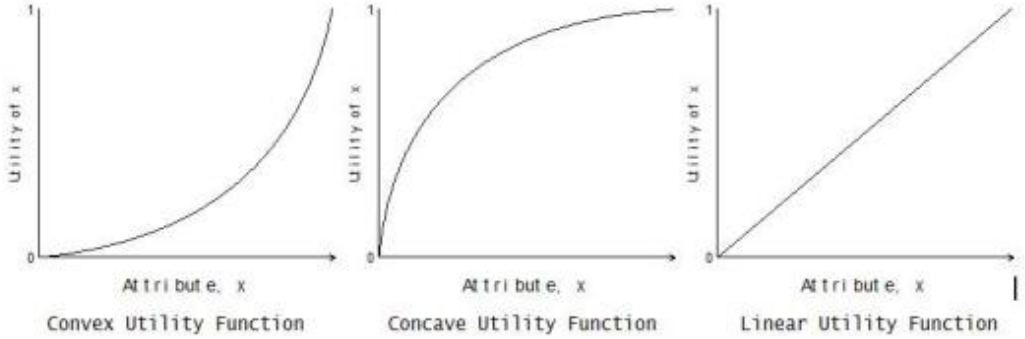

Fig. 4.2 Utility Function Curve

The convex function, concave function or linear function can be selected as the utility function. If the advertising reading actions are relatively average, the linear utility function may be adopted. If there are the Odin browser nodes with the actions of brushing the advertising reading times in the system, the concave function may be adopted as the utility function to prevent these nodes' actions of brushing advertising reading actions, that is, as the advertising reading actions increase, the increment of the contributions of these nodes brought by the increased advertising reading actions will decrease to 0.

$$\frac{\Delta \text{Contribution}(T)}{\Delta \text{clicks}} \to 0$$

In order to encourage the browser nodes to stably make long-term contributions, the viscosity for the Odin public blockchain should be increased and the concept of the contribution annualized interest θ should be introduced. The longer the Odin browser nodes use the Odin Chain software, the more profits they will gain. The compound interest contributions of the Odin browser nodes at the T-moment shall be recorded as WContribution (T). Supposing that the contribution accounting cycle is set as Δt_c day(s), the contributions of the Odin Chain nodes at the T-moment are set as Contribution(T), the previous contributions are set as Contribution(t) ($t = 1,2, \dots, T-1$), and the annualized interest rate is set as θ, then the compound interest contributions of the Odin browser

nodes at the T-moment WContribution (T) shall be defined as:

$$\mathrm{WContribution(T)} = \mathrm{Contribution(T)} + \sum_{t=1}^{T-1} \mathrm{Contribution(t)} \cdot (1 + \theta \cdot \frac{365}{\Delta t_c})$$

Wherein, $\theta^{\frac{365}{\Delta t_c}}$ is the extraneous incomes obtained by the Odin browser nodes of the Odin Chain through continuously contributing the advertising reading actions or flux to the system, which corresponds to the contribution rate interest of the Odin browser nodes.

4.1.4. Odin accounting node selection

The accounting nodes in the Odin Chain must have enough computing powers, storage space and bandwidth so as to be qualified as the accounting nodes. Assuming that the data volume generated by the accounting cycle is X kilobyte, and the computing power of the Odin Chain node ≤ X kilobyte, this Odin Chain node won't be eligible to participate in the accounting node selection. Similar to the thought of PoS, the multiple-nodes represent the equities of a series of browser nodes, and the more browser nodes they represent, the higher their possibilities to be selected as the accounting nodes will be. Assuming that the total amount of the compound interest contributions recorded by the multiple-node i of the Odin Chain at the T-moment is iTWContribution (T), whether or not it is qualified for accounting shall be determined by the following formula:

$$\text{Accounting right qualification} = \begin{cases} 0, & \text{if iTWContribution(T)} \le \pi \\ 1, & \text{if iTWContribution(T)} > \pi \end{cases}$$

π, which is the threshold value of contributions, is used for determining the accounting qualification and selecting a few accounting nodes with accounting abilities. 20% of the multiple-nodes may be selected out to keep accounts, and the accounting nodes will be selected out from the 20% of multiple-nodes through PoW mining mechanism.

4.1.5. Equity distribution

The Odin system maintenance nodes selected for accounting will synchronize the contribution data of all other Odin system maintenance nodes, and count up the total compound interest contributions WContribution (T) of all the Odin browser nodes of the Odin Chain at the T-moment, which is equal to the sum of the contribution of all the Odin Chain nodes, namely:

$$\mathrm{TWContribution} = \sum_{i=1}^{n} \mathrm{iTWContribution(T)}$$

Wherein, iTWContribution is the total contributions recorded by the No. i Odin system maintenance node, and n is the total number of the Odin system maintenance nodes.

Assuming that the total amount of the Odin equities to be distributed in the cycle at the T-moment is OdinToken (T), the number of the Token equities obtained by the No. i Odin browser node in accordance with its contributions will be as follows:

$$\mathrm{OdinToken}(T|i) = \frac{\mathrm{WContribution}(T|i)}{\mathrm{TWContribution}} \cdot \mathrm{OdinToken}(T)$$

After finishing the equity distribution, the accounting node will encapsulate the computing result into the contributions accounting block and broadcast it to the network so as to obtain accounting rewards after being verified by other accounting nodes.

4.1.6. Transaction process

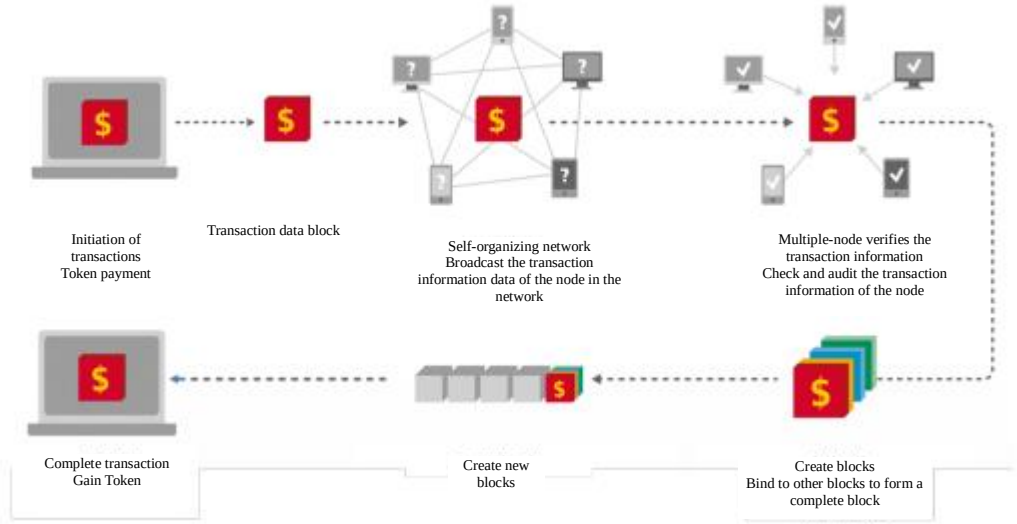

Fig. 4.3 Transaction Process

The transaction refers to the asset transferring action between the Odin Chain nodes. UTXO refers to the unspent transaction outputs of the Odin Chain nodes. The transaction constitutes a group of chain structures, all the legal Odin Chain node transactions can be traced back to the outputs of the previous one or more transactions, the sources of all the chains are the mining rewards, and the ends are the current unspent transaction outputs.

When the nodes launch transactions, they will encapsulate the transaction data and broadcast them to the internet. After capturing the transaction data of other nodes, the Odin system maintenance nodes will check and audit the node transaction information and create the block. After the block is created, the transactions will be confirmed and completed. In order to prevent the transactions of the Odin system maintenance nodes from being involved in the action of fraud, the Odin system maintenance nodes can only obtain incomes through computing the contributions and transaction fees instead of participating in any transactions.

5. Odin Chain Economic Model

5.1. Odin Token value basis

Odin Token is the primary asset on the Odin Chain, and the value origin of Odin Token is that it is able to conveniently represent and measure the digitalized economic activity on the Odin Chain. Odin Token represents not only the ownership of the Odin Chain, but also its use right: certain fees shall be paid by Odin Token for using the Odin Chain to deliver advertisements, which embodies the use right property of Odin Token; Odin Token ownership represents owning a part of Odin Token, corresponding to the shareholder of the Odin Chain who can involve in the supreme decision-making of the Odin Chain management and embody the ownership property of Odin Token.

5.2. Incentive Mechanism

The Odin network includes its built-in Odin Token, and there are multiple reasons to include one kind of Odin Token in the internet. First, part of Odin Tokens newly released in the block are given as rewards to the system maintenance nodes so as to promote network security. Second, part of Odin Tokens newly released in the block and the advertising expenses paid by the advertisers are rewarded to the users according to the proportion of contributions so as to encourage the users to use Odin browsers to view advertisements and promote network growth. Last, paying the fees with it is an anti-fraud mechanism. The PoW with transaction as its unit like Hashcash and the laissez-faire are two alternative solutions of charging transaction fees, the former is a waste of resources and it’s unfair for low-end computers and smartphones, and the latter will cause the network to be submerged immediately by an endless cycle of "logic bombs".

Besides, the punishing regulations shall be set so as to normalize the users' advertising browsing actions in order to avoid the malicious browsing actions.

5.3. Issuing Mechanism

5.3.1. Issuing model

The Odin system is divided into the online cycle, growth cycle and the stable cycle according to the number of nodes. In the online cycle, 4M Odin Tokens shall be launched through the genesis block, and the supply amount p(t)*M shall be increased every year, wherein the growth coefficient is as follows:

$$\mathrm{p(t)} = \begin{cases} p_0, & t = 0,1,2 \\ \left(2 - \dfrac{(t-1)^{\alpha}}{(t-2)^{\alpha}}\right) * p(t-1), & t \geq 3 \end{cases}$$

With the increase of time (t), p(t) decreases.

The theoretical supply amount of Odin Token is S(t)=4M+p(t)*M*t=M(4+p(t)*t), which is also recorded as S(t)=S(t-1)+ΔS, wherein, ΔS=p(t)*M. On this basis, the advertisers purchase a certain amount of Odin Tokens from the agents each year, of which 10% will be destroyed. In order to simplify the distribution model, let's assume that the proportion of the quantity of the Odin Tokens destroyed every year for the total amount of the Odin Tokens of the year is the fixed value q, then the final supply amount of the total Odin Tokens in circulation will be stabilized on a value which is equal to the value that the annual issuing amount is divided by the burnout rate. The actual supply amount of Odin Tokens of each year is Sr(t)=(Sr(t-1)+ΔS)*(1-q), and the total circulation amount is close to p(t)*M/q. The following form detailedly lists the Odin Token supply amount and the burnout amount of each year.

Tables 5.1 ODIN Supply Amount and Burnout Amount

Year	Actual Supply Amount of Odin Token	Theoretical Supply Amount of Odin Token	Burnout Amount of Odin Token
0 (online cycle)	4M	4M	0
1	Sr(1)=S(1)-S(1)*q	S(1)	S(1)*q
2	Sr(2)=S(2)-S(1)*q-(S(2)-S(1)*q)*q	S(2)-S(1)*q	(S(2)-S(1)*q)*q
t	Sr(t)=(Sr(t-1)+ΔS)*(1-q)	Sr(t-1)+ΔS	(Sr(t-1)+ΔS)*q

The proposed solution decides that the total supply amount of Odin Token is not more than 15,000,000,000, wherein, 20% are distributed to the early investors, 20% are held by the team, 5% are distributed to communities and business partners, and the remaining 55% are generated through mining. In order to ensure that, within 50 years, the theoretical supply amount of Odin Token and the actual supply amount of Odin Token in the whole life cycle in the Odin system are not more than 15,000,000,000, it's calculated out that the growth coefficient parameter p_0 = 1.49, α = 0.83, and the burnout coefficient q=0.001, M~=1,687,500,000. When the supply amount reaches p(t)*M/q, p(t)*M will be excavated out each year, and meanwhile, p(t)*M will be lost, which reaches an equilibrium as shown below.

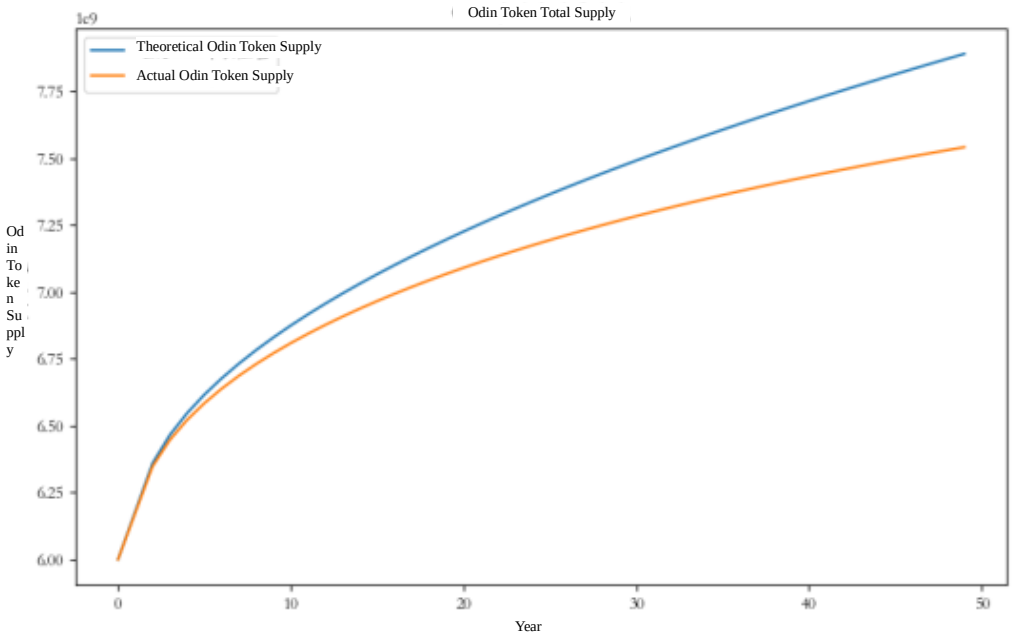

Fig. 5.1 Theoretical and Actual Odin Token Growth Curve

The Odin Token growth coefficient variation diagram is as below:

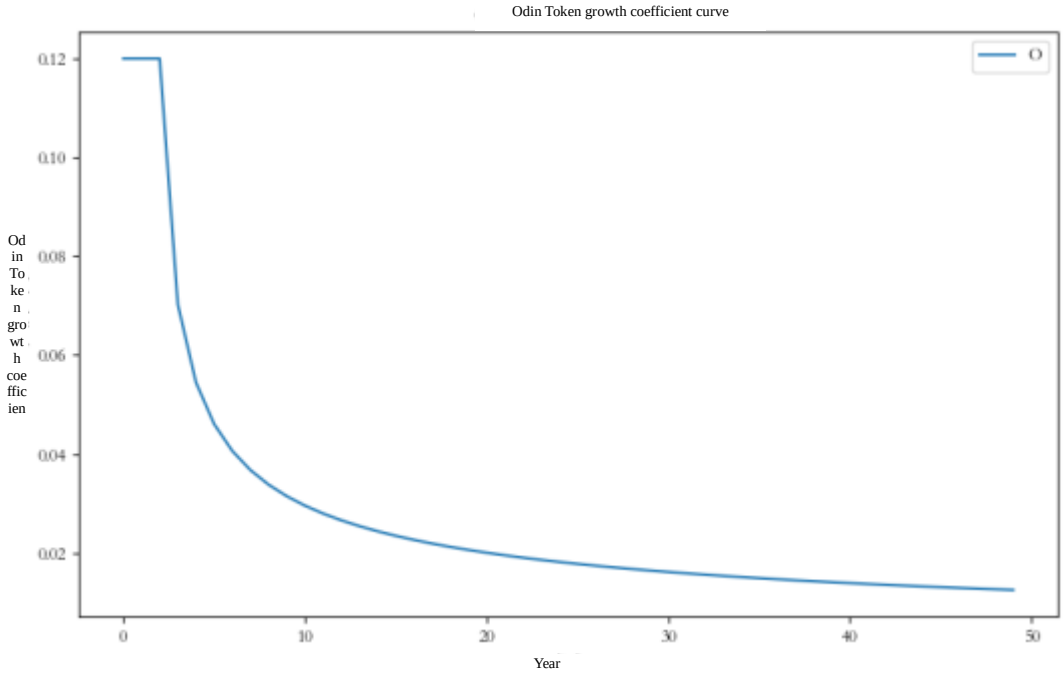

Fig. 5.2 Odin Token Growth Coefficient Curve

In the long run, the "Odin Token supply growth rate curve" tends to zero according to the non-linear growth model, which is shown as the figure below.

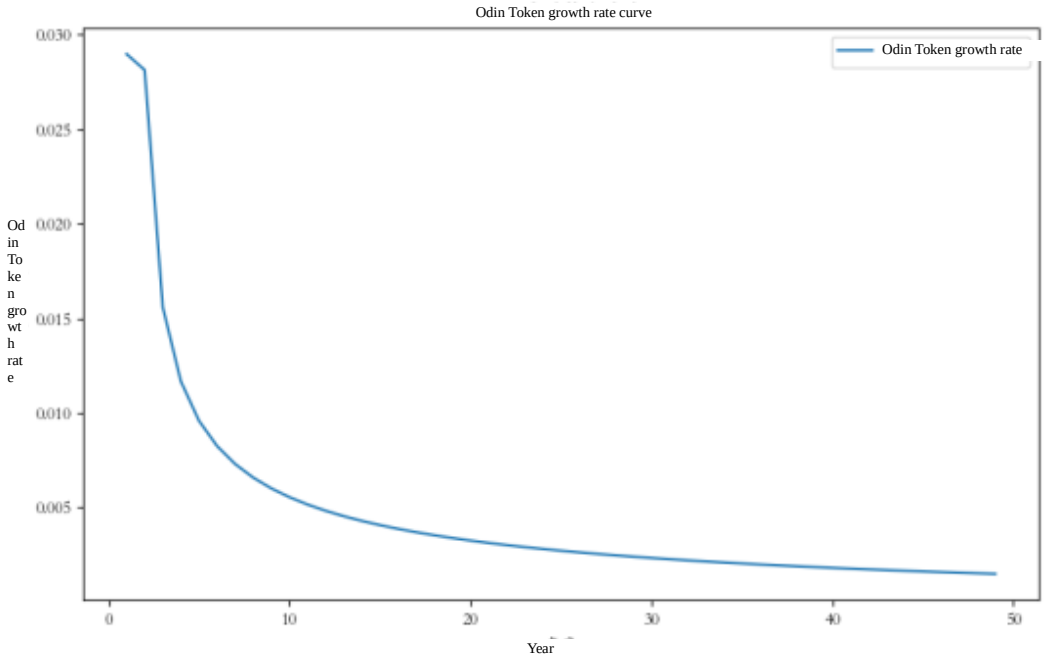

Fig. 5.3 Odin Token Supply Growth Rate Curve

5.3.2. Odin Token units

The Odin units include: Odin, mOdin and μOdin, their quantitative relations are as below:
1Odin=1000mOdin=1000000μOdin

5.3.3. Difficulty

In each cycle, the Odin system automatically sets a threshold value of contributions, the node whose contributions exceed the threshold value obtains the accounting authorization. In order to maintain the proportion of the nodes which have obtained the accounting authorization in each cycle on a certain level, the system will adjust the threshold value of contributions in the current cycle according to the proportion of the nodes which obtained the accounting authorization in the last cycle. The threshold value of contributions is defined as the mining difficulty.

On average, one Odin block is produced every t minutes, which is the basis of the release rate and the transaction confirmation speed of Odin Token, and it must keep invariable not only in the short term, but also in a few decades. In the meanwhile, the performances of computers will increase rapidly. Moreover, the miners and computers are also changing constantly. To keep the producing speed that a new block is produced every t minutes, the difficulty of mining must be adjusted in accordance with these changes. In fact, the difficulty is a dynamic parameter, which will be adjusted periodically so as to reach the speed target that a new block is produced every t minutes. In short, no matter how the mining ability is, the difficulty is set as that the new block producing speed is kept as one block per t minutes.

5.3.4. Odin Token production

Each client terminal constantly produces contribution data in each cycle and stores them in each node's internal memory. The accounting nodes start to calculate each user's contributions at the end of the cycle and give out rewards to users according to their contributions. The rewards are encapsulated in the form of a transaction into the new block by the accounting nodes. After the construction of new blocks is completed, the new blocks are broadcast to the blockchain nodes of the whole network by the accounting nodes to testify the proof of contributions and the transactions within blocks. And if the testification is passed, the blockchain nodes will add new transaction blocks at the ends of the local blockchains.

In addition, the Token transactions will also be implemented between Odin users, and the transactions will be encapsulated into the block by the accounting nodes and added to the blockchain with the consensus of the entire network. The accounting nodes will acquire the mining rewards distributed in the form of transactions.

5.3.5. Life cycle of Odin Token transactions

The life cycle of an Odin Token transaction starts at the very moment of its creation, namely its birth. And then, the Odin Token transaction will be encrypted by one or more signatures, and these signatures mark the use permission for the Odin Token fund designated by that transaction. Next, the Odin Token transaction will be broadcast to the Odin Token network in which every Odin node (Odin Token transaction participant) shall be verified and its transaction shall be broadcast to the network until this transaction is accepted by most of the nodes in the network. Finally, the Odin Token transaction will be verified by an accounting node and added to a block where many Odin Token transactions are recorded on the blockchain.

Once an Odin Token transaction is recorded on the blockchain and confirmed by enough follow-up blocks, it'll become a part of the Odin Token general ledger and be recognized as an effective transaction by all Odin Token transaction participants. Consequently, the Odin Token distributed to a new owner by this transaction can be used in a new transaction, which makes the ownership chains be extended and starts a new Odin Token transaction life cycle once again.

5.4. Distribution Mechanism

The distribution model is as follows:

1) The Odin Token will be sold to the investors with the price of x/Odin. 1.777M Odin are assumed to be sold in this way.

2) 1.777M Odin will be distributed to the startup team according to the time-locking contract, and 0.355M will be unlocked every year within 5 years.

3) p(t)*M Odin will be excavated out by the system maintenance nodes every year, and a certain number of Odin will be distributed to the Odin light nodes.

Tables 5.2 Distribution Model of ODIN

	1 year later	5 years later
Unit of Odin Token	5.485M	7.62M
Investor	1.777M	1.777M
Startup Team	1.777M	1.777M
Community and Business Partner	0.446M	0.446M
System Maintenance Node and Contributor	0.116M	0.389M

The non-linear inflation model reduces the risk of the excessive concentration of wealth seen in the Odin Token and gives individuals living now and in the future fair opportunities to acquire wealth. In the meantime, it also encourages people to acquire and hold Odin tokens, as the inflation rate still remains close to zero in the long run. Furthermore, most of participants' interest for the Odin system is in the medium term. We predict that Odin will have tremendous growth within the period of 1-10 years if it succeeds, and its supply amount during this period will be very limited.

6. Team Members

Wang Ming (Wang Yanzhao): Founder and CEO of Odin Chain. Serial entrepreneur of Xi'an Jiao Tong University, co-founder of Listen More FM, co-founder of PGYER, the angel investor, and the founder of Thunder Capital.

Wang Long: Founding Team Member of Odin Chain. Bachelor and AI Master of Xi'an Jiao Tong University, Master of University of Berkeley in the US, an expert in the safety field and a senior venture capitalist.

Yang Hu: Algorithm Consultant of Odin Chain. Doctor of Statistics from Renmin University of China, Master of Software Engineering from the School of Computer Science and Technology from China University of Defense Science and Technology, Visiting Scholar of Aarhus University, Denmark. He’s now a deputy professor of Central University of Finance and Economics. His research directions cover information economy, step-by-step calculation, big data and statistical calculation and data mining. He has published his academic achievements on the domestic and international well-known periodicals. At present, he has been undertaking a number of research projects of such units as the Fund for Distinguished Young Scholars of National Natural Sciences Fund and the Information Center of the Ministry of Agriculture of China, which makes him own rich scientific research experiences.

Song Binghua: CTO of Odin Chain. PhD in network security of the Chinese Academy of Sciences, AI Master, a senior system architect of IBM, a senior architect of the National Key

Laboratory for the New Technology of Software Architecture of Neusoft Group, and a Big Data expert. He has in-depth theoretical researches and rich practical experiences in the technical fields such as the distributed computing, parallel processing, image recognition, speech recognition, natural language understanding, deep learning and data mining, etc. He also has rich experiences of big data development in such fields as telecommunication, e-commerce, finance, military project and spaceflight, etc.

Yan Minghui: CMO of Odin Chain. Blockchain investor and co-founder of Huike Capital. His major investment cases include HLC, MCMC and HUOXUN.COM. His project domains cover IoT, media and big data. He's mainly engaged in the early angel or equity investments concerning the ecological layout of the blockchain projects. He's a Huike Capital partner who also maintains a strategic partnership with multiple blockchain project investment departments and who implements financial or ecological investment construction to the application which is conducive to the project and the sustainable resources in the blockchain ecological field.

Allen Lee: Vice-President of Odin Chain. Chain founder and architect of QLC with the experience of more than 10 years in wireless network communication. Allen is now building the next generation of DAG-based network public blockchains supporting the decentralized NAAS applications including the secure network transmission, billing, firewall and content awareness. After seven years' work at the world's largest communications equipment company, he led the team to start an undertaking and developed the vSIM system, having provided cross-border communications services for four million global users in four years. Meanwhile, Allen has led the company to complete the Round B financing.

7. Progress Schedule

Stage I: Project Approval of ODIN Blockchain - The project approval was completed in January, 2018. The White Paper of ODIN Browser was issued in May, 2018.

Stage II: Design and Development of ODIN Blockchain - The project design was launched in June, 2018. The project development is expected to be completed in December, 2018.

Stage III: Test of ODIN Blockchain - The internal test is to be initiated in January, 2019.

Stage IV: Public Test and Online Launching of ODIN Blockchain - The ODIN browser products are to be released and launched on the market after the completion of the public test in March, 2019.

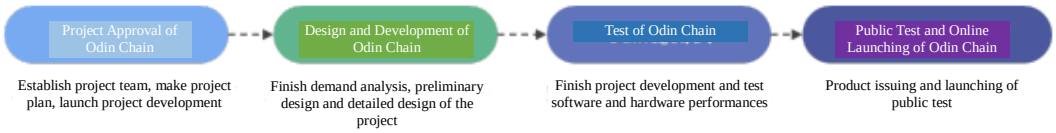

Fig. 22 Project Schedule of ODIN

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