# OE Distributed Smart Cloud Ecological White Paper

## Catalog

OurEarth (OE) Distributed Smart Cloud Ecological aims at vitalizing more than 10 trillion idle equitment, bringing in CDN and OEPC, and then forming a multi-hardware architecture. On the condition of multi-center hardware architecture, OE consensus is proposed based on DPOS supermode mechanism and integrated proof mechanism, and the OE Chain will be set up. On the basis of OEChain, OECloud, will be constructed. OE Cloud Savings ,OECloud Pooled mining, OE intelligent life, OE Games, OE Recreation, OE Copyright and other applications will be formed, eventually forming OE Distributed Smart Cloud Ecological closed loop.

# 1. Application

All over the world, the value of home broadband, computers, and smart devices totals more than $10 trillion, however the average daily usage rate is only 2.4 hours. Through block chaining technology, we encourage users to share idle bandwidth, computing resources, storage space, etc, to live up to trillions of dollars of resources.

# 2. OE Design Goal

OE is building a global block chain ecosystem, includeing digital money, digital identity, digital interaction, human-machine interaction, and smart life.

The foundation of the OE ecosystem is built on OECloud which is based on OEChain and OEPC.

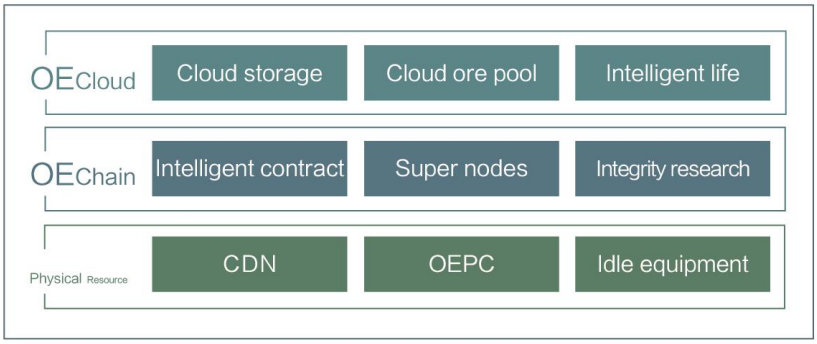
OECloud： Integrate and use idle resources such as CDN, network flow, space, and storage to contribute to society.

OEChain：It is the basic guarantee for OECloud to run automatically and safely, which is based on block chaining technology.

OEPC： As the basic support of OECloud, it has powerful processing performance to meet various requirements of mining, reliable distributed storage nodes, human-computer interaction and experience of intelligent life.

# 3. Basic Framework

OE Basic Framework

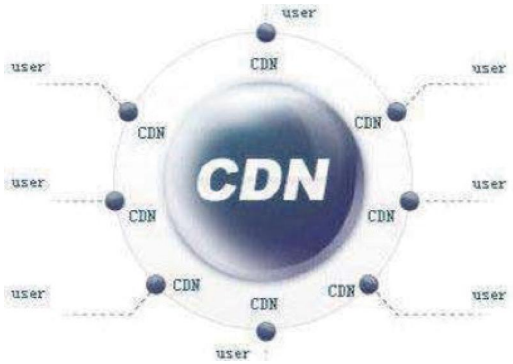



The basis of OE ecosystem is OECloud, and the core of OECloud is OEChain. OEChain downwardly includes physical resources such as CDN, OEPC, idle equipment, and

upwards, supporting OECloud through three key technologies: smart contract, super node, and integrity research.

# 4. Physical Resources

## 4.1 CDN




CDN, Content Delivery Network, is a content-distribute network. It is a virtual network which is established based on the existing Internet, and is composed of node servers distributed in different regions. The basic idea is to avoid the bottlenecks and steps that may affect the speed and stability of data transmission on the Internet as far as possible, so as to make the content transmission faster and more stable. Simple to say, CDN can copy the content of the remote server to the nearby node server. Users can get the necessary content, solve the situation of the Internet network congestion and improve the response speed of accessing to the website.

## 4.2 Idle Equipment

There are a large number of servers on the Internet at present, only a few of these servers are in saturated load, while most of the servers are still in an unsaturated state, however even the servers with relatively high resource utilization are also different at different time of the day. For example, the game server is busy at night, more idle in the daytime, some web servers are the opposite. There are still a lot of unsold idle servers and bandwidth resources in the IDC room. Not only these idle computing power and bandwidth resources can not produce any value, but also a

large number of personal computers and smartphones are in the idle state for most of the resources. Therefore, a large amount of valuable resources can be obtained after activating the idle devices.

### 4.3 OEPC

Design concept: OEPC provides a customized new entertainment content aggregation and service platform for users and the most perfect surrounding industries through the deep integration of the content. Fully functional system and powerful processing performance are equipped to meet all kinds of mining needs and allow people to achieve human-machine interaction and experience smart life. Main configuration: pre-installed Win10 system, hardware collocation for the latest Intel I5 421014 nanoscale microprocessor, 4G dynamic memory, 120GB solid-state storage, integrated Gigabit dual network card, wireless WIFI, wireless Bluetooth, 4G card slot, high-definition camera, microphone, serial port and other mainstream expansion.

## 5. OEChain

### 5.1 Summary

The history of Internet development shows that a highly available and highly concurrency network is almost impossible to be a disordered centerless network. In fact, the current mainstream Internet applications are inseparable from the support of CDN.

The application of the OE ecosystem's natural loading has high requirements for the high availability and high concurrency of the network, so we introduce CDN outside the idle equipment and OEPC. After integrating CDN, OEPC and idle equipment, OEChain must become multicentre, so we build OEChain based on multicentre.

### 5.2 Super Nodes

In view of the multi centralization characteristics of OEChain, we draw on the EOS's super node mechanism and integrate the integrity proof mechanism to propose the OE consensus. In the traditional DPOS consensus mechanism, super nodes are generated through equity voting. The core idea is that the ownership holder of the

blockchain network is the biggest maintainer of the network interests. Therefore, the owner of the block chain network ownership should also obtain the maximum network benefits. In OEChain, CDN is the biggest maintainer of the network. It must be the super node of the network and share the benefits of network growth. Therefore, in OEChain, CDN providers are natural super nodes. Super node will get a certain amount of OECoin award when an OEChain block is signed. The incentive amount decreases with the increase of CDN nodes in the whole network to avoid OECoin inflation.

**5.3 Integrity Proof**

OEPC and idle devices are the leaf nodes of CDN, contributing resources such as CPU, GPU, storage and bandwidth to the network, geting the corresponding OECoin award or punishment. Therefore, OEPC and idle equipment need to prove to OEChain that they provide corresponding resources. We use integrity verification technology to achieve this goal.

In this project, we use the data integrity proof method based on skip list. We define that the stagnation element exists in s_ (i-1) and does not exist with the elements in s_i, the high tower element is the element that exists in s_ (i-1) and in s_i, and defines the elem (V) as the element that exists in the node V, and down (V) is the node below the node in the node. The verification process on the jump table is designed as follows:

The calculation method of the label value f (V) is as follows:

Define w=right (V), u=down (V), and define f (V) =0 when right (V) =null. So:

When u=null, that is, V is on So:

A) when w is a high tower node, f (V) = H (elem (V), elem (W));

B) when w is a stagnant node, f (V) = H (elem (V), f (W)).

When u is not equal to null,

A) when w is a high tower node, f (V) = f (U);

B) when w is a stagnant node, f (V) = H (f (U), f (W)).

**5.4 Intelligent Contract**

Intelligent contracts based on block chains include transaction processing, storage

mechanism, and a complete state machine for accepting processing of Cooperative Intelligent contracts. The preservation of transactions and state processing are all completed on the block chain. Transactions mainly contain data that needs to be sent, and events are descriptions of these data. After the transaction and event information are introduced into the smart contract, the resource state in the contract resource collection will be updated, and then the intelligent contract will be triggered to judge the state machine. If the triggering condition of a certain or a few actions in an automatic state machine is satisfied, the state machine chooses the contract action automatically according to the preset information.The construction and execution of intelligent contracts based on block chaining are divided into the following steps:

1) multi-party users participate in the development of an intelligent contract.

2) contracts are spread through the P2P network and stored in block chains.

3) the automatic execution of the intelligent contract constructed by the block chain.

## 6. OECloud

OECloud is a cloud computing which is built on OEChain. OECloud is smoothing the mainstream applications of cloud services, including cloud storage, cloud mining, etc, and will further expand to games, recreation, copyright and other fields.

The OE cloud computing is a pay-per-use model that provides available, convenient, on-demand network access. After accessing to configurable computing resource sharing pools, the resources such as network, server, storage, application software, services, etc. can be quickly picked up with minimal management effort, or minimal interaction with service providers.

OECloud is smart enough to anticipate your needs in time, depending on your location, time, preferences, etc. In this new model, the search for information will be generated for you to help you think. You will get a consistent and coherent excellent experience, whatever device you use, whatever on-demand service you need.

With block chain technology, OE cloud service shall solve the problems such as

information security, data reliability, easy to delete and so on for traditional cloud. The concurrency is ensured through super node technology. OE cloud service shall ensure the security of provider's data, and to significantly reduce the cost of users.

# 7. OE Cloud Storage

### 7.1 Theory

Unlike existing cloud storage solutions, OE is a de centralized shared storage platform, where OE networks store rents between nodes. As the storage space in each node is idle, the marginal cost can be considered to be close to zero, so that the cost of OE shared storage is much lower than that of cloud storage.

The storage lease is based on intelligent contracts on OEChain. By forming an intelligent contract, the storage provider (the stored node) agrees to store the customer data, and periodically proves that they can continue to provide storage services until the contract expires. The storage provider can be rewarded by submitting the integrity certificate, but if the certificate fails, it will be punished accordingly. OEChain ensures the fairness and accuracy of intelligent contracts. Customers do not need to verify contracts. They only need to upload data and leave everything else to OEChain.

### 7.2 Document Existence Proof

POI is integrity proof, which is used to prove data stored by the provider in the complete storage intelligent contract. POI is mainly built on hash tree, and the authentication tree is formed to submit to the authentication node. We divide the data submitted by customers into small data blocks and calculate the hash value of data blocks respectively. Then the adjacent two Hashi is combined into a string, and the Hashi of this string is calculated, and every two Hashi is combined to get a sub Hashi. So calculating hash value up to the end will eventually form a tree hanging upside down. At the root of this tree, there will be one root hash in this generation. The hash tree corresponding to user data is stored in the intelligent contract.

### 7.3 Reward and Punishment

The intelligent contract concluded between the customer and the storage provider is maintained by the CDN node. The work of the CDN node to maintain an intelligent contract includes:

1) get the POI submitted regularly by the OE terminal, judge the validity of POI, and do not deal with POI effectively. If POI fails, the number of POI failure will be judged by starting the counter.

2) once the POI fails beyond the threshold, the CDN node searches for the new OE terminal to store the contents and back up the new intelligent contract.

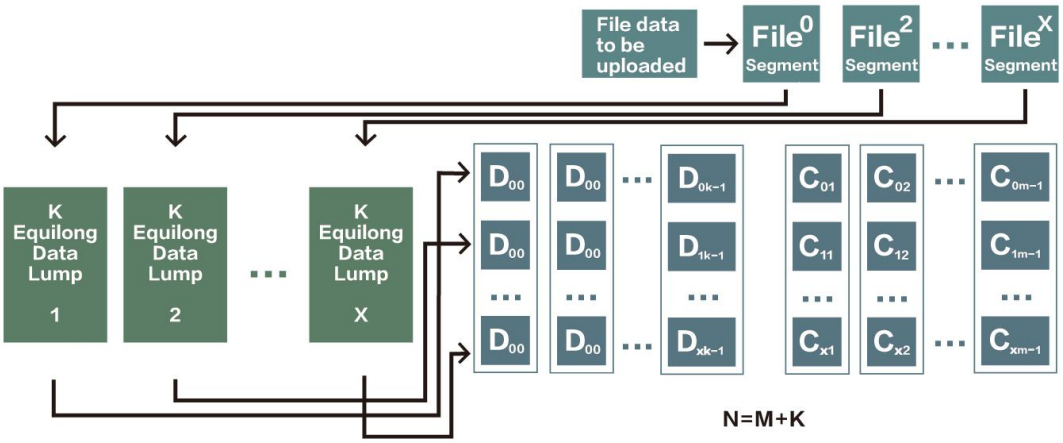
3) after the completion of the intelligent contract, OECoin reward for the effective POI will be carried out, and the invalid POI will be punished by OECoin.

**7.4 Erasure Coding**

Due to the unreliability of idle equipment, the phenomenon of equipment dropping occurs frequently. In order to avoid user data being unable to get normal access due to equipment dropping, storage data must be stored redundantly. But if we only prepare the data more efficiently, according to the Shannon theorem, the storage efficiency is too low, so we introduce the erasure code technology.

When the erasure code is used in cloud storage, the user files are first divided into X+1 data segments with equal size and a multiple of multiple K (insufficient use 0). Then each data segment is encoded by erasure code. When the data block Di and check block Dj are obtained after storage and coding, the press label is stored in different file segments respectively. For example, the data block D 0 of the file data segment 0 is stored in the slice 0, and the D1 is stored in the slice 1, and the data block D0 of the data section 1 is stored in the slice 0, and the D1 is stored in the slice 1, and in turn is analogous.

Each of the files obtained by the fragmentation mechanism is composed of data blocks and check blocks in different parts of the file. The file information in the slice is scattered, that is, the single file will not leak the user's data information. This ensures that even if the third party, including the storage node provider, can not obtain the content of the user files, the privacy of the data in the cloud storage is guaranteed.




At the same time, from the nature of the Van Redmond matrix, it is known that in the n = K + m partition, as long as there are k segments to be used normally, the system can completely restore the original file of the user. It means that even if some segments are maliciously altered, or if a single or multiple storage nodes fail, the user's data will not be lost. This feature improves the fault tolerance and redundancy of cloud storage system, and provides a guarantee for data reliability and integrity. In addition, when using RS erasure code to restore user files, it is necessary to connect K download nodes at least. The fewer the downloaded nodes are, the faster the download speed and the shorter the download delay. The advantage of this algorithm is that when network packet loss or error occurs, the download node does not need to use retransmission mechanism but to reselect other nodes to complete the downloading task.

**7.5 OE Cloud Storage Highlights**

OE cloud storage abandons the centerless thinking of STORJ and SIA, and introduces CDN to form a multi center structure to provide user experience equivalent to centralized cloud storage. In order to adapt to multicentre structure, OE cloud storage proposes an OE consensus integrating DPOS super node mechanism and integrity verification mechanism. By optimizing the distributed architecture, the cost of OE cloud storage is far lower than the cost of central cloud storage. It provides an equivalent user experience and has a strong market competitiveness.

# 8. OE Cloud Ore Pool

## 8.1 Theory

Nowadays, mining generally refers to the digital currency with the work proof mechanism. For bitcoin, it takes POW mechanism during its production. A required Block Hash is made up of N leading zeros, and the number of zeros depends on the difficulty of the network. Getting a reasonable Block Hash requires a lot of trial computation, and the computation time depends on the machine's hashing speed. When a node provides a reasonable Block Hash value, indicating that the node has indeed been tried in a large number of attempts, and of course, the number of calculations cannot be obtained, because, finding a reasonable hash is a probability event. When the node has the power of n% of the network, the node has the probability of n/100 to find BlockHash. The pool increases the probability of obtaining a digital currency by aggregating a large amount of computing power, and then distributes the profits according to the contribution ratio.

## 8.2 MapReduce

Cloud pool is a typical distributed computation. Based on MapReduce, we combined OE cloud storage with OE cloud mine pool. MapReduce is a computing model, framework and platform for large data parallel processing. It implies the following three meanings:

1) MapReduce is a high performance parallel computing platform (Cluster Infrastructure) which is based on cluster. It allows the common commercial servers to form a distribution and parallel computing cluster that consists of tens, hundreds, and thousands of nodes in the market.

2) MapReduce is a parallel computing and running Software Framework.It provides a huge but well-designed parallel computing software framework. It can automatically complete the parallel processing of computing tasks and automatically divide the computation data and calculation tasks.

It can automatically assign and execute tasks and collect calculation results on the cluster nodes. The data distribution storage, data communication, fault tolerant

processing, and other system complex details involved during parallel computing are handled by the system, which greatly reduces the burden on software developers.

3) MapReduce is a parallel Programming Model and Methodology.It provides a simple parallel programming method resort to the design idea of functional programming language Lisp. It uses two functional programming, Map and Reduce, to complete basic parallel computing tasks. It provides an abstract operation and parallel programming interfaces, which are easy to accomplish on a large scale data programming and calculation processing.

Based on MapReduce, we will parallelize the workload proof function that mining involved, and decompose it into OECloud to run. With the help of large computing power OE cloud pool has a strong competitive power compared with other mineral pools.

## 8.3 Program Integrity Proof

Since the OE cloud pool allocates the mining income in proportion of the computing force, we have to do periodic integrity verification for mining program which is implanted into the terminal equipment, in order to avoid the hashrate falsification of the participants. The integrity proof algorithm is similar to the OE cloud storage. Through integrity verification, it shall effectively avoid the participators tampering with the mining procedure and fabricating with the mining calculation force.

## 8.4 Highlights of OE Cloud Ore Pool

OE cloud ore pool integrates idle equipment computing resources through MapReduce technology. With the help of MapReduce's powerful function mapping simplifies energy, OE cloud ore pool can deal with all mining operations on the market. By introducing the integrity proof, we can avoid the falsification and guide the development of OE cloud pool ecological and healthy.

# 9. Home Intelligence Center

## 9.1 Overview

OEChain, built on OEPC, is the cornerstone of the family wisdom center. It adopts the power line carrier technology and to intelligently control ordinary household appliances cooperate with smart home products.

While OEPC is connected with mobile phone app, users can realize multi-scene interaction at home, such as, good morning greetings, meeting arrangement, temperature automatic regulation, teaching children to speak mandarin, connecting video meeting, identifying visitors, playing favorite music and movies, joining family Tours and remind children of safety...

Through the in-depth integration of the content, we can provide customized new entertainment content aggregation and service platform, as well as the most perfect surrounding industries. For OEPC, all functions are complete, with strong processing performance, it shall effectively integrate mining mode, realize human-computer interaction for experiencing intelligent life, and finally to achieve global intelligent interconnection.

## 9.2 Product Appearance

## 9.3 Family Applications

OE family wisdom center gathers full function route, distributed node, to realize shared storage, use OE cloud space storage for unified management of data through the establishment of internal and external multiple data centers.

The exclusive standard HDMI socket owns "plug and play" features. The signal source and the display device will automatically "negotiate" and choose the most proper video/audio format. Supplier advertising supplement shall bring better marketing effect.

The OE family wisdom center establishes a game flow distribution platform based on block chain technology through the unchangeability and decentralization of the block chain technology. After accessing to OE the game dealer can clearly understand the user's behavior (including registration, activation, consumption) due to the true data.It is also easier to attract advertisers who want to get real users to do the buying business.

The OE assembles CPU and GPU applied to each other. CPU is good at logic control, serial operating and general type data operating. While cooperated with GPU platform, it can improve the capability of big data processing system, and greatly increase the processing power of massive data, which are convenient for the user to set up mining.

Bluetooth, wireless applications, data transmission can be readily transferred between the main device and other devices in rotation.Users can make natural and efficient interaction between the OE system and the computer system environment through the natural interaction of voice, gesture, eyes and facial expressions.

OEPC adopts COM interface, support more external equipment, and it's low cost. It can be used for industrial control, measuring equipment and communication equipment.

## 10. Other Applications

Currently, various cloud applications based on OECloud can be moved. When the consumption closed loop is formed at the core of OECoin, OE cloud game, OE cloud entertainment, OE cloud copyright and OE cloud resource download will be further expanded to form the OE distributed intelligent cloud ecosystem.

As an example, the OE cloud game is a game based on cloud computing.In the

operating mode of the cloud game, all games are operated on the server side, and after the rendering, the game screen is compressed and transmitted to the user via the network. On the customer side, the user's game device does not require any high-end processor or graphics card, only the basic video decompression capability is required.

OE cloud entertainment, that is, direct access to the Internet via TV, no computer, mouse, keyboard. Only to use a remote control can easily travel online world. It saves time and money to the cinema, and leave out the trouble to download movies. Television users can be free to enjoy at any instant, the vast network, to create a wider 3C fusion new way of life.

# 11. Business Model

## 11.1 The Closed-loop

OE closed-loop model is centered around a series of related consumer demands, in sequence provides the corresponding product to satisfy the business model. The closed loop, simply explained, is "one-stop" service.

There is a big difference between the whole industry chain mode and the closed-loop mode.The whole production chain mode takes the product as the core, and it’s vertical; its advantage is to improve operation efficiency, control product quality during whole course.

The closed loop mode takes the user as the core, which will be closely related to a series of consumer demands one-stop solution, which is horizontal; its advantage is improving user experience, and deeply binding the user.

For example, Alibaba group's closed loop, concentrates on a series of consumer demands. Alibaba group almost solves taxi, group purchase, watching movies, ordering food, managing money, socializing, traveling, music, etc. by “one stop”. For every need, Ali has corresponding solutions. Ali group owns companies such as Fast Taxi, Ju Huasuan Group Purchase, Taobao Movie, Tao Diandian Online Food Ordering, Yu Ebao Financial Management, Friends Circle, Ali Travel, Xiami Music...

The OE will dedicate to the equipment "one-stop" service for the Internet, recreation, HD video play, game, advertising supplement, full function routing, distributed node, shared storage, shared flow, engineering control, intelligent life, mining based on the block chain technology ecological incentive mechanism. Finally, OE shall build an intelligent cloud ecological closed loop.

OE wallet and APP are officially put into use, and it shall contain the OE Mall. As the only token of the system, the primary circulation of OECoin will encompass a series of related consumer demands. Through OE APP, users can enjoy the "one-stop" intelligent life experience.

## 11.2 Circulation

From the beginning to the end, people need to consume for living. Food and clothes cost. Shopping malls and supermarkets are the places where goods are circulated and consumed, and the circulation of goods generates profits, which leads to the circulation of wealth.

Currency circulation is the currency movement caused by the circulation of commodities, which has two functions: circulation means and payment method. In essence, the circulation of money is determined by the circulation of commodities, but formally commodity circulation is reflected and realized through the circulation of money. Whether the currency circulation is normal and stable, directly affects the circulation of commodities and the operation of the national economy.

The OE intelligent cloud ecological closed-loop creates the shopping mode of the mall, so that consumers can easily turn the token into an investment while using the token to get shopping. Consumers can use OEPC to produce a replacement currency, and offline stores or businesses can also run their own products. Along with the development of the mall unceasingly, this consumption pattern is gradually formed a "closed circulation system," participation in closed-loop circulation system of all people, will enjoy the closed-loop circulation pattern generated huge profits. For example, if you are the holder of the OE, you can enjoy the full use of the tokens in the mall products; if you are a merchant, we have a special cabinet in the earth mall,

which can be used for free for life. If you are a token that is obtained through OEPC, you can gain profits according to the market conditions. If you are a merchant enterprise, you are in the earth cloud platform, which is equivalent to OE doing all kinds of free and paid advertising...With the integration of material exchange, e-commerce, mining revenue, and currency appreciation, the OE closed-loop model makes idle resources become investment, waste becomes treasure, energy saving, and benefit people.

With the arrival of OE wallet and APP application, as the only token in the early stage of the token system, OECoin will be responsible for the effective and healthy operation of the whole mall platform.

# 12. Profit Model

## 12.1 CPU、GPU Distributed Mining

OE gathers the hashrate of CPU and GPU of the distributed OEPC, gathers big calculate force, to execute the virtual coin mining task, and to gain the tokens profits.

## 12.2 Provide Distributed VPN Services

The users acquire the required remote data through the OE. Each data is encrypted. The user pay for the use of the VPN according to time and flow.

## 12.3 Provide CDN Distributed Nodes

OE is dedicated to the one-stop solution of cloud computing, big data and CDN, one-stop video-on-demand for video applications, live broadcast. It also contains services such as content collection, upload acceleration, storage, code transfer/screenshot, identify yellow service, CDN distribution and player service. It creates the profits not only through the CDN service itself, but also through opening up the whole cloud service, creating a video publishing platform for its content.

## 12.4 Games Distribution

OE gathers CDN, VPN and cloud space, to solve the Internet network congestion situation, and to improve the response speed for accessing to the website, which

shall bring the ultimate experience and the pleasure for the users. Especially for the game itself, OE can draw the profit through the game.

## 12.5 Advertising Supplement (TV box, desktop software)

OE is devoted to intelligent life, and the application will be all over the country. The partners will put advertisements to attract eyeballs. OE sets the advertising space and gives the price according to the algorithm. Advertisers need to consume a certain amount of OECoins for advertising.

## 12.6 OE Mall ( Online mall )

OE, based on decentralization and traceability of block chain technology, is establishing a non-intermediary, manufacturer traceable products, sharing consumption electronic shopping shopping mall. OE wallet and OE APP are officially put into use. The closed loop business model of merchants, platforms and users shall finally be built.

## 12.7 Intelligent Life

OEPC will provide paid and free services for the interactive and intelligent links of users around the world.

## 13. Project Schedule

2017.05 Start Our Earth project;

2017.05 Application feasibility demonstration of OE project;

2017.07 OE white paper;

2017.09 Basic development of the main chain;

2017.09 Appearance, configuration and internal structure design of OE hardware;

2017.12 The official website launch;

2017.12 Function test of Our Earth PC;

2018.02 OEPC mainboard shaping and mold opening;

2018.05 Preliminary preparation for mass production OEPC;

2018.06 APP launch;

2018.06 Launch online trading platforms;

2018.08 OEPC officially booking;

2018.08 The main chain test;

2018.09 Launch cloud storage and cloud ore pool;

2018.10 Modular application of intelligent life;

2018 Continuous development of new applications, and extensive advertise the existing applications.