Eco-system of ioeX Blockchain Driven Decentralized Network

ioeX is a decentralized network of distributed smart-device-nodes that delivers business value and ensures information security

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Foreword

According to research conducted by Strategy Analytics, the Internet of Things (IoT) sector will continue its rapid growth, with the number of IoT central box and connected devices worldwide reaching nearly 20 billion by the end of 2017, and a further 10 billion expected to be added over the next four years. It is estimated that as an increasing number of IoT business applications are introduced to residential and work environments on an expanded scale, the total number of IoT devices may surpass 50 billion by 2020.

The rapidly growing number of IoT devices and their diverse range of highly mobile applications are driving an astounding demand for network transmission, which includes 1) information access and user interactions via network connections to user devices, 2) connectivity and interactions between user devices, 3) network services provided by smart device providers to support product features, and 4) software updates and other product optimizing measures provided by smart device providers.

As suggested by 1-4 above, there are currently two main types of practices on the smart-device-end:

1. User interactions: These are done through channels provided by Internet Service Providers (ISPs) such as social media like Facebook, Weibo, and Instagram; instant messaging applications like Whatsapp, LINE, and Wechat; or internet applications like Google Drive, Baidu Cloud, and Dropbox. While these channels offer the advantage of cheap or free usage, there are potential problems regarding personal information leaks and the unauthorized use or sale of personal or business files along with the resultant issues of personal safety or property damage.
2. Features or services provided by smart device providers: These allow users to bind smart terminals to the device-end to facilitate wireless use in the intranet or remote transmission and configuration in the extranet. Device providers usually need to set up the network system required for these features themselves or outsource the work. In order to achieve iterative updates of software and firmware in the purchased smart devices, smart device providers perform over-the-air (OTA) upgrades for both software and firmware. This procedure also involves the aforementioned network service system. The network service systems of smart device providers need to include file servers used for the OTA upgrades and relay servers that ensure smooth transmission for user devices connected to the extranet. In addition to the setup and maintenance costs of the system itself, accumulated storage and data transmission costs driven by an increasing number of units can eat into the profit margin as more devices are put into consumers' hands. Additional costs incurred due to increasing numbers of users and maintaining the security of user information should also be taken into account by smart device providers.

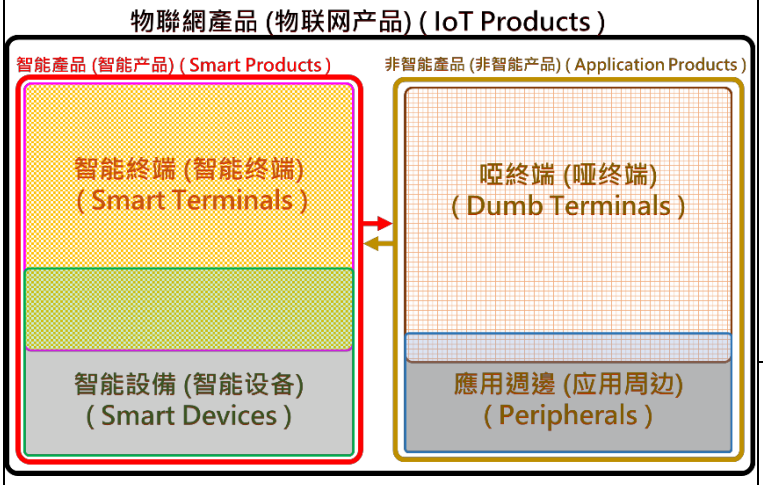
To counter the core factors of the aforementioned issues, ioeX proposed its Decentralized Network of Distributed Smart-Device-Nodes (hereinafter referred to as the decentralized carrier network or the ioeX carrier network) as a solution. The ioeX carrier network utilizes the connections and communications between bootstrap nodes and peer nodes to establish a network architecture of direct communication based on the current internet and build a secure network that provides distributed storage services and data transmissions without third party intermediaries to smart device vendors, application service providers, content providers (including both individuals and teams), and even user-generated content around the world.

All great deeds begin with a solid first step. For ioeX, our market entry strategy has been to create revenue by providing services for smart device updates and to further expand our business by reducing operational costs and risks for smart device vendors as our service becomes widely adopted, thereby building a robust and secure carrier network system. The distributed smart devices required for the operation and setup of the

carrier network are not limited to new products sold by device vendors, but also include older smart devices currently in use. IoeX provides users with both terminal and device apps that they can install themselves, allowing users to upgrade their existing devices, redistribute their unused storage space, and utilize the existing data bandwidth in their homes to meet demand for private cloud storage, instant messaging, and more. Using our proprietary R&D capabilities and our strategic cooperative alliances, ioeX will continue to build on the aforementioned foundation to enrich the ecosystem by developing applications for both personal and business use.

The ioeX carrier network blockchain records the workload and contributions of the nodes and provides bootstrap nodes and peer nodes with rewards and incentives in the form of IOEX, a digital currency issued through our self-owned public chain, to encourage brand owners, integrated solutions companies, CPU vendors, and original design manufacturers to adopt this business model and join its ecosystem. These rewards and incentives also increase end consumers' inclination to purchase smart devices with P2P carrier network capabilities which then become nodes as they join the carrier network, allowing vendors, Internet Service Providers, and general users of the device supply chain to access network functionalities with IOEX coins. With the issuance and use of IOEX, the ioeX carrier network has thereby established a circular economy of digital currency and its surrounding ecosystem.

IoeX is rapidly implementing the ioeX carrier network value chain, and has now gained the support of various chip vendors, solution providers, and device vendors. This new network ecosystem offers tremendous benefits for conventional internet applications and easy IoT setup solutions.



Application Products

Dumb Terminals

Products that accept inputs and return certain character data. In this whitepaper, we deliberately apply the name and its concept to products which lack processing capabilities but which are equipped with sensors that allow them to receive peripheral information or with writable ports that give write-access to smart devices, and are capable of generating end results. For example, smoke detectors, soil sensors, and Bluetooth devices.

Peripherals

Products without processing capabilities that are dedicated to input or output functions, such as mouses, keyboards, and ordinary headphones.

Smart Products

Smart Terminals

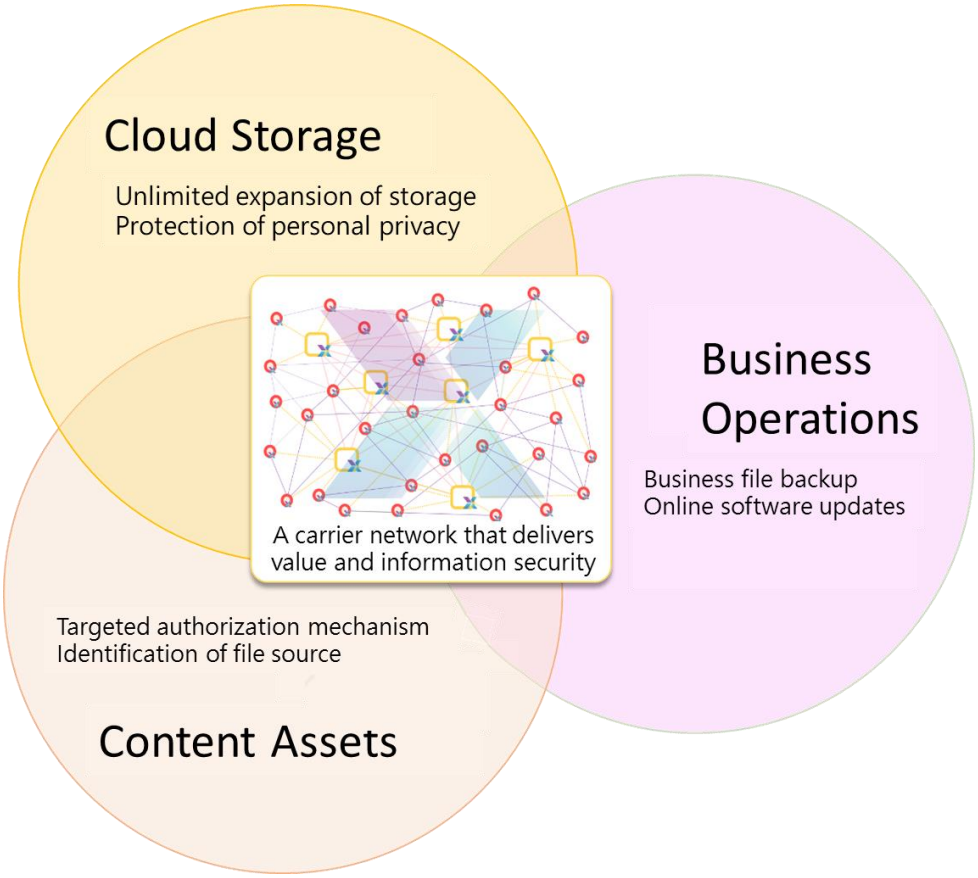
Observation of the results of current technological development shows the line between smart devices and smart terminals is becoming thinner, with the two categories now overlapping. For purposes of accuracy, references to smart terminals in this whitepaper indicate highly mobile smart products that are carried around by their users and possess more control capabilities or are more often used as the control end. These include smartphones, tablets, laptops, smartwatches with user interfaces that allow app installation, for example, or potentially even intelligent vehicles in the future. In most parts of this whitepaper, the term "smart devices" is generally used to refer to smart products.

Smart Devices

In certain parts of this whitepaper, smart terminals and smart devices are deliberately differentiated in order to give a more accurate description of the interactions among stationary smart products with low mobility and computing, storage, and network capabilities. These may include desktop computers, servers, network-attached storage (NAS), internet set-top boxes, smart routers, smart speakers, or even future smart household appliances such as smart refrigerators and smart home robots.

Figure description: Description of IoT product categories. IoeX focuses on smart IoT product connection, integration, and applications.

The vision of ioeX is the worldwide delivery of business value based on information security in a decentralized carrier network architecture of distributed smart-device-nodes. IoeX helps users convert their existing unused storage space into cloud storage with the Personal Cloud feature, and can distribute parts of the storage space to implement distributed cloud backup, thus providing businesses and owners of content assets with backup and temporary storage services. Business operation and authorization and tracking of content assets can be achieved through the use of its content addressable functionality and the implementation of blockchain-based smart contracts.


Cloud Storage
Unlimited expansion of storage
Protection of personal privacy
Business Operations
Business file backup
Online software updates
A carrier network that delivers value and information security
Targeted authorization mechanism
Identification of file source
Content Assets

I. Industry Overview and Motivation

IoeX is focused on smart devices with computing, storage, and network capabilities in the IoT sector. These include smart devices and application scenarios in which central box terminals are used to drive dumb terminals and compile the generated information.

A. Device Networking Requirements, Market Size, and Industry Pain Points in the IoT Sector

(A) Networking requirements for billions of IoT devices worldwide

With the popularization of the internet and increases in transmission efficiency, network appliances have become more varied in type while both data transmission volumes and the demand for network transmission have greatly increased.

1. Software/firmware updates

Smart devices commonly seen today, including but not limited to OTT boxes, internet TVs, smart speakers, IoT central boxes, and smart routers, can no longer meet user needs throughout their lifespan with their original factory software/firmware. They need to be iteratively updated, and may even need added features that enable interaction with other smart devices or other IoT products (including dumb terminals such as temperature and humidity sensors communicating over Zigbee) to help the products meet user demand during the lifespan of the product.

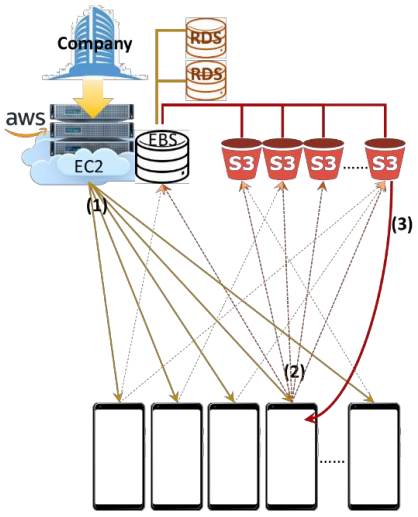
2. Interaction and data transmission with other devices

Because of the demand for functional interaction and data generation, storage, display, and transmission applications in smart devices, these devices no longer operate independently or store data locally. We call these applications, which transmit or present device functions, data, or results through connections with smart terminal devices such as smartphones, tablets, or laptops, Applications of Private-cloud-based Personal-cloud storage.

(B) Operational cost and system implementation issues

1. OTA server setups come with immense operational and data transmission costs

Vendors bear the burden of a range of costs for the continuous updating of purchased smart devices. These include the cost of market research and the development of the functionality required for continuous updates and improvements, along with the cost of enabling online updating, the establishment of a network system for OTA updates, and the handling of online updates for products sold overseas (for example, the same product being exported to the U.S., Japan, and Australia), and the cost of a system capable of managing sudden influxes of server clients requesting the latest update package. These costs can be a heavy burden on small and medium-sized vendors, and can also add a hefty cost for large enterprises. The immense accumulated expense of cloud storage and data transmission can easily eat into the profit margin of the product.



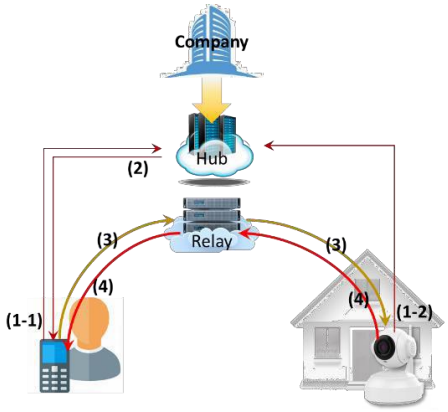
Smart device software is not limited to apps (for example, Android apps updated through Google Play). Middleware, operating systems, and firmware all need to be updated through the supplier's own OTA system.

As products experience an increase in sales and shipment growth, suppliers with a larger shipping area are faced with system update cost pressures and efficiency issues, both of which are hurdles on another level. Online updates, such as for Tmall on Singles Day, can flood servers with sudden increases in transmission demand, and thus require high-performance data servers or multiple servers as load balancers. The costs entailed, accumulated over time, are crucial factors that eat into the after-sales profit margin of the products.

2. Staggering costs of relay servers

At a minimum, for smart devices to connect to and interact with users' smartphones, mutual data access between the smart device and smartphones must be ensured on both the intranet and the extranet, including such functions as remote display access and remote data restore, both of which are user needs under this type of scenario.

However, household smart devices such as internet set top boxes, smart speakers, or network-attached storage (NAS) are mostly connected to wireless routers, and are assigned to floating IPs. This, coupled with the fact that the 3G, 4G, and upcoming 5G telecommunications networks utilized by smartphones are also of the dynamic IP type implies the existence of network penetration barriers such as those caused by multi-level routing or firewalls. This can lead to device vendors or service providers having to provide additional data transmission and file transfer relay servers to help with the transmission of control commands and data, taking a second bite out of vendors' profits after the aforementioned cost of OTA services.



For indoor smart devices placed in homes or workplaces as shown in the illustration on the left, consumers usually have two types of needs:

Type (1): File uploads or function configurations over a remote connection.

Type (2): File downloads over a remote connection.

Due to network penetration issues, smart device suppliers are usually required to provide users with corresponding network link services with transmission capabilities. If connected through the extranet, mobile terminals and indoor devices are often unable to penetrate the barrier to establish a direct connection, and must be connected through a relay server, which can lead to increased operational costs. To handle the sudden increases in data transmission, a large number of relay servers may need to be set up.

(C) How cost-intensive are these measures?

With regard to online software updates, the actual cost estimation of system setup and subsequent operation is based on a product's sales territory, sales numbers, the software file format, and even product type. One example is the time needed to allow most or all device users to complete product software updates.

We have simplified conditions as follows to give and compare several examples below:

(1). The estimated price range is based on an operational scale of between 20,000 and 100,000 daily visitors and between 500 and 2,000 simultaneous visitors.
(2). Only five pairs of linking sites (file servers) are required.
(3). 100GB of storage space is sufficient, and additional storage is not required.
(4). Users do not redownload files, whether deliberately or due to interruptions to prior downloads.
(5). There is no demand for cross-regional transmission.
(6). There is no demand for accelerated transmission.
(7). The size of the software package to be downloaded is 100MB.
(8). The number of devices that need to finish the download is 1,000,000.
(9). The download can be completed on all devices within a month.
(10). Suppliers' equipment lease, data storage, data transmission, and cross-regional transmission expenses are calculated with different unit prices in different regional markets. Only the average price in the Asia Pacific region is used here for comparison.

In reality, suppliers with a higher number of sales, wider sales territory, longer product lifespan, and larger software update package are burdened with higher data transmission costs. Assuming that it only takes three minutes to download a 100MB software package, the installation of multiple download node servers in multiple regions should be considered. The expense amounts used here is based on an extremely simplified set of operational conditions in order to facilitate comparison.

Based on the aforementioned conditions, should a supplier with a shipment number of 1 million units wish to provide online update services, it would need to pay between US$258 and US$680 per month to cover the basic cost of system setup. If the supplier wished to complete all updates within a month, then data transmission would cost between US$10,000 and US$14,000. If cross-regional transmission were required, then data transmission expenses could double. In this calculation with its set of simplified conditions, a monthly expense of US$10,258-US$14,680 has already been reached.

Functions	Amazon AWS	Microsoft Azure	Google GCP
Web Server	US$42~US$166/month	US$48~US$193/month	US$43~US$174/month
Database	US$182~US$340/month	US$220~US$425/month	US$230~US$450/month
Load Balancer	US$19~US$21/month	US$18~US$20/month	US$19~US$21/month
File Storage	US$15~US$30/month	US$15~US$25/month	US$18~US$35/month
OTA Transfer for 1M sets	≥ US$14,000	≥ US$14,000	≥ US$10,000

Table: Under simplified conditions, examples of central systems and their operational expenses

The actual case shown in the illustration below is one of Sharp S3's three online updates in 2018; it was an OTA task with the smallest software file size of the three updates.

We can learn from this actual case that:

(1). A smart device usually goes through multiple online updates.
(2). A 100MB software package on an Android smart device is not deemed a large target content.

Illustration: An example of a smartphone update notification, showing the file size of the update.

[1] Reference:
https://calculator.s3.amazonaws.com/index.html
https://azure.microsoft.com/zh-tw/pricing/calculator/
https://cloud.google.com/products/calculator/

B. What is the market size involved in the issues to be solved

(A) Increasing use of smart devices and data transmission in the Chinese smart internet TV market

Under the influence of the prosperous pan-entertainment industry, the OTT smart device market has become a flourishing part of the industry chain. A good example of this is China, with its enormous market size and its consumers who are more accustomed to OTT Boxes and TVs. According to the *2018 Chinese OTT Market Development and Marketing Research Report* co-published by the Digital Marketing Committee of the China Advertising Association of Commerce, the Big Data Joint Laboratory co-founded by Yoyi Digital and the Communication University of China, and China's National Institute of Advertising, 2011-2015 was the rapid growth period of the OTT set-top box market; by the end of 2017, the number of OTT devices shipped in China had surpassed 200 million units, with the number of new users reaching 168 million people. It is estimated that the number of OTT devices will increase by another 50 million units by the end of 2018.

This confirms the significant growth strength of the smart device market and the issue of online updates for a large number of devices. The amount of energy required for OTAs and relays, including data transmission and storage, to enable connection access in the extranet between this many devices and smartphones is a huge hurdle.

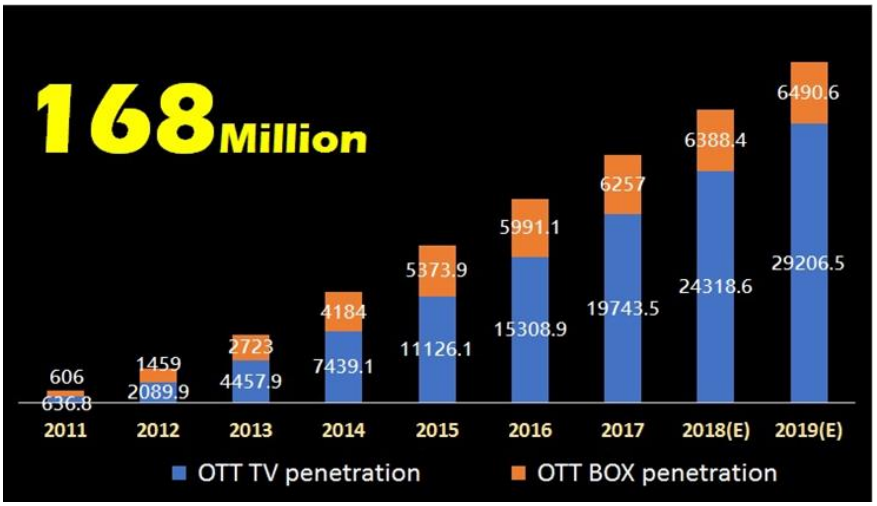


Figure: Number of OTT smart device sales in China (Unit: 10,000 units)

(B) Increasing use of smart devices and data transmission in the American smart speaker market

Smart speakers have been the fastest-growing end-consumer product in 2018. These products are not just a carrier for interactive voice systems, but also a portal for smart homes. The enormous ecosystem of the connected market and the resulting business opportunities have attracted major players. Besides market pioneers Amazon and Google, newcomers like Apple, Facebook, Baidu, and Tencent have also entered the market this year. According to TrendForce Corporation's Topology Research Institute, 62.25 million smart speakers were shipped in 2018. It is estimated that that number will reach 95.25 million units in 2019 for a one-year increase of 53%, with both Google Home and the Chinese market showing an increased market share. Expenditures for both online device software and language learning content updates involve immense, cumulative costs.

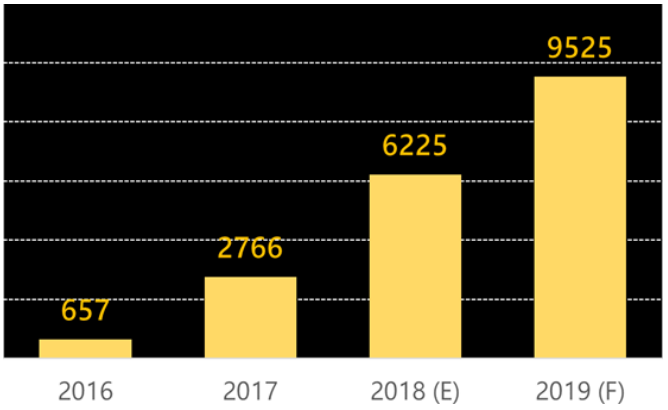


Figure: Number of smart speakers shipped in the global market (Unit: 10,000 units)

(C) Cisco analysis of the global web application market

According to Cisco's trend analysis report The Zettabyte Era: Trends and Analysis, the number of devices connected to IP networks will be more than three times the global population by 2021. There will be 3.5 networked devices per capita by 2021, more than the 2.3 networked devices per capita recorded in 2016. Personal devices and machine-to-machine (M2M) networked devices will be extensively used, with the number of networked devices reaching 27.1 billion units in 2021, up from 17.1 billion in 2016. Network users will increase from 3.3 billion to 4.6 billion (58% of the global population).

M2M applications in various industries have accelerated the IoE phenomenon. As the report shows, the number of M2M-connected products globally will increase 2.4-fold, from 5.8 billion in 2016 to 13.7 billion by 2021. By 2021, there will be 1.75 M2M-connected products per capita globally (as shown in the figure below).

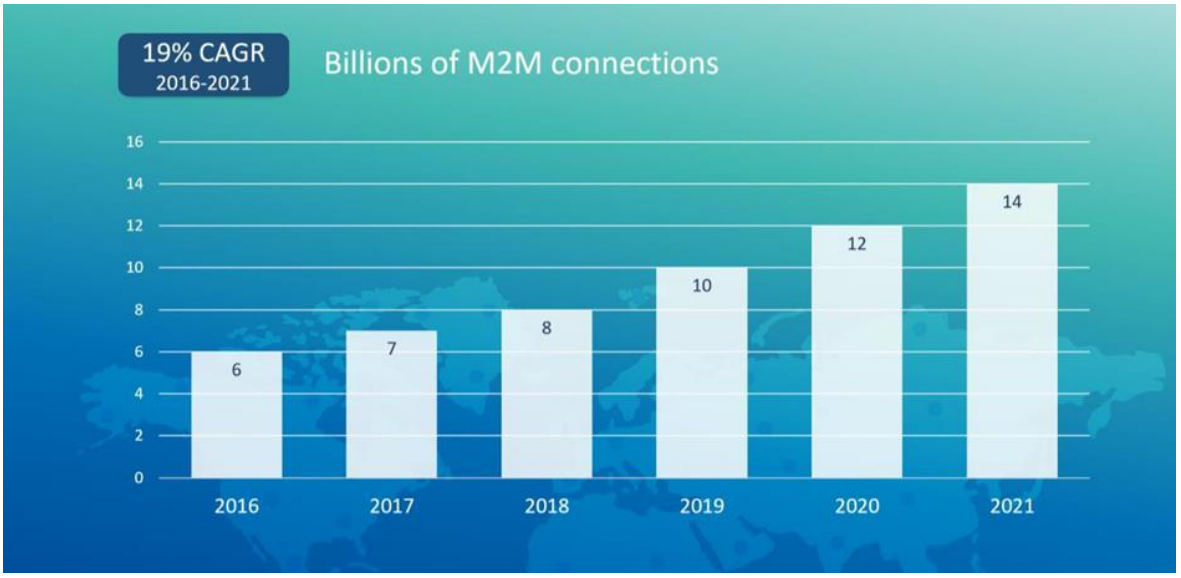


Figure: Increase in global M2M connections.

By 2021, connected home automation, home security, and video surveillance applications will be connected to home appliances and tracking applications, and will account for 46%— nearly half— of total M2M connections, with the number of connections in connected workplaces in second. This shows how pervasive M2M connections are in our day-to-day lives (as shown in the figure below). These smart devices all use immense amounts of data transmission.

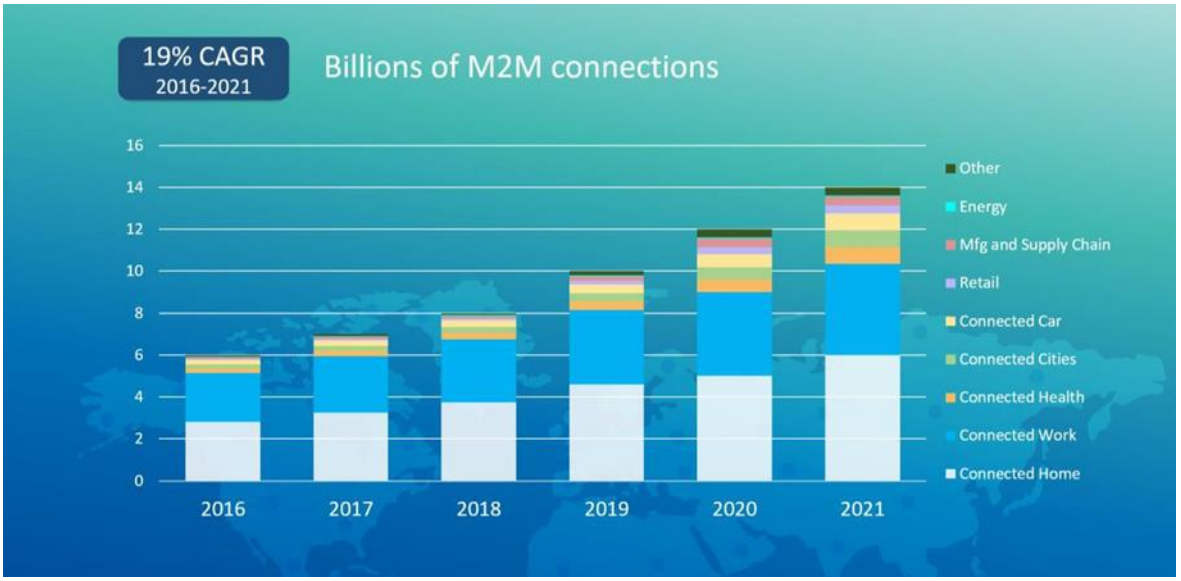


Figure: M2M connections in various industries around the world

Although the number of connections has grown 2.5-fold, global M2M network traffic has grown 7-fold in the same period of time, from 2 Exabytes (EB)[2] (2% of global network traffic) in 2016 to over 14 EB (5% of global network traffic) in 2021 (see the figure below).

Due to an increase in demand for online updates with lower latency among applications with M2M connections, growth in network traffic has overtaken the number of connections.

Figure: Increase in global M2M network traffic (Exabytes per month)

With calculations based solely on the US$0.1/Per GB data costs of AWS, and ignoring the basic costs incurred on account of servers, load balancers (floating hourly rate), human resources, and differences in geographical location, the average monthly data transmission cost can exceed US$1.5 billion. In the M2M connection market, this amounts to an annual expense of US$18 billion.

[2] 1 Kilobyte (KB) = 1024 Bytes · 1 Megabyte (MB) = 1024 KB · 1 Gigabyte (GB) = 1024 MB · 1 Terabyte (TB) = 1024 GB · 1 Petabyte (PB) = 1024 TB · 1 Exabyte (EB) = 1024 PB。

II. Providing solutions using the ioeX network

The functional components of ioeX include (a) a decentralized network of multiple smart devices serving as distribution nodes, (b) a DPoS blockchain for recording the workload and contribution of network nodes, and (c) a PoW blockchain for issuing IOEX digital currency as a reward for such workloads and contributions. IOEX digital currency can also be used to access and apply ioeX network functions and services.

IoeX is a global commercial value distribution network based on blockchain-driven nodes.

A. A decentralized network with distributed smart terminals serving as nodes

(A) IoeX decentralized network

The goal of ioeX is to continuously promote ioeX functions and increase the number of smart terminals that utilize or are equipped with ioeX functions, thereby allowing ioeX to interconnect a wide range of smart devices; consolidate their computing power, storage space, and network transmission functions; construct direct point-to-point transmission, distributed storage mechanisms for content, and other important functions; integrate blockchains; and create decentralized smart terminal networks capable of delivering business value. In this whitepaper, the term "ioeX network" is used to refer to "distributed and decentralized smart terminal networks", and shall be substituted as such in the following text.

1. Definition of "decentralized"

The majority of conventional IoT operating systems use central systems to interconnect end terminals and control terminals. Multi-centered distributed deployment approaches emerged as business scope and functionality expanded. Nonetheless, the connections between end/equipment terminals and centers (sub-centers) or control centers remain predetermined.

The term "decentralized," as defined in ioeX, refers to the interaction between distributed bootstrap nodes and distributed peer nodes. Distributed bootstrap nodes replace the central systems of conventional models and only function as serial connectors, allowing individual peer nodes to determine which bootstrap node to use to join a network based on network conditions. In this instance, equipment is not assigned to a specific central node. Once a peer node joins a network, the node is interconnected with existing nodes to fully integrate it into the network.

IoeX decentralization represents the evolution of networks from a single center, to multiple distributed nodes, to independent selection of nodes based on network conditions.

2. Components of the ioeX network

The ioeX network comprises two major node groups:

(1) Bootstrap nodes:

Devices with bootstrap nodes are connected to the internet using fixed IPs. They serve only as link channels. Once peer nodes join the network via a bootstrap node, they interconnect with other peer nodes and disconnect from the bootstrap node. Bootstrap nodes do not store or execute any files from peer nodes, thereby circumventing the possibility of contracting or spreading viruses. IoeX decentralized networks separate the organization/transmission and storage functions into different node types.

(2) Peer nodes:

Peer nodes are general smart end terminals that connect to the internet via fixed or floating IPs.

Once the ioeX function is installed, peer nodes can join the network via any bootstrap node. These nodes are responsible for file storage and sharing in the network. Personal UIDs or the UIDs of other users can be used to encrypt data during transmission or reception. Only the recipient can obtain both UIDs; therefore, only the recipient can successfully open the file.

To maximize overall performance and network stability, the ioeX requires the following specifications for smart end-terminals: 1 GHz dual-core processor, minimum 1 GB of RAM, and minimum 4 GB of storage space.

On smartphones, the storage space allocation function is replaced by the phone node function to maintain privacy.

Bootstrap node	Peer node	Phone node
		
• Preferred devices: High-performance smart devices Corporate computers or servers • Connects via a fixed IP • Provides network functions • Offers relay capabilities to facilitate peer nodes. • Install ioeX bootstrap node SW	• Preferred devices: General smart devices able to satisfy basic hardware requirements • Connects via a floating IP or fixed IP • Provides storage and backup capabilities • Shares storage space • Install ioeX peer node SW	• General smartphones that can connect to the internet via Wi-Fi, 3F/4G, or 5G • Discards the storage sharing function of peer nodes • Primarily serves as a connector/controller for peer nodes • Install ioeX phone node SW

Figure: ioeX network node type descriptions

3. Formation of the ioeX network

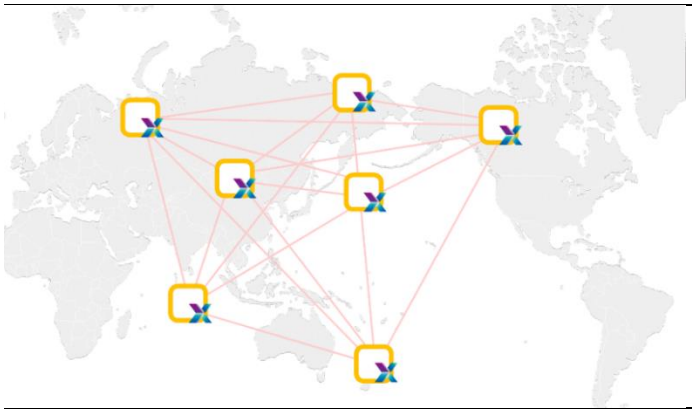
Once a peer node is connected to the internet, it joins a network via a bootstrap node. The network construction process is as follows:

(1) Establishing a bootstrap node

The ioeX team establishes a batch of bootstrap nodes worldwide. These nodes serve as the backbone of the network.

The devices used by the ioeX team to set up the bootstrap nodes are server-class devices.

In addition to these bootstrap nodes, which are used to invite business partners to jointly manage the network (Node Partner Program), the ioeX team will also introduce many partners capable of operating bootstrap nodes to the network, allowing the partners to set up and manage their own bootstrap node equipment.



(2) Connecting, auto-querying, and interconnecting bootstrap nodes

After loading the ioeX bootstrap node software onto the bootstrap node device, start up the device and connect to the internet. The auto-query function will be activated, and the node will automatically connect to other bootstrap nodes.

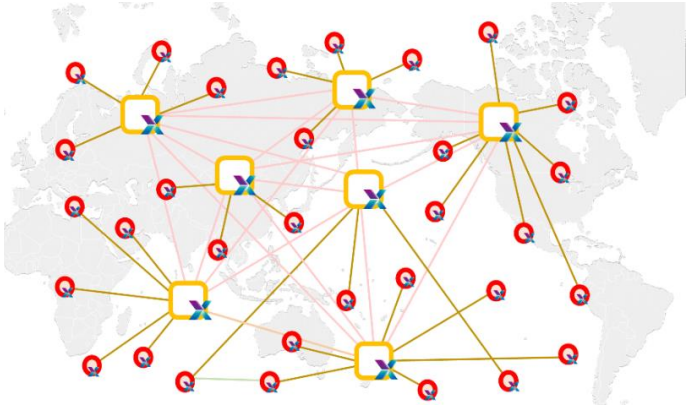
Once the new bootstrap node is online, it will search for and connect with other bootstrap nodes, continuously expanding the coverage of the bootstrap node.

(3) Inclusion of peer nodes

Smart devices loaded with ioeX peer node software will continue to enter the market. After a peer node is connected to the network, it will automatically find a bootstrap node.

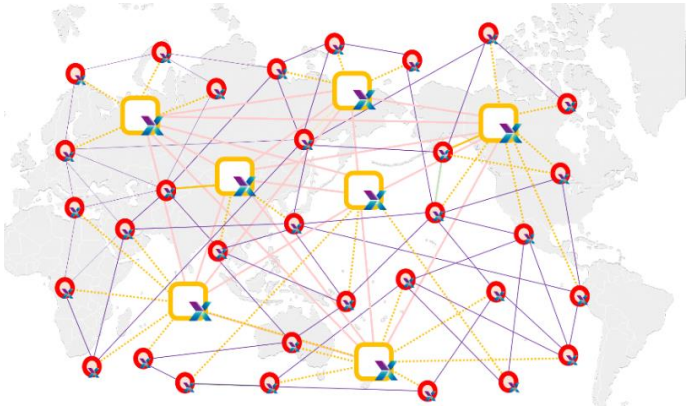
Peer nodes are displayed in multi-parallel. For example, many types of peer node apps can be released into the applications market, where users can download and install them to their smart devices, or peer-node developers can collaborate with device manufacturers to build the peer node SDK into their smart products before shipping. For consumers, the product is a cloud storage device. For device manufacturers, this approach reduces the cost of online hardware/software updates.

In response to the growing international demand for clean energy, ioeX emphasizes the use of computing power and storage capacity as new resources for clean energy in the era of high-speed mobile networks. Such resources may not be supported by all products featuring ioeX functionality manufactured by device suppliers. Therefore, it is necessary to consider methods of utilizing existing unused equipment coupled with unused bandwidth at home and unused device storage to create a secure network with global value.



(4) Peer nodes join the network via bootstrap nodes

Peer nodes automatically identify and select a bootstrap node based on network conditions to connect to the network.



(5) Peer nodes and bootstrap nodes form the network

Peer nodes in a network can be connected to other peer nodes for file transfer. Peer nodes are primarily connected directly. If a direct connection cannot be established, the peer node can relay the transmission through a bootstrap node.

Figure: ioeX network setup and development

(B) Relationship with Elastos Carrier

1. What is Elastos Carrier?

The ioeX network has adopted Elastos Carrier functions for node querying and interlinked/direct-linked transmission. IoeX will enter the market via business applications, targeting the needs from collaborating businesses. Once a network has been formed, the network functions can be accessed by service providers to provide services that satisfy demand from general users. This process also offers numerous basic functions that users of smart-device-nodes can use and provide feedback on.

In other words, the ioeX network can be expanded and innovated using Elastos Carrier technologies to develop even more functions. In addition to general user applications, such as communication and personal cloud storage, efforts are also being made to develop business applications, enabling the network to better meet the needs of business users.

Elastos Carrier was built on DHT network technology. **Carriers are based on a friend-to-friend (F2F) communication architecture. The nodes between carriers are not the same as the nodes between blockchains.** Please must be clearly distinguished. In carriers, "point-to-point" refers to node-to-node. " Bootstrap nodes connected to the internet via fixed IPs " indicates carrier bootstrap nodes used to create the basic network framework of the carrier network. These facilitate smart devices connected to the internet via floating IPs and equipped with carrier SDKs. The smart devices are then known as peer nodes and spread throughout the network. Bootstrap nodes can also serve as a relay (file relay transmission) between peer nodes. However, bootstrap nodes do not participate in any application functions. Therefore, peer nodes do not have a friendly relationship with a bootstrap node. Peer nodes participate in application functions. Data or information can only be transmitted between peer nodes with friendly relationships.

Because the communication frameworks of carrier networks are based on a friend-to-friend model—that is, although these nodes are on the same DHT network—they cannot form direct connections without having friendly relationships. A trusted relationship must be established to initiate communication, allowing carriers to maximize control to prevent DDOS attacks and enhance network safety.

Carriers themselves are internet communication frameworks. They do not have a specific application. Rather, they are equipped with a universal development interface that can handle different applications, functions, and logic according to the needs of the developer. Carriers do not store any user data, such as messages or nodes sent and received by users, or user relationships. These data are stored in the peer nodes.

In addition to realizing the basic friend-to-friend API model, carriers also process information dissemination APIs, such as the establishment of friendly relationships between nodes. Basic messaging functions can be implemented based on the DHT network.

In addition to DHT operations, carriers achieve P2P data transmission through interactive connectivity establishment (ICE), which is a framework that combines several NAT transversals such as STUN, TURN, and RISP. [3]

[3] https://en.wikipedia.org/wiki/Interactive_Connectivity_Establishment

Carriers can encrypt/decrypt and multitask data and files. Carrier interfaces can also carry forward upper-level semantics, which makes it convenient for carrier developers to carry out application support. The data file transfer APIs provided by carriers can be divided into two layers, the call layer and the session layer. The call layer is essential, while the session layer is optional. Call and session layers can be introduced depending on the needs of the application. Usually, if the application only requires messaging, then only the call layer must be introduced. If streaming data is required, then the session layer must be introduced to make it easier to control the size of the application.

Carriers also provide session APIs to assist in the creation of connection-oriented or UDP datagrams for data transmission. These are known as streams in the carrier system. The session communication transmission capability of the carrier can be divided into two layers, a UPD-like datagram mode, and a TCP-like mode. Both modes are implemented on a stream. The datagram mode or stream mode can be selected in the drop-down menu.

On the terminal end, the two modes are identical. However, they execute different work protocols. The lowest transmission protocol of carriers is the UDP because TCP has weak penetration while the penetration of UDP is relatively stronger. Essentially, a scenario with 70% to 80% penetration is acceptable for P2P. Such scenarios can maximize direct P2P transmission. Although UDPs are used as the fundamental transmission protocol, the upper-level application of carrier APIs provides UDP-like datagrams and TCP-like streams for data transmission. Data can be transmitted or streamed according to the requirements of the upper-level application, and encryption and decryption can be selected by the application.

The transmission of large amounts of data requires the establishment of a communication mechanism for the sockets. Carriers provide TCP-like and UDP-like transmission channels that do not support break and resume. Break and resume functions must be established by the developer using the application functions of the sockets. Carrier APIs involve a large number of I/Os. The structure is entirely reliant on asynchronous I/Os (AIO, Async I/O)[4], which comprise a lower-level thread. All user APIs are asynchronous. Forward calls are only used in forward calling. Reverse calling is achieved through callbacks. (The basic concept behind AIO is the initiation of numerous I/Os in a process rather than blocking or waiting for operations to complete. After receipt of a delay or I/O completion notification, the results of I/O operations can be retrieved.)

If a direct transmission cannot be established between peer nodes, bootstrap nodes can be used as relays. The establishment of relays relies on the basic P2P penetration protocol in the carrier. Carrier's basic P2P penetration protocols are implemented based on standard RFCDE [5] specifications. The relay function is also achieved using these specifications. The search for and detection and application of relays (bootstrap nodes) are automatically completed in conjunction with DHT, and the carrier function package of the peer node automatically identifies the fastest bootstrap node and connects to it in accordance with the network topology. A centralized relay is not required. There are numerous relays (bootstrap nodes) on a carrier network. The carrier algorithm selects the optimal relay for the peer node on the DHT network. These specific mechanisms are standardized in RFC. In the DHT network, peer nodes do not store bootstrap node

[4] https://en.wikipedia.org/wiki/Asynchronous_I/O

[5] https://github.com/tpospisi/RFCDE https://arxiv.org/abs/1804.05753

IDs. Rather, they store an adjacent bootstrap node table determined by the algorithm. The node table fragment is stored locally, and the relay link is directly retrieved from the local bootstrap node table.

The UID in the carrier function is a unique user ID on the DHT network. The carrier UID is your external identity. External holders of your UID cannot directly access your data. Rather, they must have a friendly relationship with your UID. The carrier has a basic authentication process completed by the application. The carrier UID is a public key that corresponds to one on an elliptic cryptography curve, similar to ID digital wallet IDs. The carrier UID is generated during initialization. It is a public key associated with a private key. All end-to-end communications and data transmission, including the authentication, between peer nodes are encrypted by a private key at both ends. If a private cloud drive is established on a carrier, the IP address and URL of the private cloud drive can be ignored. The private cloud drive can be accessed using the carrier UID.

We explain the F2F binding association using a private cloud drive. If the private cloud drive is set up using a standard ownCloud[6] solution, the username and password function for the private cloud drive can be established using ownCloud. The carrier itself does not provide username/password functions, it only offers access authentication. In other words, when your mobile phone wants to access its own ownCloud service, the relationship between the nodes must be established using the carrier API. In other words, your mobile device should be paired with the private cloud drive. This pairing is established using a pairing code set by the user during service configuration. The correct code can be entered to pair the mobile device with the private cloud drive. Once paired, the client terminal of the private cloud drive can be accessed to access the drive. Accessing the private cloud drive is impossible without a pairing code. Once an association is established using a pairing code, a formal username is required to access ownCloud. Therefore, the authentication process is in two layers. The first is pairing authentication, and the second is ownCloud username authentication. Friendly relationships can be pre-set during the development of the application on the carrier. Alternatively, default pairing codes can be established for the subsequent establishment of friendly relationships.

Carriers support application development. In order to increase business applications, ioeX will continue to develop useful functions and incorporate Elastos iterations and updates.

Figure: Example of peer node interconnection (Add friend, F2F)

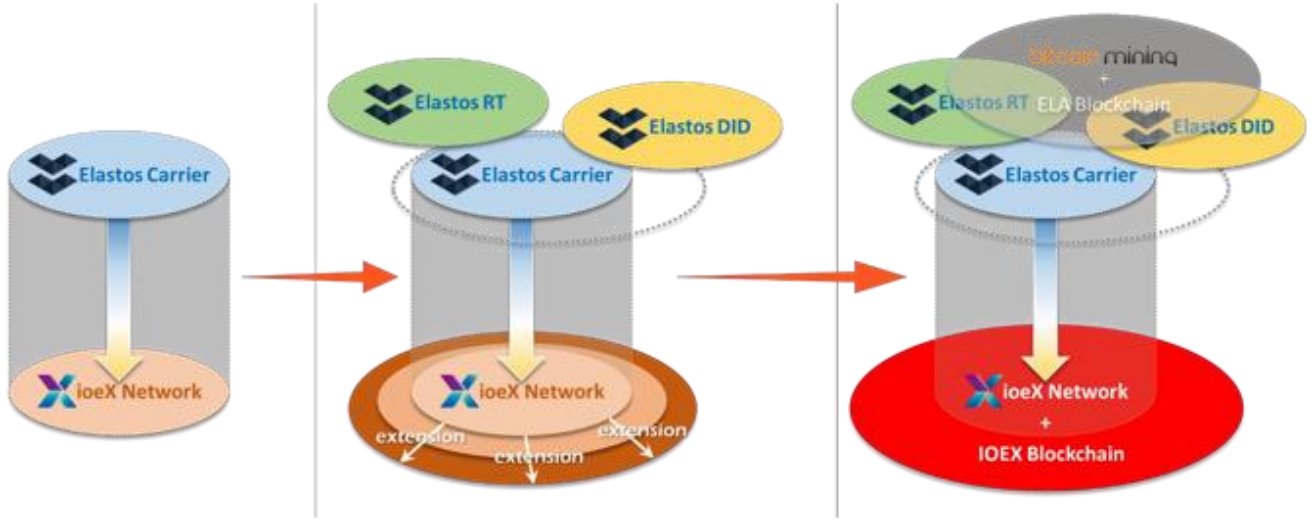
[6] https://owncloud.org/

2. Relationship between the ioeX network and Elastos Carrier

The relationship the ioeX network and Elastos Carrier is best explained using an example. Elastos carriers are like engines that can be used in a variety of domains, such as in cars (land), ships (sea), and airplanes (air). Say ioeX uses these "engines" to build cars. To differentiate its cars from other brands and satisfy user needs, ioeX creates dedicated functions and innovative applications for different models and continuously seeks out more application scenarios in the automotive industry, even potentially creating new models that can be used for aviation and navigation.

The Elastos Carrier perpetually optimizes engine performance and provides these technologies to its partners for development within and beyond the industry. Partners in different industries have varying levels of participation and citations in the development of Elastos-related functions.

All ioeX nodes are included in calculations of the number of Elastos Carrier nodes,.



The ioeX networking function evolved from Elastos Carrier, and the initial functionality of the ioeX network is almost identical to an earlier version of Elastos Carrier.	ioeX will be enhanced and extended based on existing core competencies, and the network can be applied to suit different usage scenarios, including file encryption and segmentation, multi-storage of split files with limited spread, break-and-resume, content addressing and downloading, media streaming, instant messaging, file management, and other e-commerce functions. Elastos has also created other functions associated with Carrier, such as DID and Runtime, which can be used to build its ecosystem. ioeX will continue to collaborate with Elastos to achieve a higher level of functional integration and innovation and to serve ecosystem participants.	ioeX enables the bootstrap nodes in the network to contribute computing and storage power to the blockchain, transforming these nodes into PoW chain miners and DPoS chain arbitrators. PoW public chain miners can also be equipped with bootstrap node functions to integrate them into the network. The ioeX network provides operational power to its own blockchain, and the blockchain provides an economic system for the network ecology. The main Elastos chain operates independently and uses sidechains to operate other functions such as DID sidechains to jointly mine bitcoin sources. Over time, Elastos Carrier derives new features and optimizes existing features to benefit and complement the ioeX network.

Figure: Functional evolution and interrelationship of the ioeX network and Elastos Carrier

(C) Theoretical descriptions and sample code

1. Connecting to the network

Before connecting the network, devices are required to establish their own node data (UIDs) and register all necessary callback functions, such as adding friends, sending messages, and querying friend statuses.

All messages or files may only be transmitted between friends (friendly relationships).

```
//structure of network data
ioeXCarrier *w;
//structure of network options
ioeXOptions opts;
//structure of network callback
ioeXCallbacks *callbacks;

//Load network data
cfg = load_config(buffer);

//Import network data to ioeXOptions
for (i = 0 ; i < cfg->bootstraps_size; i++) {
        BootstrapNode *b = &opts.bootstraps[i];
        b->ipv4 = node->ipv4;
        b->ipv6 = node->ipv6;
        b->port = node->port;
        b->public_key = node->public_key;
}
```

```
//Registration of callback functions
//Query callback function for friends list
callbacks.friend_list = friends_list_callback;
//Query callback function for friend connection
callbacks.friend_connection = friend_connection_callback;
//Query callback function for friend info
callbacks.friend_info = friend_info_callback;
//Callback function for friend request
callbacks.friend_added = friend_added_callback;
//Callback function for friend messaging
callbacks.friend_message = message_callback;
```

```
//Structure of network
ioeXCarrier *w;
//Create network node
w = P2PNetwork_new(&opts, &callbacks, NULL);
```

```
//Connect network
connect_to_bootstraps(w);
```

2. Sending Messages

Devices must establish a relationship (friendly relationship) to enable the messaging function. Messages cannot be sent to the same device. The following checks must be completed before sending a message:

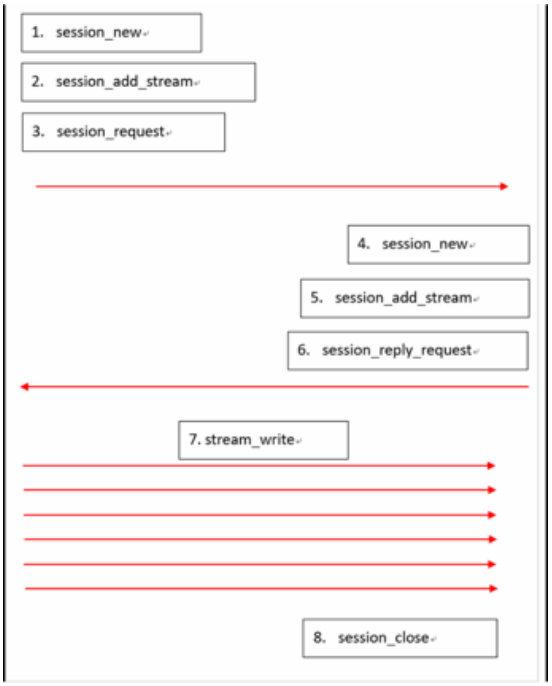
```
//Sender
w: Network message
to: Receiver address address
msg: Message content
len: Message length
Send_friend_message(ioeXCarrier *w, const char *to, const void *msg,
                    size_t len){
// Check if the message exceeds the maximum length
if (!w || !to || !msg || !len || len > MAX_APP_MESSAGE_LEN) {
    return -1;
  }
//Check address validity
if (!is_valid_key(to)) {
    return -1;
  }
//Unable to send message to the same device
if (strcmp(to, w->me.userid) == 0) {
    return -1;
  }
//Check connection to network
if (!w->is_ready) {
    return -1;
  }
//Check whether the address is friendly
if (!friends_exist(w->friends, to)) {
    return -1;
//Send message
rc = dht_friend_message(&w->dht, to, msg , len);

}
```

```
// Receiver
w: Network message
from: Sender's address
msg: Message content
len: Message content
static void message_callback(ioeXCarrier *w, const char *from,
                      const char *msg, size_t len)
{
  // Display received message
  output("Message from friend[%s]: %.*s\n", from, (int)len, msg);
}
```

3. Sending Files

First, both parties must establish a common channel using a session. Once a set of channels has been established, files can be transmitted in segments. Step 1 to Step 6 in the figures below are used to establish a common channel. Step 7 represents the transfer of the file in segments. After the file has been transferred, the receiver may close the channel.



(a) session_new:
Create a session.

(b)session_add_stream：
Set various session parameters (file transmission: select reliable), including activating the callback function for receiving data and acquisition of the session ID.

(c) session_request：
session。Send a request to the receiver to activate the session.

(d)session_reply_request：
Reply to the sender that the session is ready.

(e) stream_write：
Write file data.

(f) session_close：
File received, close session.

B. Basic functions and applications of the network

A simplified description of the ioeX decentralized network would be to say that once smart devices have been converted to peer nodes, they can join the network via bootstrap nodes and interconnect with one another. Peer nodes with friendly relationships can transfer information and files directly. If a direct connection cannot be established, bootstrap nodes can serve as a relay.

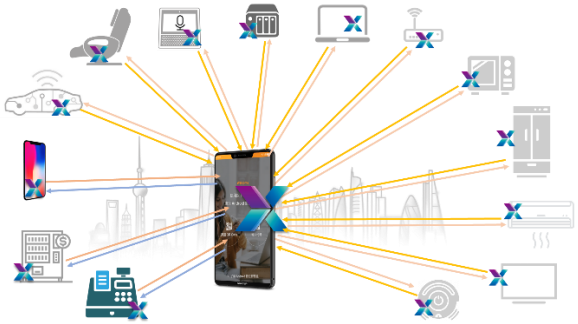
The owner of a peer node ("Kenneth") can share information and files with another party using an end-terminal application (ioeX app). If the other party is also an owner of a peer node ("Barbie"), then the two nodes can establish a channel of communication, transforming the app into an instant messaging tool. If Kenneth uses a smart device, the end-terminal application can be bound to the equipment-terminal application (ioeX device) to set up a personal cloud drive, whereby the user can remotely access and back up stored files. Besides Kenneth, the super peer node of the ioeX team can also temporarily store inspected, safe, and harmless files to the device through distributed backup. The files can be accessed by the receiver using a content hash address. This function assists smart device vendors in performing online software updates of their products. Finally, Kenneth is awarded digital currency for the workload and contribution of his device.

Proper planning of storage space on devices and ensuring their privacy and security are important tasks during network construction. IoeX SDK can be shipped with devices by a supplier or downloaded as an app by the owner.

In the initial application provided by ioeX, the relationship between planning personal cloud storage and distributing backup data on the device is illustrated in the figures below. The peer node owner can decide whether to enable the device's network function.

1. Personal cloud client app (ioeX app)

General users can download the Client app via their preferred application platform (Apple's App Store or Google Play Store). They can then remotely connect to multiple peer node products, access stored files in the personal cloud drive, back up files in the control terminal to any peer node terminal, and consolidate scattered storage space according to their needs (see the figure *Flexible consolidation and allocation of user storage space* below).



2. The specific peer node's distributed backup function

A specific peer node managed by ioeX is the only peer node that is able to access the distributed storage space of each peer node in the network. This function is mainly used to back up software update packages sent by smart device providers to multiple locations; to back up the system files of system operators such as telecom providers and law firms; and to create authorization tools for creators who need content right protection. Content authorization can be recorded via the ioeX DPoS blockchain smart contract. The ioeX team manages the use of distributed backup space to ensure that:

(1). storage space is not abused
(2). storage space is safe and confidential
(3). (c)end users are able to manage cloud backup files that have passed the expiration date and clear their storage space.

3. Peer node app for smart terminals (ioeX Devices)

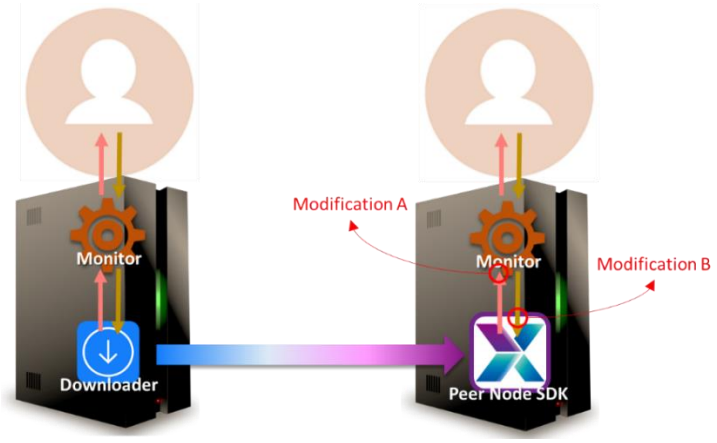
General users can download the device app via their preferred application platform (Apple, Google, or Ubuntu) onto their smart devices. Device terminals can be connected to a smartphone terminal. The smartphone terminal can then be used to relay commands for backing up or transferring files.

When a general user activates the personal cloud function on the peer node app or the internet function at home, the cloud backup function is concurrently activated and accepts the storage space management of a specific peer nodes. Allocated resources (transferred as stored files) are recorded and calculated by the ioeX DPoS blockchain and given an IOEX coin reward.

4. Smart terminal peer node SDK (peer node SDK)

Device operators can fine-tune their device software to conform with the ioeX peer node SDK and allow the device to execute software updates or other network functions via the ioeX network. Vendors can develop their own application functions using the ioeX SDK. Developers can develop a range of software using the ioeX peer node SDK to support even more device providers and users.

Figure: Peer node applications and network function activation/deactivation



Smart device providers can replace previous software download managers with the ioeX peer node SDK to perform content addressing on the ioeX network, as well as download, assemble, decrypt, and restore segmented software files, and load new software updates. Device operators must fine-tune the original features.

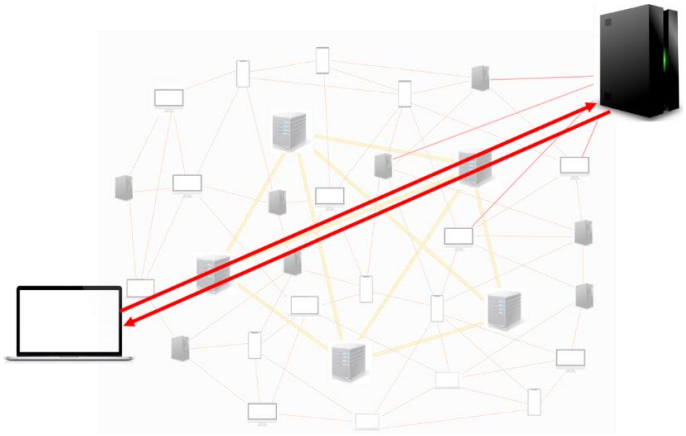
(1). After the device holder agrees to perform an update, the peer node SDK must be notified to perform a search and download the segmented files on the ioeX network using the segmented file content address list obtained with the update version information.

(2). Once the peer node SDK completes the download, the SDK prompts the device holder to launch the software and perform the update.

Figure: Smart device manufacturers need to modify the terminal software to perform online software updates via the peer node function.

Due to the query and connection characteristics of network nodes coupled with their storage space functions, the following basic functions and applications are available:

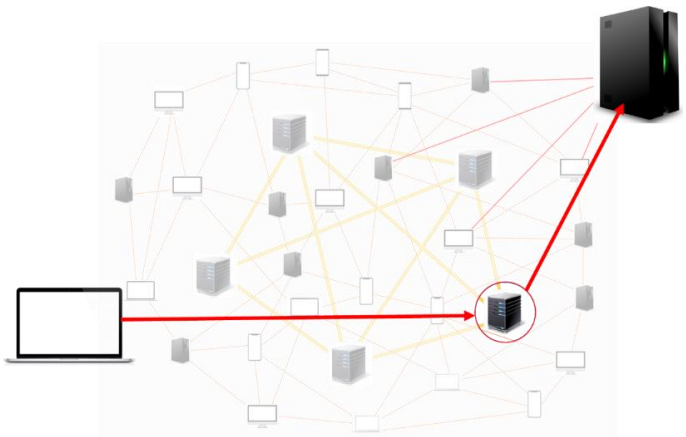
(A) Basic function 1: Direct point-to-point connection



After a peer node joins the network, any two terminals can send and receive files via a point-to-point connection. This process eliminates third-party intervention.

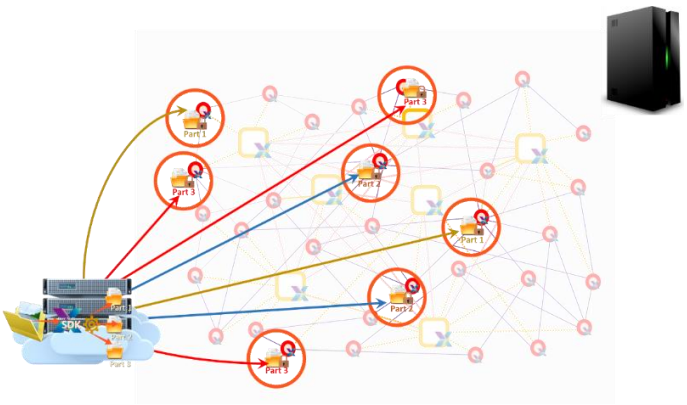
A single peer node can simultaneously send and receive requests from multiple friends, which is the core function of the networking ecosystem application.

(B) Basic function 2: Relayed transmission



If peer nodes are unable to establish a direct connection, they can relay the transmission through a bootstrap node. Bootstrap nodes only serve as transmission channels. They cannot be used for storage or executing files or applications.

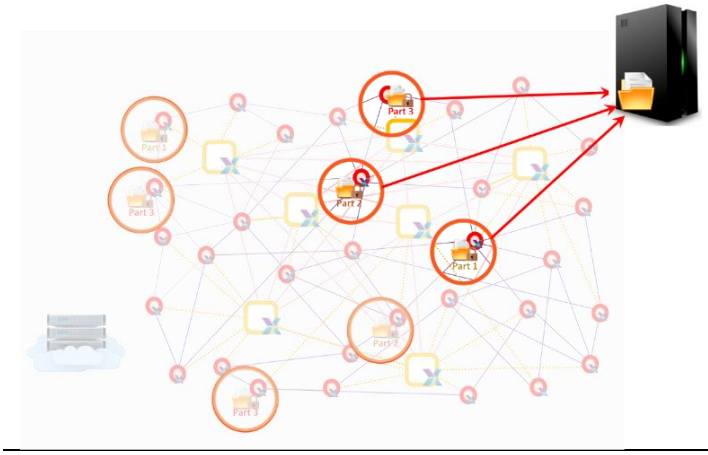
(C) Basic function 3: Distributed backup



The specific peer node (SPN) can split, compress, and encrypt files. It backups each file segment in different locations in the ioeX network. Each segment has a content address. Senders and receivers can then perform content-address searches to find and download the segments. The SPN provides a content address list to the task requester via the e-commerce system.

Since SPN can manipulate the storage space of all the other peer nodes in the network, its functions are not available to all peer nodes. Initially, the SPN will be operated by the ioeX team. Over time, VIP node partners may become eligible to undertake this task.

(D) Basic function 4: Content addressing and recall



Each file is segmented and stored in different locations. General peer nodes can perform a content address search within the network to locate the segments, calculate the optimal download location, and commence automatic download. The peer nodes are decrypted, and the file is consolidated and restored for subsequent use.

(E) Basic application 1: Personal cloud storage

Remote cloud storage and access functions are created using basic functions (A) and (B). Device holders can connect the ioeX Client app to the ioeX Device app to create their own personal cloud.

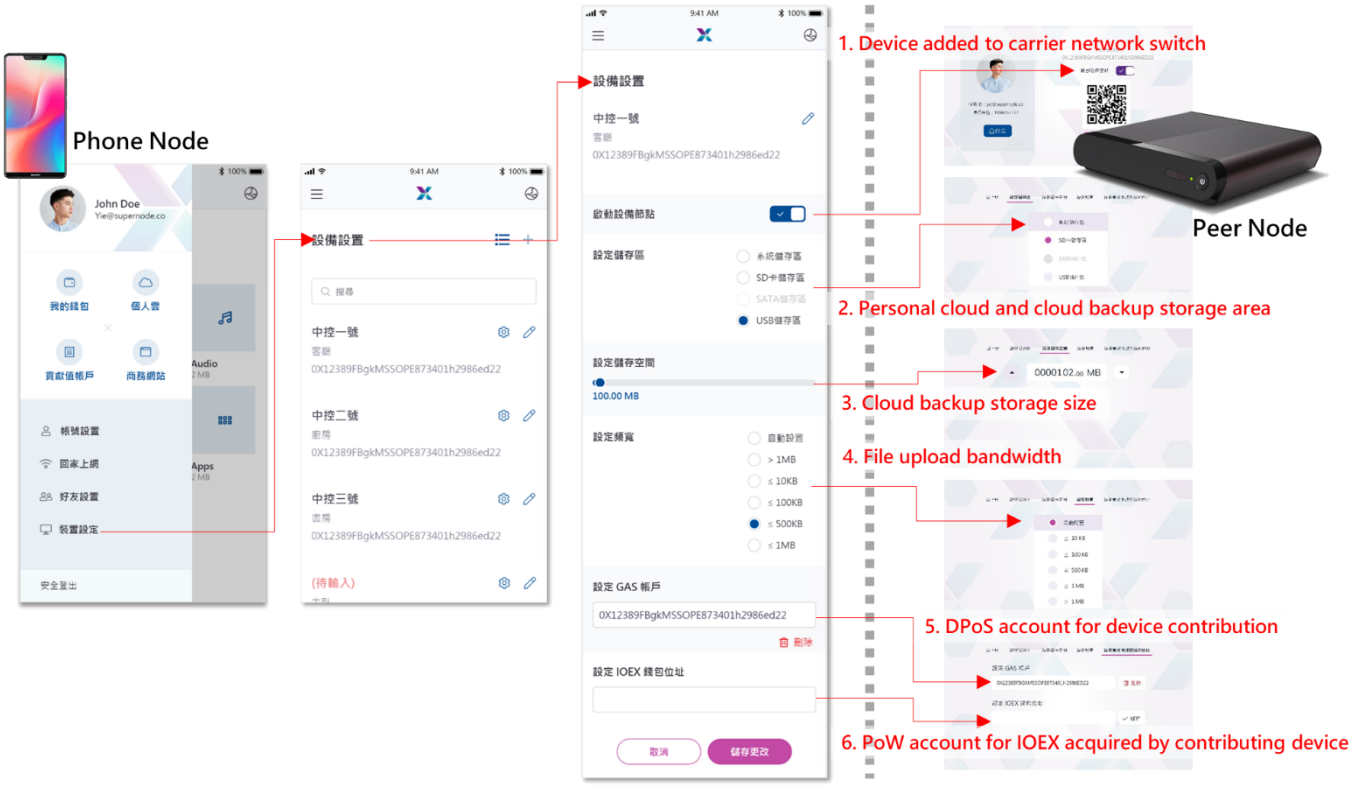
(a) One-to-many and many-to-one functions allow users to hold multiple peer nodes at the same time, thus allowing multiple devices to respond to client requests based on specific functional and environmental conditions. The remote device function can be used to independently set different end devices.

(b) The conditions set by the device holder on the Client app for the connected peer node are automatically synchronized to the peer node product.

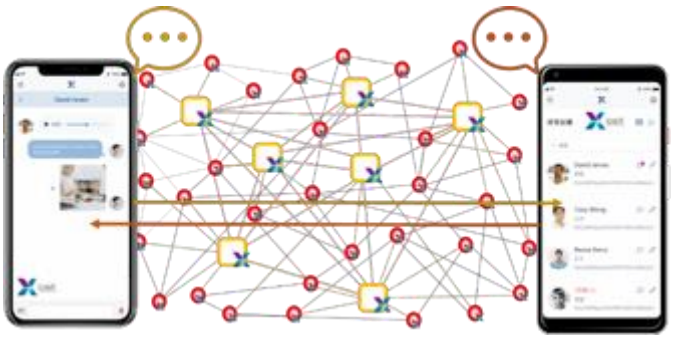
(c) Device holders are automatically synchronized to the peer node product after completing the peer node settings on the Client app.

(d) The linked device (cloud drive) must be selected before use. Existing and newly purchased devices can be concurrently used to achieve infinite expansion.

The personal cloud functions are available free-of-charge to users with sufficient ioeX currency. Before personal cloud functions are activated, the ioeX app checks whether users possess sufficient ioeX currency for network access.



(F) Basic application 2: Instant messaging tool



Using basic functions (A) and (B), clients can friend each other to share messages, pictures, audio files, and video files.

Users can add multiple friends. Client users can edit their friends' profile information to easily identify each friend. Information on friends is only stored locally.

Streaming functionality will be imported for users to access more streaming functions with each new update.

1. Audio files are transferred to the receiver via streaming media.
2. Video files are transferred to the receiver via streaming media.
3. Parties share audio files through streaming.
4. Parties share audio and video files through streaming, ultimately creating a completely decentralized communication tool.

All communicated content is stored locally on the client device. Decentralized sharing and communication functions can only be used when both parties are connected to the ioeX network to prevent the loss of information. To optimize power consumption in mobile devices, the mobile device client app does not operate in the background or remain connected to the network once the app is closed.

Although the messaging function is available free-of-charge for users with sufficient ioeX currency, the ioeX app checks whether users have sufficient ioeX currency when the messaging function is activated to determine network access.

(G) Basic application 3: Home connection function

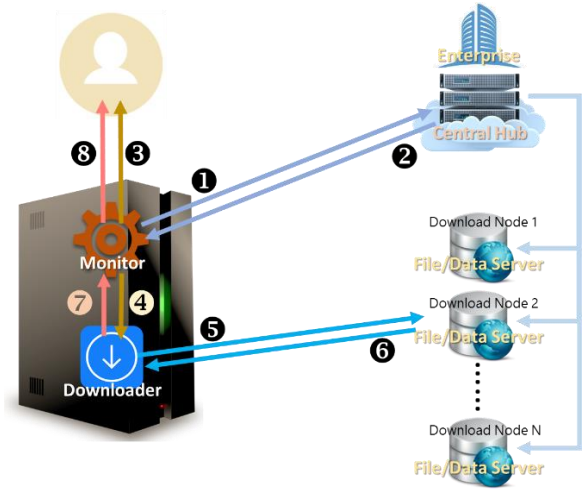
Clients may issue commands to equipment to request access to certain websites or pages. Content can be streamed from devices to clients using the media streaming function.

The home connection function is available free-of-charge for users with sufficient ioeX currency. That is, the ioeX APP checks whether users have sufficient ioeX currency when the home connection function is activated to determine network access.

C. Network applications

The ioeX network's basic functions and applications are applicable for both business and general users. In the following section, we explain the items to be implemented in the initial roll-out of the ioeX network in the market and compare the current situation with the expected benefits of adopting the ioeX network.

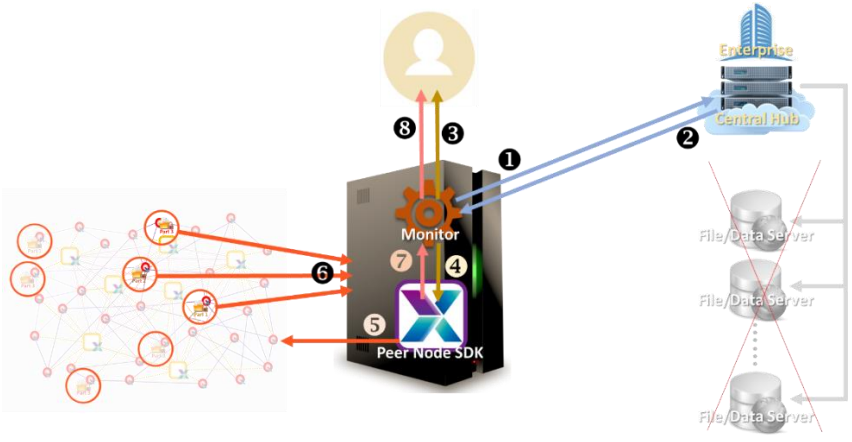
(A) Online smart terminal software and firmware updates



Current approach:

For online updates, smart device suppliers are required to set up a central system and several file servers (depending on the product sales area, sales volume, and number of products currently online). Once devices are connected to the network, they are then able to upload personal information and locations, maintain the connection and exchanges with the central system (i.e., Monitor function illustrated in the figure), and enable the central system to issue notifications such as software update notifications in real-time. Using online software updates as an example, Monitor notifies the file download manager to connect to a specific node to download the software files once the device receives a notification and the node (file server) download list is issued by the central system, and the device owner accepts the update prompt.

As sales increase and the sales area expands, the cost of installation, operating expenses, storage costs, and traffic charges from file download managers also increase for smart device suppliers.



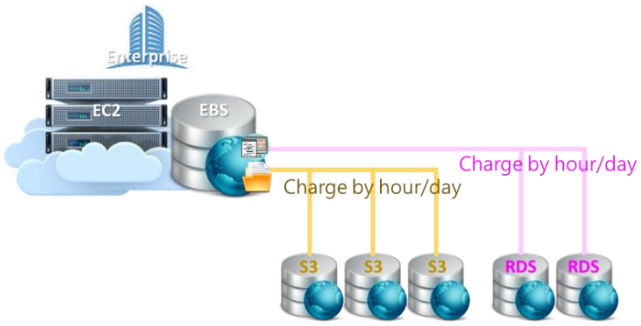
IoeX approach:

For online updates, smart device vendors are required to establish a central system. However, they do not need multiple file servers. The Monitor function of the device terminal is perpetually connected to the central system to receive notifications in real-time, including software update versions. Using online software updates as an example, when devices receive a notification from the central system containing the addresses for the update file, and the user agrees to the update, Monitor notifies the ioeX peer node SDK to perform a content address search on the ioeX network and download the update files.

Once the peer node SDK finds, downloads, and consolidates the update files, it notifies Monitor, and Monitor notifies the device user. The device user accepts the prompt, and the update files are installed on the device. Equipment suppliers are not required to expand the size of their file servers, thereby saving or reducing four types of costs—server equipment, construction/development, file storage, and traffic costs.

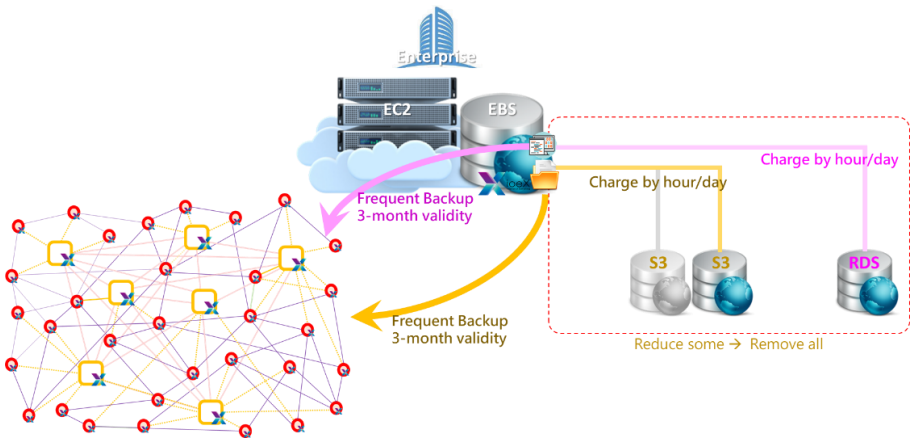
Sender and receiver information are recorded in a smart contract on the ioeX DPoS chain. The information serves as authentication data which cannot be randomly modified.

(B) Online distributed backup of business system files



Current approach:

The business system simultaneously backs up data in the database and transfers the backup data to the backup server. Security issues associated with distributed backup increase the cost of system setup, storage, and data transfer.



IoeX approach:

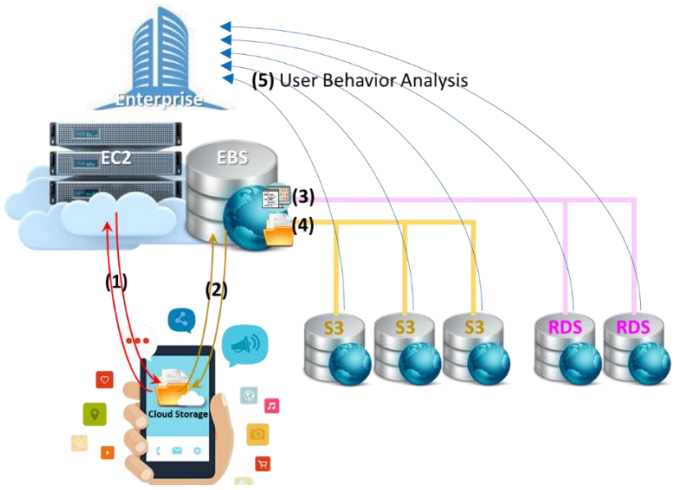
Business system files (database backup) can be backed up on the ioeX network via the e-commerce system. Each backup is valid for three months. Backups are automatically deleted after this period. However, backups can be performed multiple times. The backup schedule record kept by the e-commerce system can be accessed from the network at any time to retrieve backup files.

This approach can be used as a complement to the original backup method to reduce costs (compress backup server volume, reduce storage space, and reduce traffic).

As a device node, the business system can search, retrieve, and consolidate segmented files on the network using their content addresses.

Sender and receiver information is recorded in the ioeX DPoS chain in a smart contract. The information serves as authentication data which cannot be randomly modified.

(C) Cloud storage services



Current approach:

Cloud storage functionality is provided by the vendor. After registering an account and setting a password, users may access the system and perform file backups. Files are stored on the vendor's system. Although data are distinguished using usernames and passwords, stored information can be converted into useful data for the system operator or other vendors through categorization, information extraction, and tagging of categorization, information extraction, and tagging of user behaviors. Unethical operators can even steal or resell personal data illegally.

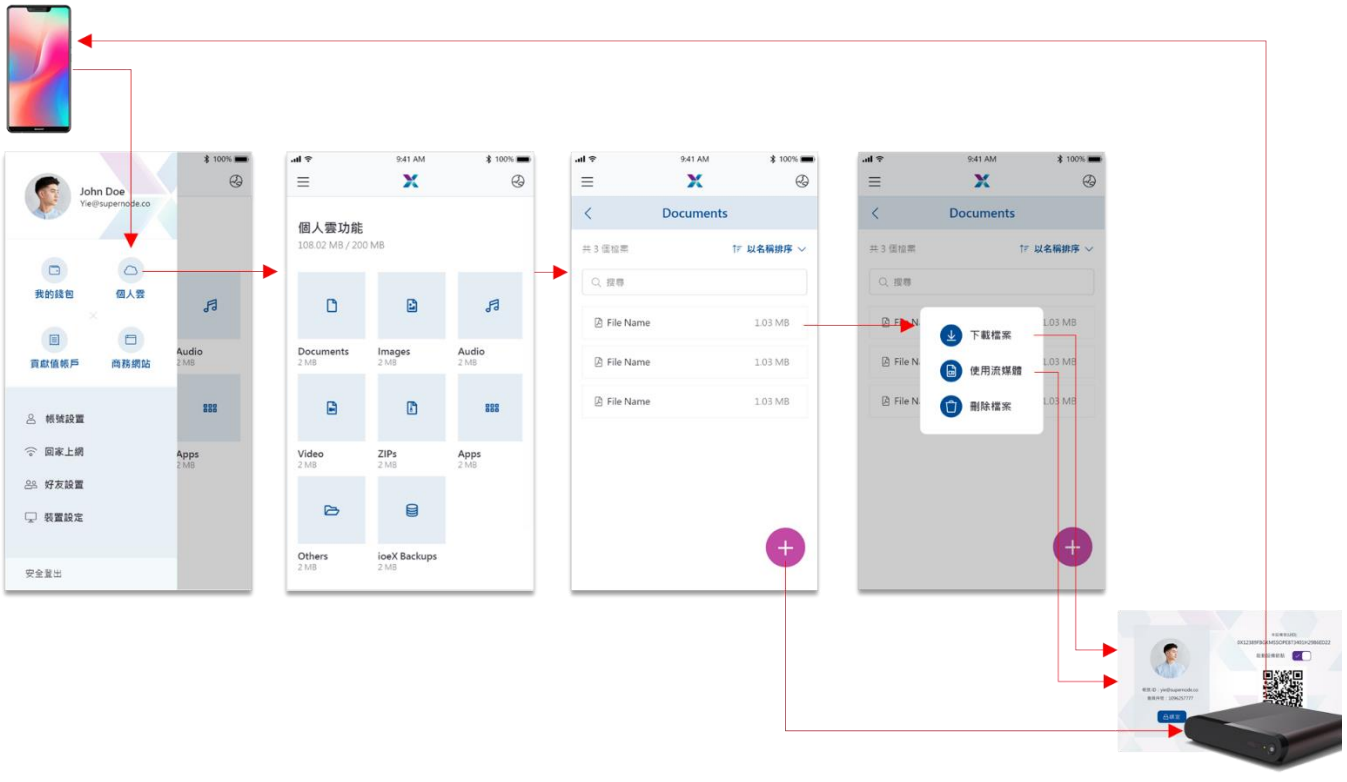
IoeX approach:

By installing the ioeX device app or importing the peer node SDK to produce personal cloud functionality, users can directly transform their smart devices into a decentralized network at home without having to use a third-party cloud drive. Terminal devices include, but are not limited to, smart routers, internet set-top boxes, internet TVs, and old smartphones. Any smart device can be transformed into a personal cloud drive by importing the ioeX peer node function to provide remote file backup-, applications-, and settings functionality.

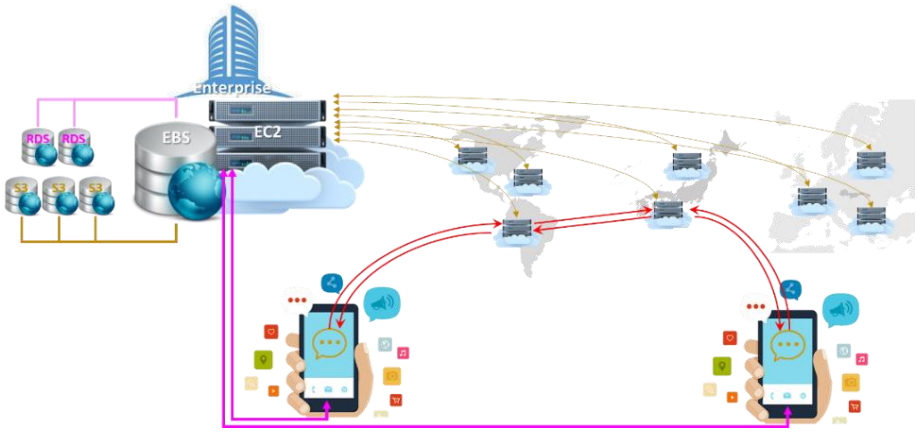
Until more service providers develop and launch personal cloud services using the ioeX network, users can download the client app developed by the ioeX team from online stores such as GooglePlay and the AppStore. Once their devices are connected to the device app, users can set the storage location and size, and then back up files from the end terminal to the peer node via the client app or download files from the peer node to the client app. Users can also set the terminal peer node remotely.

Cloud backup files are segmented and temporarily stored in the device storage (e.g., the segmented software files used in the online updates). After the three-month period, the files appear in a cloud backup folder on the personal cloud interface of the device holder. In this instance, the device holder is authorized to delete the files in the folder to free up storage space and prevent the buildup of digital waste.

Files are encrypted, compressed, segmented, and renamed (with each segment allocated to a different content address). Device holders are able to view the files within the three-month period without access permission, thereby maintaining information confidentiality, while at the same time, the files are segmented and non-executable. Device holders do not have to worry about viruses attached to the files.

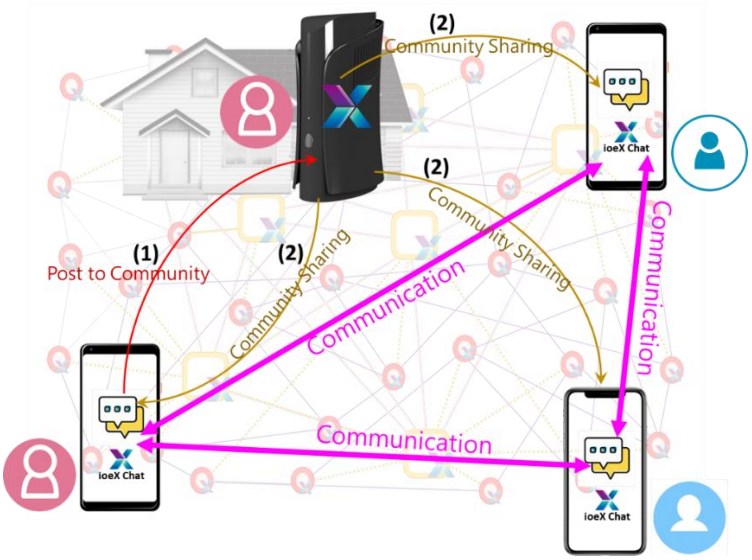


(D) Instant messaging applications



Current approach:

Vendors establish service systems, subsystems, and relay systems to offer instantaneous messaging and conferencing functions. The data, information, and files produced during user exchanges are stored and archived on the vendor's system. These data are used to analyze consumer behavior, or even for surveillance and speech analysis. Vendors are required to constantly strengthen network safety measures when data are stored on their servers to avoid cyber attacks and theft of personal data.



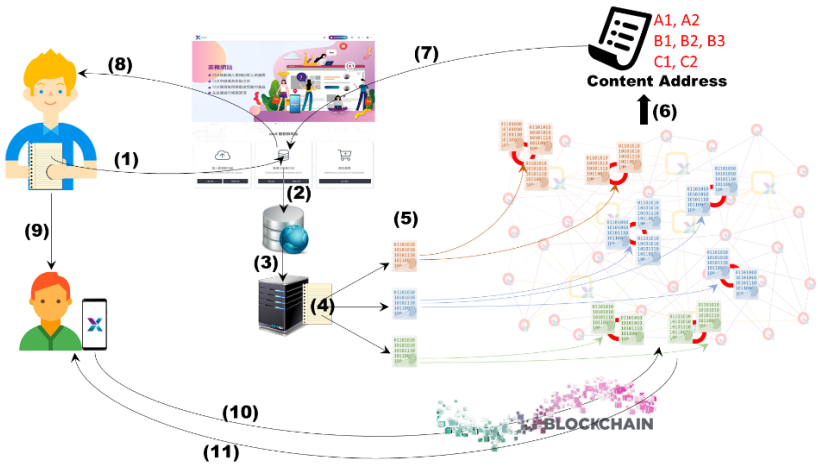
IoeX approach:

Users with the ioeX client app can friend one another. Friends are able to share text messages, pictures, and audio and video files, similar to an instant messaging app. After several update iterations, the ioeX app will provide streaming media for communication applications, allowing users to communicate more smoothly.

This socializing tool in the ioeX app is a decentralized, non-intermediary function, and communication data between friends remain locally between the apps. To maintain the battery life of mobile terminals, users are disconnected from the network when they exit the app or move the app to the background. Users are reconnected to the network when they access the app again. Therefore, the communication function is only activated when both parties launch the ioeX app and are connected to the network, thus preventing the loss of data or files.

The personal cloud device can also be used to establish a dynamic sharing function among friends similar to that of WeChat Moments, whereby files are only stored on a single peer node to maximize the confidentiality of personal data. Personal digital exhibition or sales areas can be derived from this function. It is also a precursor for creating and providing digital capsules.

(E) Content asset orientation authorization and tracking



This function is jointly executed by the network, blockchain smart contracts, and the e-commerce system. Users launch the cloud backup service via the e-commerce system and specify an authorized receiver for the file (network UID) and purpose. The content to be authorized is stored in the DPoS chain. Once the user has paid with IOEX, the e-commerce system sends the content files to the specific peer node for encryption and segmentation. The files are then backed up on the network. The specific peer node then sends content addresses to the e-commerce system. The addresses are delivered to the user via a close order list. Once the list is downloaded by the user (if the authorized party is not a network user) or the system has transferred the file to the authorized party (when both parties are network members), the authorized party can access the content addresses using the ioeX app to download, merge, and restore the files.

The downloader can be identified in the records stored by the DPoS chain. Functions that allow users to block unauthorized parties or identify and track the original authorized party through ID tags attached to the content files will be implemented in the future.

In addition to the above-mentioned business scenarios, the team also plans to establish cross-industry alliances and launch new tools to facilitate discussion in the technical community and identify new domains into which to expand the network.

III. Carrier Network Operates Blockchain Functions, Blockchain Drives Carrier Network Economy

The ioeX decentralized carrier network integrates the computational power, storage space, and network communication capacity across distributed smart devices including bootstrap and peer nodes, closely mimicking the computation and ledger storage properties required for blockchain operations. One of the medium-term objectives of ioeX is to maintain independent carrier network storage and transmission as well as blockchain storage, transmission, and broadcast operations and shared computational power to further integrate all carrier networks and blockchain, thereby establishing a new form of blockchain network

At the current stage, partial bootstrap nodes can serve as DPoS arbitrators and PoW miners, and PoW miners promoted during the initial stage can be simultaneously used to support bootstrap node functions.

A. IoeX PoW public blockchain

The ioeX PoW blockchain plays the role of a public blockchain that is capable of keeping a ledger for the various device owners of carrier network nodes. The blockchain generates IOEX digital currency. On average, the blockchain generates a block every 120 seconds, or approximately 720 blocks per day; each block has a maximum capacity of 8MB or 10,000 transaction records. For each block generated, 4 IOEX is rewarded to the authorized miner.

During the initial period, ioeX administrators will provide mining machines to generate blocks within a short time period. In other words, a group of bootstrap nodes will be assigned to execute the task. The IOEX reward quota generated during this period will be used as an incentive for the ioeX community. Subsequently, guidance will be provided to suppliers to introduce affordable mining machines so that everyone from members of the community to the general public can easily acquire mining capability of the ioeX public chain and thus maintain it.

During the initial period, in addition to promoting bootstrap nodes and PoW mining machine installations, the ioeX administrators will seek suitable candidates to scale up the computational power and security required for the blockchain as well as to integrate carrier networks with the blockchain. During this period, the public key will not be made completely open source until the blockchain can be operated at an appropriate level of security.

By connecting bootstrap nodes and PoW blockchain miners, these participants can obtain the fixed daily reward quota[7] for bootstrap nodes and have a chance to obtain rewards generated from the public chain, thereby maximizing returns in relation to workload.

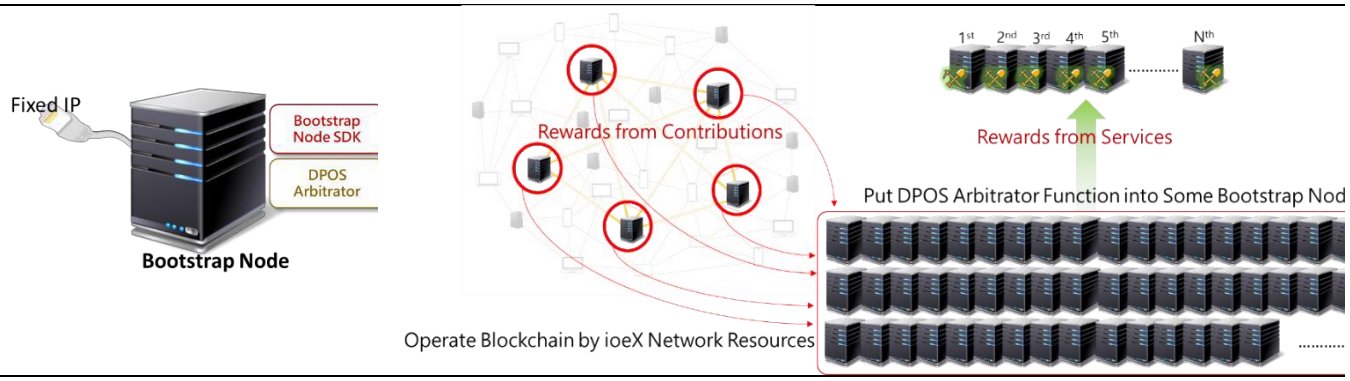
[7] Both the fixed daily workload reward quota for bootstrap nodes and file transfer contribution rewards will be issued in IOEX coins; these will be finalized and announced prior to online operations on the carrier network. Before finalization, multiple versions will be released to verify network transfer conditions in each region.

B. IoeX DPoS consortium chain

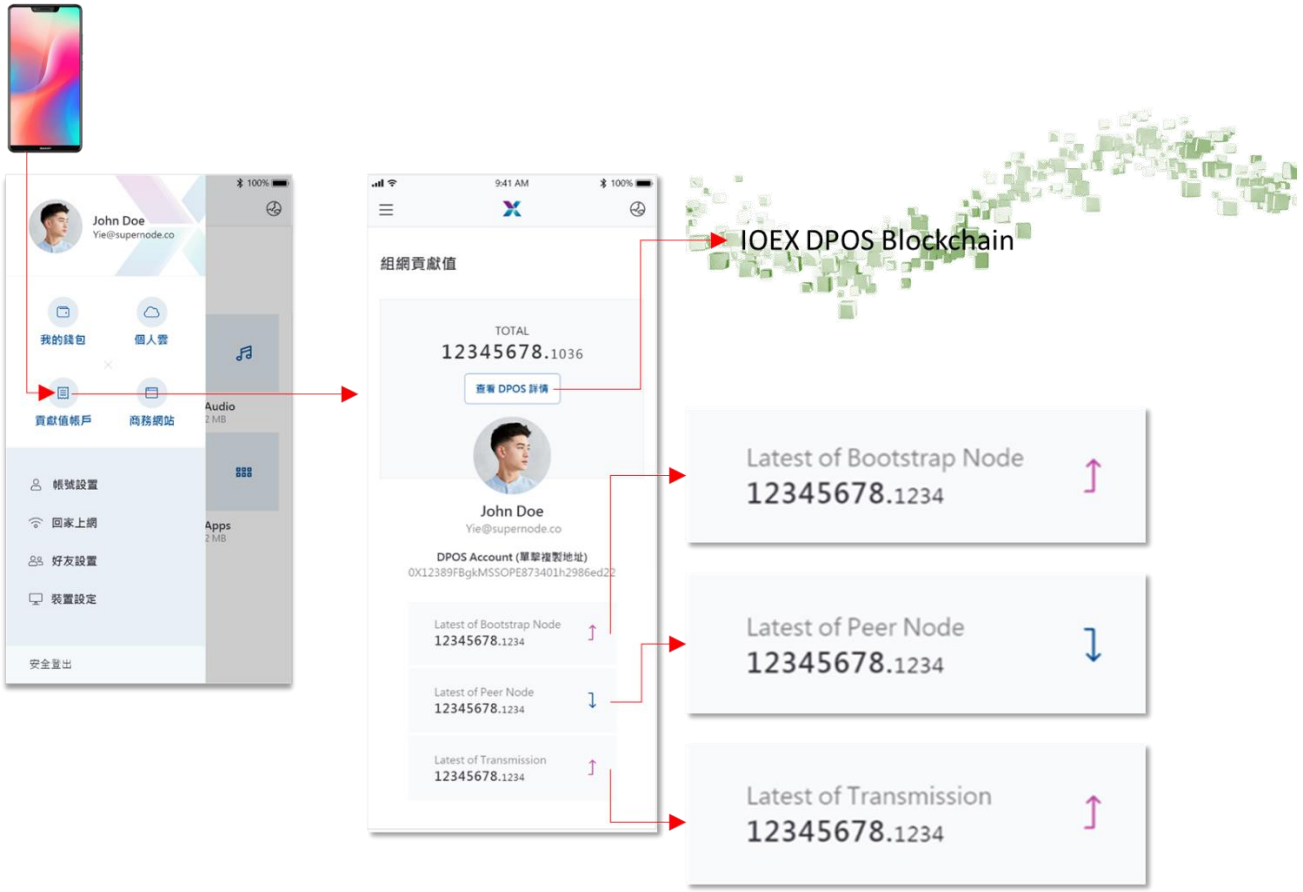
IoeX DPoS blockchain is a consortium chain that is compatible with Ethereum smart contracts. Via a smart contract, the consortium chain records nodes that contribute to the carrier network and use the carrier network service, and focuses primarily on verifying the scope of ioeX in terms of the business aspect of the business side. The DPoS blockchain will generate the token GAS.

However, GAS is not issued to the general public; it is mainly used for the accumulation of points based on node workload and determines the level of quality of the nodes and carrier networks.

Integrating the arbitrator function of the DPoS blockchain into the 51 ioeX carrier network bootstrap partners can generate blocks on a rotational basis for the DPoS blockchain and guide carrier peer nodes to join the carrier network. The 51 node partners can obtain a fixed daily workload reward quota from the bootstrap nodes and a reward quota for blocks generated through ledgers on a rotational basis in the DPoS blockchain. On average, the blockchain generates a block every 30 seconds and approximately 2880 blocks per day; each block has a maximum capacity of 8MB or 10,000 transaction records. The time required to generate each block can be reduced depending on the development status of the carrier network. The reward quota generated for each block will be reduced proportionally to the reduction in block time and the increase in the number of cumulative daily blocks generated. For each block an arbitrator generates in the DPoS blockchain, 5 IOEX is rewarded.



The DPoS blockchain records the workload and contribution of nodes in the carrier network. To facilitate searches for device contributions, workload, and IOEX reward quotas when the owner of a node simultaneously owns multiple devices, the reward quota accumulated in the ioeX app contribution accounts of each node can be checked, including the workloads of the bootstrap and peer nodes and contributions via transmission services. The owner of the nodes can check the smart contracts and cumulative GAS through the DPoS blockchain browser for relevant details.



The total quota of the reward put toward miners accounts for 3% of ioeX token distribution, or 6,000,000 units of IOEX. This quota is released for sustainable miner contributions every 360 days[8], and is entirely generated through the mining processes of PoW miners, as detailed in the following descriptions.

A PoW miner is rewarded 4 IOEX per time and 2880 IOEX per day; a DPoS arbitrator is rewarded 5 IOEX per time and 14,400 IOEX per day. An additional 6,220,800 IOEX reward quota is generated each year for miner and arbitrator workloads, which is greater than the 3% released. The excess 220,800 IOEX units will be equally compensated each year from the node rewards plan's 35% of distributed tokens. Opinions from the global community will be solicited every other year regarding the processing of this batch amount. PoW miners mine 24 IOEX for each block generated, of which 4 units are used for miner rewards and 20 units are transferred to the DPoS arbitrator reward account used for releasing arbitrator contribution rewards.

[8] 60 s/min, 60 min/h, 24 h/day, 30 days/month, and 12 month/year for a total of 360 days.

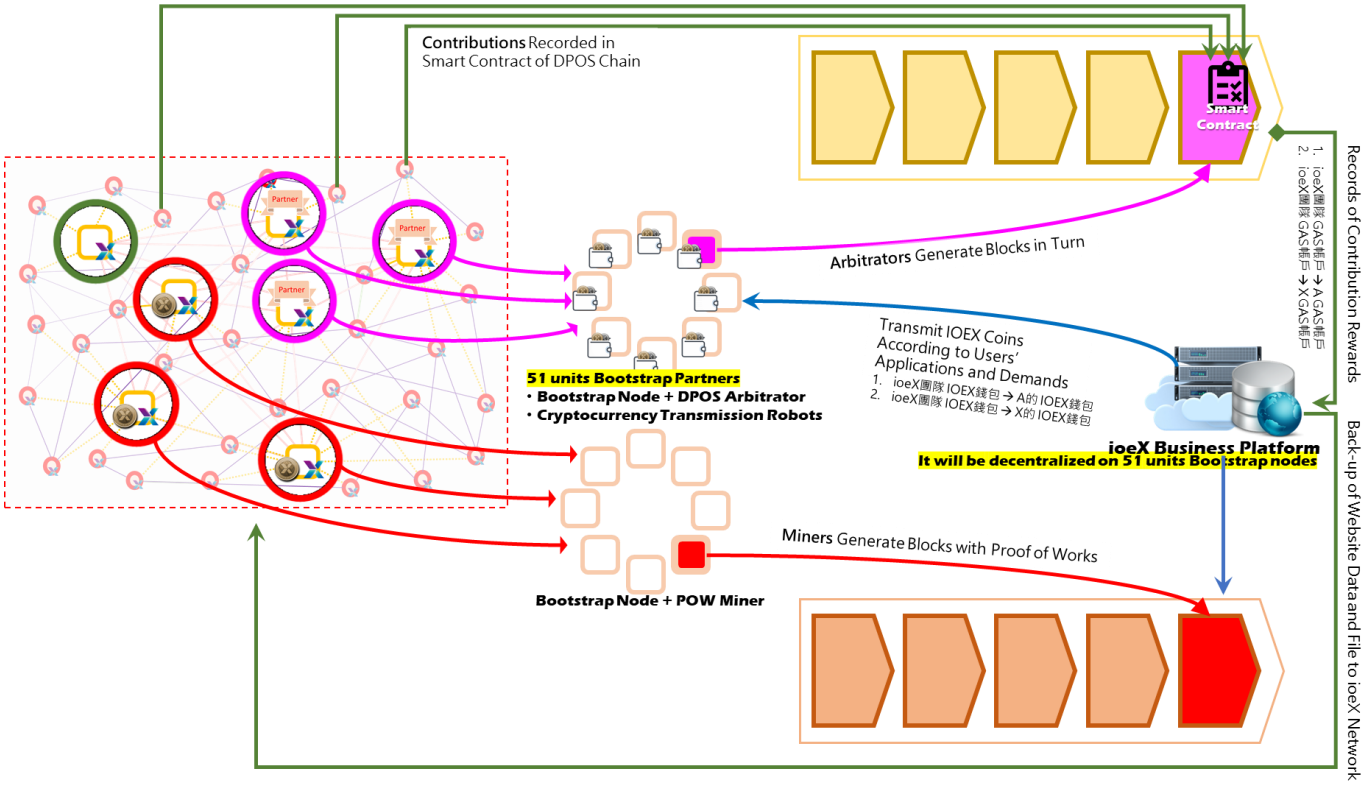
C. IoeX business operations: Dual chain model and decentralized carrier network

The operation of the DPoS consortium chain and PoW public blockchain is supported by the computing power of the ioeX carrier network. The DPoS blockchain records the workload and contributions of carrier network nodes. The PoW blockchain generates IOEX coins for rewarding carrier network nodes and enables users of carrier network services to activate functions by making IOEX payments. In addition to direct transfers to IOEX wallet accounts from the mining of PoW public blockchain miners, the remaining rewards, including node workload and contributions, and the DPoS arbitrators' amount of block generation will be recorded in the business system. All rewarded node owners and DPoS arbitrators can readily use the IOEX currency throughout the business system, including:

(1). To carry out exchanges for equipment capable of executing bootstrap or peer nodes or PoW mining machines. This equipment enjoys the production and sales and after sales services of ioeX SDK suppliers; ioeX provides demonstration and promotional platforms for IOEX circulation.

(2). To activate personal cloud services, including personal cloud storage, home internet access, and instant messaging functions.

(3). To use distributed cloud backup services, including online software updates and system file backups.



D. IoeX business system

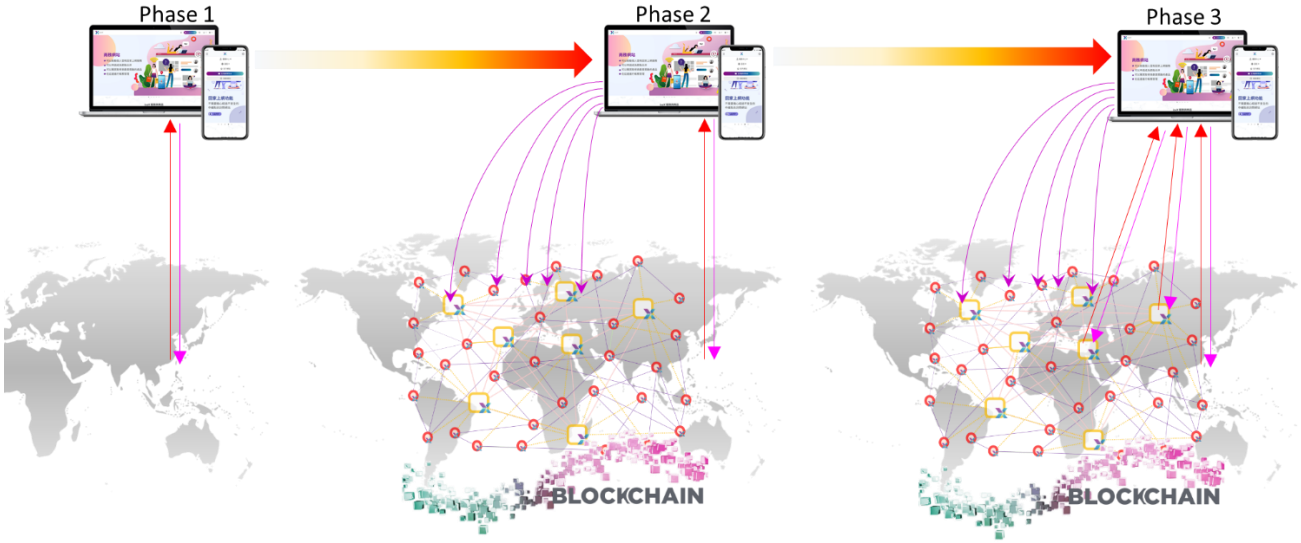
The business system operations of ioeX create a business model which generates a new, practical business strategy through a decentralized evolutionary process. This strategy can be used to provide a guide for other business site operators to construct a next generation decentralized or semi-decentralized (hybrid) business system through the ioeX carrier network and blockchain functions, thus enabling successful penetration of ioeX into basic cross-border e-business platforms in addition to IoT applications.

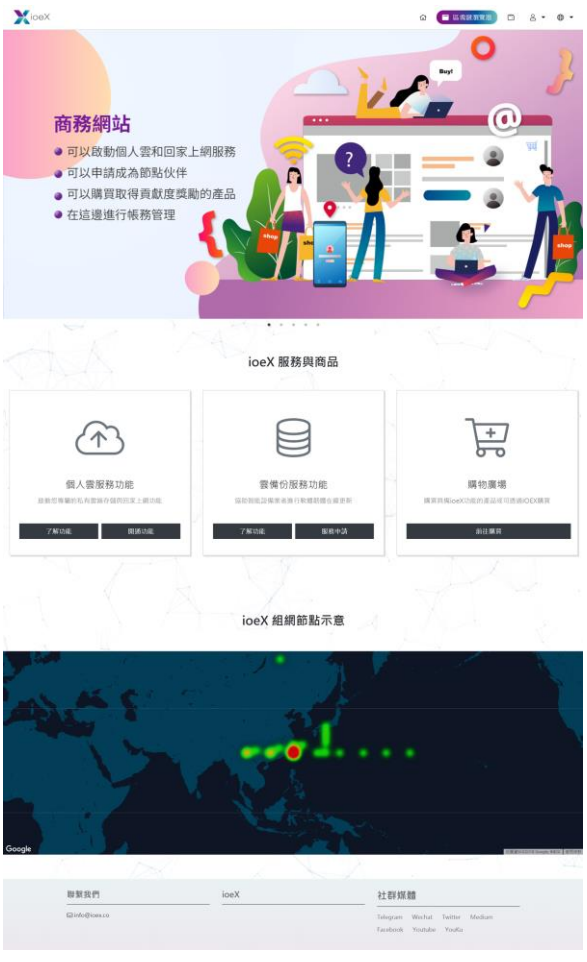
(1). In Phase 1, the business system will first adopt a centralized model to ensure smooth business operations.

(2). In Phase 2, following the official business operation of the ioeX carrier network, the system will remain

centralized but the business system data files will be stored in the carrier network through distributed backup. Peer nodes responsible for the backup of the business system will be rewarded in IOEX according to the carrier network reward system.

(3). In Phase 3, the business system will be decentralized to operate on the 51 bootstrap node partners. System files will be stored in peer nodes through distributed backup. Bootstrap node partners and peer nodes will be rewarded for assisting in decentralizing the business system. Through decentralizing the business system and accumulating blockchain operational experience, ioeX may form an example of a new type of practical business promotion.





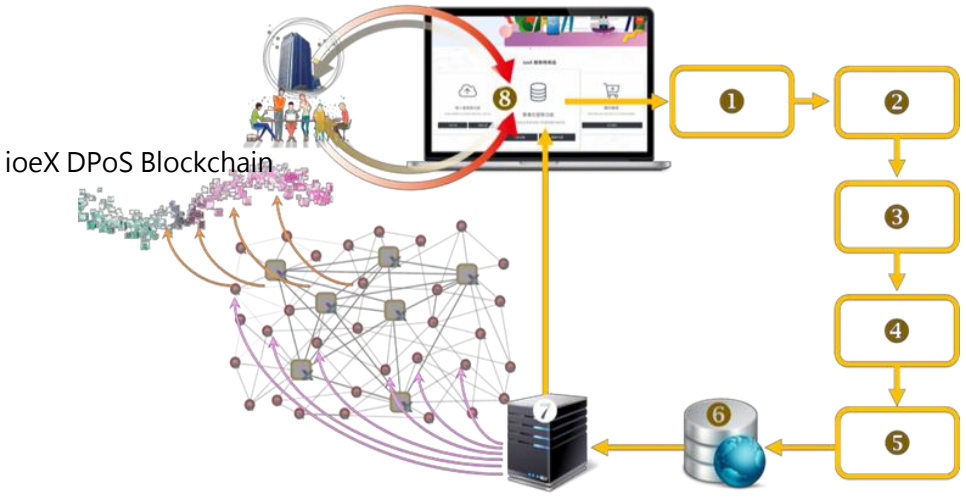
The business system will generally be presented in multiple languages, which initially will include traditional and simplified Chinese and English. In Phase 2, Korean and Vietnamese will be introduced. In Phase 3, Japanese and Russian or Malay will be considered. Functions include:

Web version of the IOEX wallet: Enables users to send and receive IOEX coins.

1. IoeX PoW public blockchain browser: Enables users to view transaction results and track transaction processes.
2. Reward distribution center: After a contribution is made to the workload on carrier networks and network traffic, the IOEX quota rewarded to the user will first be distributed to the business system. The user can activate personal cloud and cloud backup functions using the existing IOEX balance in the business system, purchase or exchange IOEX for carrier network products, or withdraw IOEX to their wallets.
3. Personal cloud service activation: Personal cloud functions will be consecutively launched in 2019, including personal cloud storage, home internet access, and social media communications. Users who already own IOEX in dedicated wallets can directly activate the personal cloud function. This function mainly provides a solution for users without IOEX coins so that all users can access relevant functions in the carrier network.
4. Cloud backup service applications: Users looking to access the cloud backup function can apply for the service, estimate the costs, pay in IOEX, and acquire service results here. Cloud backup services to be introduced in 2019 include software online update and system file backup.
5. Carrier network node device purchasing and exchange: Users can enter the shop and use normal purchase processes to buy products

	with ioeX functions from smart device suppliers or exchange IOEX for specific products. 6. Global node distribution display: A global node distribution heat map is displayed. The total number of cumulative global nodes and distribution of countries will be displayed after a sufficient number of nodes have been accumulated (the display will be expressed through a heat map of color gradients complemented with numbers for larger values). 7. iChat chat room and forum: The function enables the community to propose potential improvements or creations regarding the UI or its functions. Multiple images can be uploaded to start a thread to compile and provide information to and interact with ioeX administrators.

For example, the following steps can be adopted to apply and activate cloud backup software online update services:

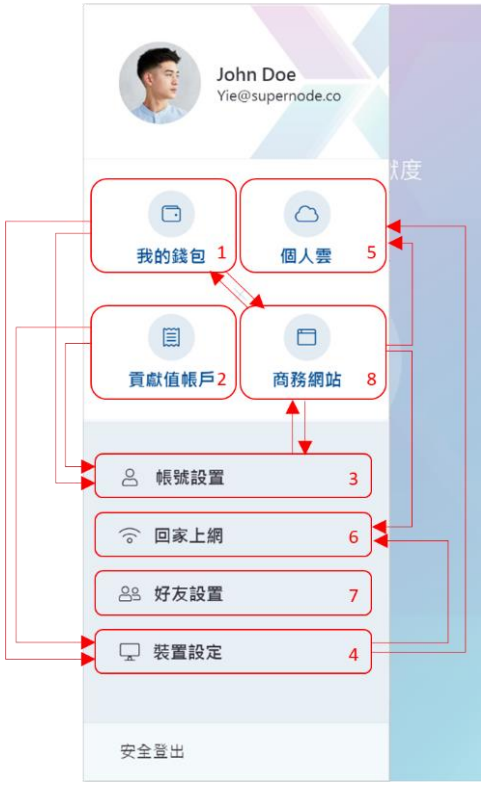


1. Business system user inputs the brand and model of the product on the UI to perform the online software update.
2. User inputs the quantity of products for which the online update will be performed.
3. User uploads the software package for the update; the system will scan and calculate the file size.
4. System estimates the available discount price through ioeX carrier network services and presents the amount in IOEX.
5. User pays using IOEX balance from the business system; can replenish from the IOEX wallet if the amount is short.
6. After completing the payment, the business system will generate an order and transfer the software file to a specific peer node.
7. The specific peer node performs distributed cloud backup through task scheduling. In case of urgent need, a price increase in or bidding of IOEX may be adopted to prioritize the order.
8. The specific peer node will automatically perform task scheduling, tabulate content addressing parameters after task completion, and submit the data to the comments field of the order settlement. The user can download this data to perform online software updates.

✓ Dedicated IOEX wallet, which is also used for distributing workload and contribution rewards for carrier network nodes.

E. IoeX app

The ioeX administrator will provide an initial version of the terminal app (ioeX App) to enable users to use ioeX blockchain functions such as blockchain browsers and IOEX wallet appropriately, instantly retrieve personal cloud files, perform remote backup and peer file transfers and messaging, and provide home internet access. Network service providers can use the ioeX tools to develop, release, and promote applications on their own, and integrate their products to the ioeX app, operating jointly with ioeX administrators to provide services to the general public. In addition to the ioeX App and ioeX Device (app used in smart devices), users can also select and embed functions created by developers via ioeX SDK to serve the general public.



1. IOEX wallet: Web version integrated into the mobile app; will be developed into a native wallet application, which can directly connect to the public blockchain to view, use, and receive IOEX.
2. DPoS contributor account: Connects to the DPoS blockchain to view blockchain browser, cumulative GAS points, and IOEX balance obtained from workload and contribution.
3. Member account setup: Synchronized with the business system member center.
4. User smart device setup: Used to associate and bind ioeX functions on multiple smart devices. Can label and distinguish equipment uses and locations and remotely and individually configure each peer node.
5. Personal cloud application function: Can select the equipment to display on the personal cloud application interface and perform remote backup, calling, and browsing of selected peer nodes.
6. Home internet access function: Can link and respond to web requests from selected devices.
7. Friend settings and chat: Binds with friend's ioeX app (add friend). Can send messages and files. Because of the direct point-to-point connections without intermediary, information will only be stored in app terminals.
8. Mobile version of the business system: The business system is provided in the form of a mobile app with responsive web design (RWD).

F. Token Circulation System

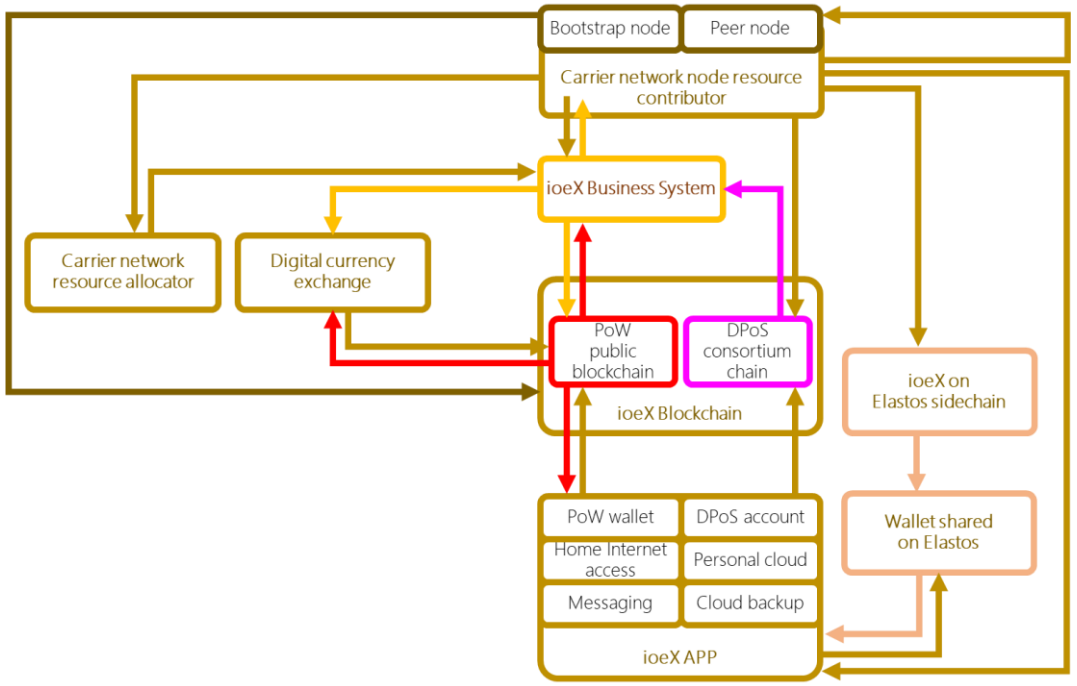
IoeX business operation and token circulation are closely related.

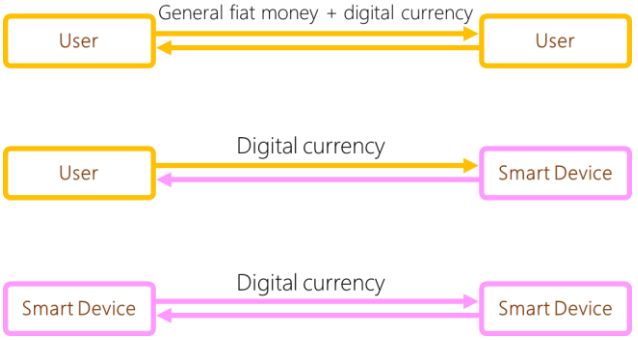
Mainly consist of 4 operational roles:

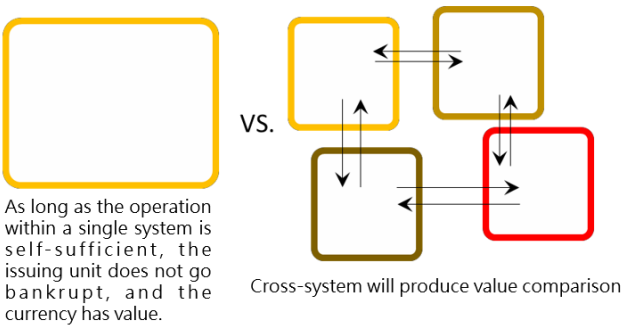
1. ioeX blockchain
2. ioeX carrier network (including bootstrap nodes, peer nodes formed by ioeX Device App and ioeX SDK, mobile phone nodes)
3. ioeX Business System
4. ioeX App (terminal app constructed through mobile nodes and IOEX wallet functions)

At the current stage, the system must first promote user demand for the carrier network, trust towards the blockchain, and willingness to adopt IOEX to drive the carrier network functions, thereby gradually creating demand and ultimately reliance. However, to support automatic machine to machine (M2M) connections, and independent exchange and trading, IOEX can serve as a dedicated M2M intermediary. This results in the formation of a new type of common digital currency economic system that can be adopted for information and file exchanges between smart devices or even robots. This system can coexist and thrive alongside physical monetary systems and serves as an objective in the decentralization of the ioeX carrier network. As long as there is demand for applications and exchange, there is value in the intermediate currency. This new internet pattern is in its essence a digital republic of smart devices.

Although the system comprises self-built public blockchain and consortium chain, ioeX will be constructing the ioeX blockchain on the Elastos side chain and closely cooperating with Elastos to jointly support the construction and operation of the second generation internet and building of an information security network.



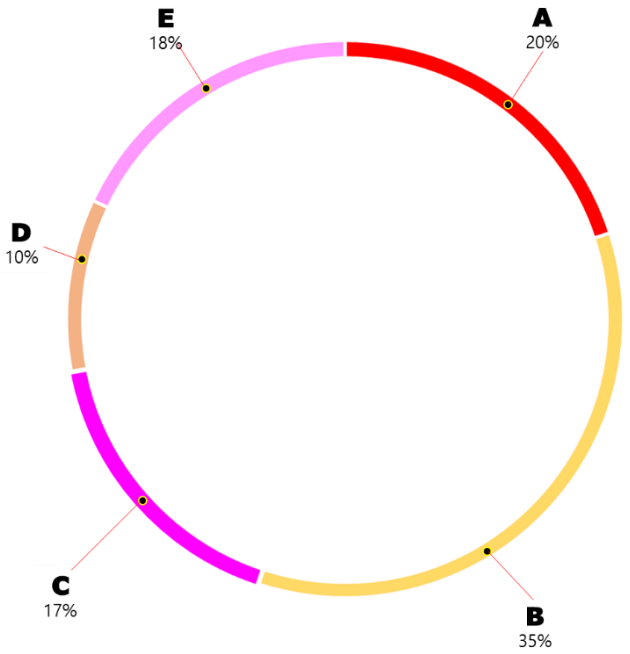




As long as the operation within a single system is self-sufficient, the issuing unit does not go bankrupt, and the currency has value.

Cross-system will produce value comparison

G. Token application plan



Application		Proportion	Description
A. Sales promotions and fundraising		20%	Fundraising from external sales
B. Node rewards plan		35%	Rewards workloads and contributions of bootstrap and peer nodes and encourages device owners to join the carrier network in order to engage the public in carrier network participation to obtain and possess IOEX. Expedites external IOEX circulation and stimulates IOEX applications.
C. Foundation		17%	Used to build and operate communities from various locations Used to increase the number of enterprises participating in the carrier network
D. Team ownership		10%	Incentives for the executive team Locked for 2 years; unlocked in 4 terms, with 25% unlocked in each term.
E. Others	Strategic partnerships	5%	Unsold amounts of ioeX investments from strategic partners will be moved to sales promotion and fundraising quota. Locked on exchange listing for 1 year; unlocked in 4 terms, with 25% unlocked in each term.
	Angel fund	5%	Unused amounts of ioeX invested by angel investors will be moved to sales promotion and fundraising quota. Locked for 1 year; unlocked in 4 terms, with 25% unlocked in each term.
	Miners' fees	3%	Supports PoW miners' fees and DPoS arbitrators' fees in the first year (2019). Starting from the year after, an additional 3% will be released each year, completely allocated to PoW miners and DPoS arbitrators' fee payments. The PoW mining system will be opened to the public at an appropriate time. The DPoS chain belongs to a league chain used for business operations and will be arranged or selected by the ioeX team.
	Consultants' fees	3%	Paid to ioeX consultants. Locked for 9 months; unlocked in 3 terms, 35%, 35%, and 30% each.
	Promotion rewards	2%	Rewards for investors and promotional sales team

IV. IoeX Roadmap

A. Milestones

Item	Time	Milestones
1	2018-Aug	Release carrier network SDK basic version of app/service (one-to-one and one-to-many messaging and file transmission[9])
2	2018-Sep	Introduce carrier network functions to AI smart speaker local and remote control programs[10]
3	2018-Oct	Introduce carrier network functions to IoT box local and remote control programs[11]
4	2018-Dec	1. Carrier network incorporates blockchain functions and rewards carrier network nodes. Test version release delayed to 2019-Jan. DPoS chain to be self-developed by the ioeX team to replace the originally referenced Elastos side chain program. 2. Alpha version of the digital wallet and blockchain browser (testnet version[12]) 3. Online operation of the business system for releasing IOEX coins and executing lock-up program 4. Early activation of carrier network content addressing development project (replacement for original 2019-Jan IPFS development plan)
5	2019-Jan	1. Beta version of digital wallet and blockchain browser (official blockchain version will be released for the business system[13] and ioeX App) 2. Alpha version of carrier network online upgrade function 3. Lay out of bootstrap and peer nodes at various locations 4. Beta versions of ioeX Device App and SDK. Initial construction of new peer nodes using existing smart products from the consumer end. 5. Business system, node product purchasing function, IOEX point transfer function 6. DPoS testnet (non-smart contract version) 7. Activation of technical community building activities
6	2019-Feb	1. Operation of beta version of carrier network online upgrade function 2. ioeX App (IOEX Wallet) distribution 3. Personal cloud storage and transmission (non-streaming media playback version) released along with ioeX App 4. Messaging and file transmission (non-streaming media playback version) released along with the ioeX App 5. DPoS testnet (smart contract version) 6. Activation of online personal cloud function in business system
7	2019-Mar	1. Release of PoW blockchain mining machine 2. Operation of official version of the carrier network 3. Official operation of DPoS blockchain 4. Execution of workload reward activities for carrier network nodes 5. Cloud backup service applications available for business systems 6. Coordination with cooperating operators to ship products equipped with ioeX functions
8	2019-Apr	1. Release of personal cloud storage and transmission (streaming media playback version) 2. Verified version of home internet access functions 3. Online test operation of personal digital asset authorization system 4. Coordination with cooperating operators to ship products equipped with ioeX functions
9	2019-May	1. Release of messaging and file transmission function (streaming media playback version) 2. Official version of home internet access functions
10	Each month of 2019	Continuing development of new functions; recruitment of technology enthusiasts, partners, product manufacturers. Expanded application scenarios for the carrier network and blockchain.

[9] https://youtu.be/tltpAUru_9Q?t=53

[10] https://youtu.be/_hDoMGVGAxE

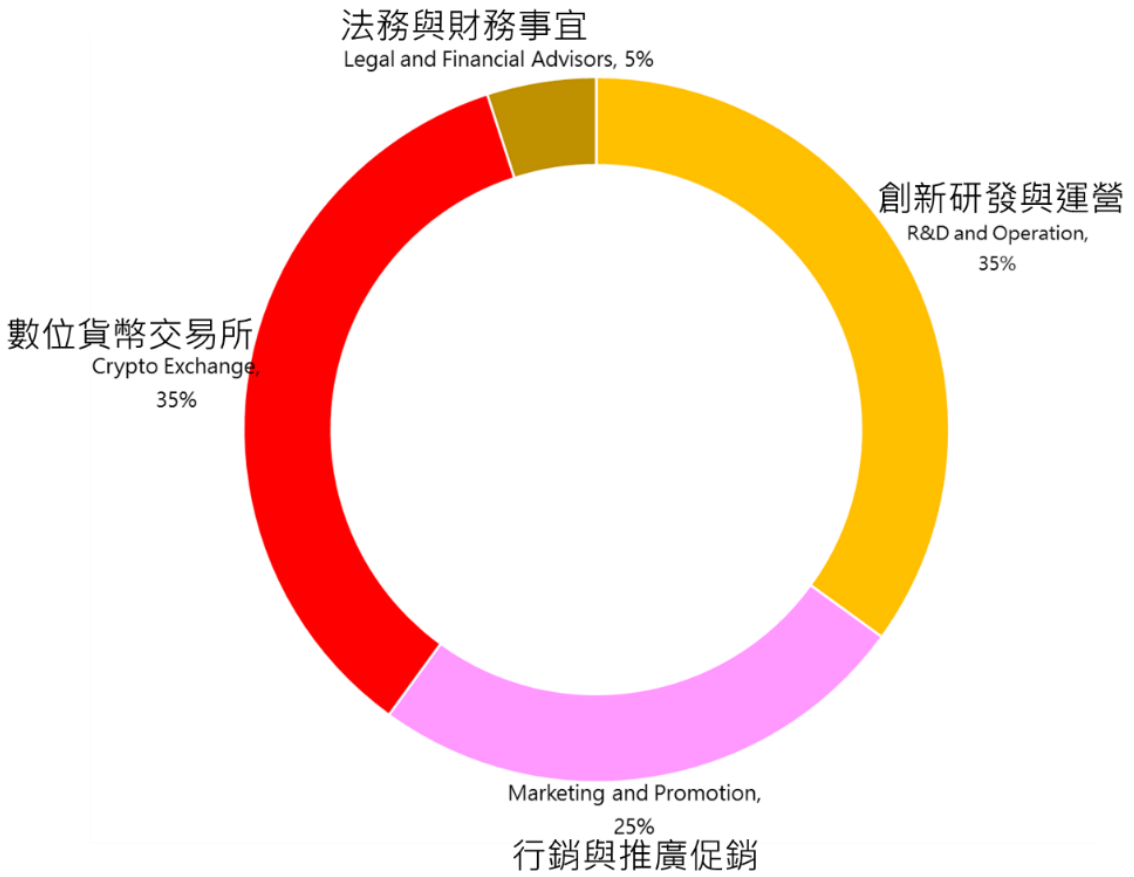
[11] https://goo.gl/3mgjkL

[12] http://dev-ioex-mall.pin2wall.com/wallet/wallet_index

[13] https://www.ioex.vip

B. Utilization of Raised Funds

A limited amount of the raised funds is primarily put towards developing the aforementioned functions, carrying out external promotions to increase usage and carrier network scales, constructing the ioeX platform brand image and community base, registering at the digital currency exchange, and all legal and financial matters involved.



V. The ioeX Team

A. Executive Team

Aryan Hung, CEO & Founder

- ✓ Project management, business development
- ✓ Project manager, department manager, and site manager at Foxconn Technology Group's branded mobile phone ODM department
  - Site manager, Spreadcomm Technology Corp. (Chengdu)
  - Director, Kortide Technology Co. (Shanghai)

Adguel Wang, COO & Co-Founder

- ✓ Years of RF engineering experience
- ✓ Over five years of business customer service experience
- ✓ Hardware development manager at Pegatron Corporation and Foxconn Technology Group's mobile phone ODM departments
- ✓ Business department manager, FIH Android GMS

Michael Wu, Chief Sales Officer

- ✓ General manager, MaideaX
- ✓ Project leader for 12 Taiwan FinTech projects
- ✓ Former deputy general manager, Mitake Inc. applications business unit

Neo Peng, CMO & Co-Founder

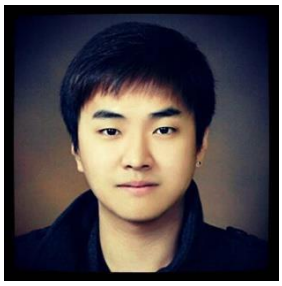
- ✓ Ten years of experience in brand marketing
- ✓ Four years of experience as product development manager for global brands
- ✓ Consultant on strategic development in the greater China region, opinion leader in cryptocurrency community
- ✓ Early Bitcoin investor, early ICO investor

Kenneth Kuo, CSO & Co-Founder

- ✓ Investor in over 30 blockchain projects, top fundraiser in international fundraising organizations
- ✓ Four years of international work experience, including as token economy strategist and community builder
- ✓ Consultant on token development strategy, strategic development of European/North American/Taiwan markets

Monika Lin, Chief Public Relations Officer

- ✓ Two years of international work experience, four years of marketing and planning experience for leading global brands
- ✓ Four years as account manager responsible for online/offline advertising, event planning for Leo Burnett
- ✓ Experience in community building, public/media relations



Jonas Kim, Korea Business Development Director

- ✓ Participant in numerous blockchain projects, expert in technical analysis
- ✓ Project evaluations recommendations using philosophical and economic perspectives
- ✓ Chief editor of Steigern Blockchain Labs
- ✓ Two years of international hardware engineering experience

Karl Kim, Korea Marketing Director

- ✓ Leader of core marketing operations for numerous Korean projects
- ✓ Three years of international work experience in China and South Korea
- ✓ Community builder and manager
- ✓ Liaison for collaborations between South Korean government and companies

Jones Chung, Korea Technology Promotion Representative

- ✓ Algorithm optimization specialist for Solidware
- ✓ Assistant researcher at Postech's Programming Language Laboratory
- ✓ Ethereum-based derivative mode head researcher for DeDe NETWORK
- ✓ Co-founder, CEO, and CTO of DeDev

(These bios will be continuously expanded and updated.)

B. Technical Team

Anthony Lin, Chief Technology Officer

- ✓ Experience in Android and Linux IoT system functions and device development
- ✓ Over 10 years of employment at Quanta Computer and Foxconn Technology Group
- ✓ Experience in application functions, firmware, and low-level development

Elvis Lin, R&D Manager

- ✓ Full-stack developer who is passionate about e-commerce and transactions
- ✓ Over 10 years of experience in business system front-end, back-end, and database development
- ✓ Worked at Kortide Technology Co. (Taiwan)'s internet functions department

Bruce Huang, Senior R&D

- ✓ Over 15 years of experience in graphic design, 2D animation, web design, and front-end development
- ✓ Worked at Kortide Technology Co. (Taiwan)'s internet functions department

Wade Ku, Senior R&D

- ✓ Experience in firmware and system software development, PHP back-end development
- ✓ Over 15 years of Linux and C++ development experience
- ✓ Worked at DBTel, Quanta Computer, and Foxconn Technology Group's mobile phone development departments

Art Hsu, Senior R&D

- ✓ Ample experience in Linux, Windows, and Android network architecture and protocols
- ✓ Over 10 years working as digital television systems, digital photo frames, and mobile phone applications developer at Acer and Foxconn Technology Group

Jay Chuang, Senior R&D

- ✓ Expert in iOS and Android apps and PHP back-end development
- ✓ Over 7 years of experience as developer of smartphone applications and functions at Foxconn Technology Group
- ✓ Worked at Kortide Technology Co. (Taiwan)'s software department

Hung-jiun Shieh, Senior R&D

- ✓ Firmware and system software developer
- ✓ Over 10 years of experience in network communications, mobile devices, video streaming, and front-end and back-end e-commerce systems at Tainet Communication System Corp. and Foxconn Technology Group

Earnest Chen, Senior R&D

- ✓ Software and hardware developer
- ✓ Over 10 years of experience in mobile device and digital development board software and hardware
- ✓ Full-stack e-business systems engineer
- ✓ Worked at Tainet Communication System Corp. and Foxconn Technology Group

Ricky Huang, Senior R&D

- ✓ Back-end engineer who is passionate about cloud systems and blockchain capabilities
- ✓ Over 6 years of experience in Linux system and open source software development
- ✓ Worked at Kortide Technology Co. (Taiwan)'s internet functions department

(These bios will be continuously expanded and updated.)

C. Advisors

Rong Chen: Founder, Elastos

- ✓ Holds master's degree from University of Illinois Urbana-Champaign
- ✓ Currently serving as director-general of the Elastos Foundation
- ✓ Leading Chinese internet expert and operating systems scientist

Dinghe Hu: Chairperson, Yuntu Capital

- ✓ Manager, Newton Eco Development Fund
- ✓ Former president of Chongqing Lifan Group

Feng Han: Founder, Blockchain Pillar and Foundation MIT

- ✓ Visiting scholar at Columbia University
- ✓ Professor, Tsinghua University's iCenter
- ✓ Director-general, Elastos Foundation

Raymond Lee: Chairperson, Everex Group

- ✓ Holds bachelor of law from University of Toronto
- ✓ Holds Advanced Diploma in Legal Studies from the University of Hong Kong's School of Professional and Continuing Education
- ✓ Has held professional license from Institute of Paralegal, United Kingdom practicing certificate since 2012
- ✓ Over 20 years of experience in consumer electronics supply chains and European and American sales channels

Daniel Liebau: Founder, Lightbulb Capital

- ✓ Visiting professor at IE Business School (Spain)
- ✓ Over 17 years of experience in investment banking technology
- ✓ Former COO and executive director of HSBC Securities

Matthew Cannon: Co-Founder, Lightbulb Capital

- ✓ Founder and CEO, Wordgallery
- ✓ Over 25 years of experience in global capital markets
- ✓ Head of global markets, HSBC

Simon Szeto: Director, SBI E2-Capital Group (HK)

- ✓ Currently serving as director of SBI E2-Capital
- ✓ Worked at Merrill Lynch, Wells Fargo's investment bank, and Countrywide Financial; has deep understanding of Silicon Valley industries

Miranda Tan: CEO, Robin8

- ✓ Juris Doctor, St. John's University
- ✓ Bachelor of science, Cornell University
- ✓ Chairperson, Excite Media Group
- ✓ Founder, Excite PR
- ✓ Fifteen years of experience in public relations and marketing; expert in big data, artificial intelligence, blockchain, marketing with Chinese internet celebrities/key opinion leaders

(These bios will be continuously expanded and updated.)

D. Partners

(This list of partners will be continuously expanded and updated.)

E. Vendors

(This list of vendors will be continuously expanded and updated.)

F. External Partners

(This list of external partners will be continuously expanded and updated.)

G. Media Coverage

(This list will be continuously expanded and updated.)

H. Disclaimer

This white paper does not offer any legal, financial, commercial, and/or tax advice. When engaging in any of said or related activities, please consult with your legal, financial, commercial, tax, and/or related professional advisers.

Neither the ioeX team nor members who participated in the development of ioeX can be held responsible for any direct or indirect loss you may suffer from participating in the project.

This white paper is for information purposes only and does not serve as a prospectus, offer file, securities offer, and/or offer for solicited investment and/or the sale of products, materials, or assets (digital or otherwise) in which the offer is presented. The following information may not be exhaustive or completely accurate; nor does it imply any element of contractual relationship.

None of the content contained in this white paper can be used to represent or guarantee ioeX's future performance.

No part of this white paper may be reproduced, retransmitted, redistributed, and/or propagated in any way without the written consent of the ioeX team.

Other disclaimers are listed as follows:

1. Issuance of non-negotiable securities

The use and purchase of tokens sold by ioeX involves high financial risks. IoeX hereby declares that transactions made on the ioeX platform do not constitute the issuance of negotiable securities in any jurisdiction. Documents published on the ioeX platform do not constitute the raising of investment funds.

2. Security of transaction platforms

You acknowledge that any services provided by ioeX and information stored and transmitted on ioeX platforms may be lost, damaged, or become temporarily unavailable due to computer software failure, protocol changes by third-party service providers, network failure, or other force majeure. "Other force majeure" includes but is not limited to third-party distributed denial of service (DDoS) attacks, regular or ad hoc maintenance, and other reasons within or beyond ioeX's control. You agree to bear complete responsibility for all losses sustained should any of the aforementioned occur.

3. ioeX token-related responsibilities

The use and purchase of tokens sold by ioeX involves high financial risks. IoeX does not offer investment, financial, and/or legal advice. The documents provided to you are not substitutes for professional advice or factual evidence. You are responsible for your own research and analysis, the independent verification of any document that you wish to rely on, the consideration of your own circumstances and objectives, and obtaining independent financial advice from professionals prior to making any investment decision or taking any action (including but not limited to the purchase of ioeX tokens). You also acknowledge and accept that ioeX is not responsible for doing your due diligence or being your trustee.

4. Responsibilities

IoeX and any individual or entity associated with ioeX (including but not limited to its agents, users, employees, insurers, attorneys, successors, and assignees) do not bear any responsibilities (e.g.,

contractual and infringement responsibilities, including negligence) for any costs and/or losses you have sustained resulting from the use of ioeX tokens.

5. Users of ioeX platforms and tokens

IoeX platforms and tokens are not open to everyone. To use the platforms and tokens, users must follow a series of procedures including providing the required information and documentation.

6. Issuance of controlled products in jurisdictions

No plans are in place for ioeX tokens (as defined by this white paper) to constitute securities or other controlled products in any country or jurisdiction. This white paper is not a prospectus or a document used for the issuance or fundraising of securities or controlled products in any country or jurisdiction. This white paper has not been reviewed by any regulatory authority in any country or jurisdiction.

7. Advice

This white paper does not provide advice on whether you should join ioeX platforms and/or purchase ioeX tokens, and is not a document that you should reference to make your contractual or purchase decisions.

8. Declarations and guarantees

This white paper makes no declarations or promises assuring that the information, statements, opinions, and all other matters (including prospective or conceptual statements and results) described or conveyed pertaining to the project are correct or complete. In addition, this white paper makes no declarations or promises assuring matters not mentioned above. No part of this white paper shall constitute or be deemed a declaration or promise regarding future affairs. To the extent enforced by applicable law, any person who has sustained any damage or loss (foreseeable or not) because of actions taken on the basis of this white paper will be held solely responsible for said damage or loss, regardless of whether such actions have been taken due to negligence, acquiescence, and/or inattentiveness. If the law stipulates that the person bears limited responsibility, he/she shall be responsible for the maximum responsibility stated by said law.

9. Language

The Chinese version of this white paper is the only officially approved version. All translated versions are for information purposes only and have not been officially approved. In the event of discrepancies between the translated and original versions of this white paper, the Chinese version will prevail.

You should accept all necessary professional advice (including tax and accounting advice). We hope that the ioeX project will be a success. However, we cannot guarantee success and there are risks associated with electronic assets and platforms. You should assess these risks and your ability to withstand them prior to investing.

10. Technology–refinement

Tokens have been described as being highly technical. To understand the risks associated with them, one must have a complete understanding of applied cryptography and computer science. You hereby declare and guarantee that you have sufficient token knowledge, are familiar with token markets, have experience in tokens and/or received relevant professional advice, and have carefully

assessed the risks and rewards of ioeX tokens prior to purchasing them, and you agree that you will be held solely responsible for the aforementioned responsibilities.

11. Technology-disclaimer

Neither ieoX nor its affiliates own or control any fundamental software used to build blockchain networks. Thus, ioeX and its affiliates do not guarantee the functionality, security, or availability of such software and networks.

12. Technology-forks

Fundamental blockchain technology used to operate tokens may change at any time; an example is changes in operating rules (commonly referred to as "forks"). In addition, situations including lack of internet availability due to reasons such as blockchain network program errors and hard forks may have serious adverse effects on the value and functionality of your ioeX tokens. You agree that you will take full responsibility for monitoring these changes and situations and bear all relevant risks caused by such changes and situations.

13. Technology-malicious nodes

Some nodes in ioeX networks may be malicious and attempt to obtain desired data/results without making contributions. Without severe penalties in place, hackers may try to destroy ioeX systems. We are thus required to install powerful protection measures to protect our networks from malicious attacks, ensure the security of transactions, and enable continued system operations. Possible attacks that may threaten our blockchain network operations are listed below:

- Sybil attacks

Malicious nodes may generate many Sybil identities in an effort to obtain desired data/results or deceive target networks. In general, firewalls are built to protect systems from Sybil attacks. However, there is no guarantee that such firewalls will be able to do so for an extended period of time.

- Out-of-work attacks

Hackers can control many nodes and use these nodes to interfere with shared computing networks. Maliciously attacked nodes are called "zombies." The attacks may strike in a way that causes the zombie nodes to stop working completely. In ioeX networks, zombie nodes may receive commands for AI but not complete the tasks assigned or produce valid results. If the AI's commands are issued through multiple zombie nodes, the results generated will be inauthentic or directly cause errors.

- Outsourcing attacks

Malicious nodes may outsource commands received to other nodes to obtain desired data/results without having to expend a considerable amount of computing power. In ioeX networks, nodes should demonstrate the ability to work. Verifying the ability of nodes to work by using proof-of-intelligence may diminish the number of outsourced attacks because malicious nodes will not be issued commands if they do not complete the identical tasks assigned. Nevertheless, the aforementioned solution is not fail-safe in the long-term.

- Cyberattacks

Should ioeX tokens or ioeX experience cyberattacks, ioeX tokens may be adversely affected. ioeX and its affiliates do not guarantee to anticipate, prevent, or diminish said attacks or take appropriate action against such attacks.

14. Supervisory measures

Encrypted tokens may be subject to the supervision of one or more jurisdictions today or in the future. IoeX may receive inquiries, notifications, warnings, requests, or administrative sanctions from one or more authorities at any time, and may even be ordered by the competent authority to suspend or terminate ioeX token-related activities. Because jurisdictions may enact or amend laws regulating crypto-tokens, and the competent authority may change or adopt more stringent standards or regulatory measures at any time, the future development of ioeX tokens is highly uncertain and subject to serious obstacles. In fact, ioeX tokens may even be terminated.

15. Liquidity and price volatility

IoeX Tokens may have no market demand in the future. IoeX is not responsible for the trading and circulation of ioeX tokens on the market. Tokens usually experience high price volatility in trade markets, where frequent rises/drops often occur in a short period of time (the "price" referred to here is legal currency such as Bitcoin, Ethereum, and US dollars). These fluctuations may be caused by market activity (including speculative investment), changes in the law, technological innovations, trading activity, or other objective factors and reflect changes in supply and demand.

IoeX does not expressly or implicitly state the uses or value of ioeX tokens, and you understand and accept that any benefits to be obtained from ioeX tokens are not guaranteed.

16. User compliance with laws

You understand and agree that ioeX is not responsible for the choice of applicable transaction laws, and that applicable laws may include but are not limited to anti-money laundering laws, the Securities and Exchange Act, and tax laws. You understand and agree that you will be responsible for all applicable transaction laws. Without violating the above, you understand and agree to bear sole responsibility for all tax liability incurred during the purchases of ioeX tokens, and that ioeX does not directly or indirectly bear any of said tax liability.

Regulatory orders or administrative sanctions may require that ioeX disclose your account information as required by government agencies. When this occurs, you agree to have ioeX provide the relevant information to the competent authority. IoeX will endeavor to notify you in advance when said activity occurs but does not guarantee to do so.

I. Contact us


Email：info@ioex.co


官方网站：https://www.ioex.co


Telegram(Chinese)：https://t.me/ioeXnetwork


Telegram(English)：https://t.me/ioeXnetwork


Twitter(English)：https://twitter.com/IoeXnetwork


Facebook(Chinese/English)：https://www.facebook.com/ioeXnetwork/


Medium(Chinese)：https://medium.com/ioexnetwork-cn


WeChat(Chinese)：Search for IOEXnetwork on WeChat