IPS

– High Performance Public Chain Based on P2P Storage

—— Leading the Future of Decentralized Internet

Abstract

With the rapid development of blockchain technology and the continuous improvement of smart contract, the blockchain applications will be heavily landed; P2P distributed storage is the key to the landing. The implementation of smart contract and distributed storage technology will promote the coming of the blockchain 3.0 era. Compared with centralized storage, P2P distributed storage improves the capacity and efficiency of information storage. The distributed technology solves the problem of waste of storage space and network resources by automatically allocating data which achieves flexible expansion, reduces operating costs, and avoids resource waste. Therefore, P2P distributed storage will be the trend to replace the traditional centralized storage.

IPS: A high-performance public chain based on P2P distributed storage.

P2P distributed storage not only provides a secure, reliable, and low-cost storage platform, but anyone can freely use the distributed storage provided by IPS while defining smart contracts. Based on multichain and multi-consensus, and combined with verifiable storage certification and token economy, IPS aims to achieve the efficient governance of nodes on the blockchain. The goal of IPS is to build a new type of distributed encryption storage network, provide users with efficient storage services, and build a distributed application (DApp) with rich feature.

——IPS makes data storage more secure.

The fault-tolerant mechanism ensures that the users ' data are copied a certain quantity and stored on different nodes. Even if the data of one node disappear due to abnormal conditions, the backup of other nodes can completely restore the users ' data, which greatly guarantees the data security stored on IPS. Distributed data storage reduces the loss and damage of the data caused by war, natural disasters, human factors, etc., which is beneficial to valuable data to be permanently stored. Data files are split into multiple parts and distributed to different storage nodes so that the data are more secure and difficult to snoop or copy. Moreover, since it is decentralized and without a centralized server, the IPS network is hardly affected by DDOS attacks. Therefore, when a large number of centralized accesses enter the network, they will be dispersed to different nodes without causing network congestion or even collapse.

——IPS makes data storage more efficient.

A file will be distributed into many copies and stored in different storage nodes around the world. When downloading files, users only need to query the corresponding address (Hash) to obtain data from multiple storage nodes at the same time, so the storage speed is faster compared with centralized storage. In terms of data transmission speed, IPS is also more advantageous. When the users need to read data, all the storage workers will send the data they have saved to him at the same time, and the server will automatically integrate the data after receiving. Accordingly, the download speed will no longer be subject to the bandwidth of the server, but mainly depends on the network download bandwidth.

——IPS makes storage cheaper.

On the IPS network, all files are unique and not likely to be maliciously tampered with, which greatly reduces the waste of storage resources and the cost of storage resources. IPS distributed storage makes full use of the resources of public idle storage and bandwidth, which improves the utilization rate of the resources and reduces the use cost.

——IPS can better support the blockchain applications.

One of the bottlenecks in the development of blockchain is the distributed storage capacity. At present, the biggest problem with most public chains is impossible to store a large amount of hypermedia data on their own chains. IPS distributed storage will be the infrastructure of all blockchain projects, laying a good foundation for the large-scale development of blockchain applications.

——IPS will be a parachain of the Polkadot network.

We are building a seamless network to provide more flexible functionality to customers by taking advantage of Polkadot cross-chain technologies. Under the Polkadot's file storage chains umbrella, IPS customer could store/retrieve their files without care where the files are stored and if which tokens they could use for the payment. Image a customer

could choose IPS to store video files and use Filecoin to store documents. Actually, they don’t need to care where files stored on but focus on produce files itself.

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01 Background

Nowadays, the world is in a phase of gradual transition from the Industrial Age to the Information Age, and data are becoming the most valuable resource in the world. With a huge amount of data being generated along with the various behaviors of human beings, it is more and more significant to store and further utilize the data. The migration from on-premises storage to cloud storage is not only the subject of the past decade but this trend is now being accelerated. On the other hand, a large amount of storage space is idle on the hard disks of people around the world, virtually wasting many resources.

The birth of blockchain technology, which opens up a new path for the development of software defined storage, creates the possibility to rethink cloud storage and find ways out of industry dilemmas at the technical and economic levels. Firstly, the pooling of storage can be implemented in a wider space and in a richer form. Secondly, the Token incentive mechanism can drive people to contribute the remaining storage space of enterprise storage, servers, PCs, mobile storage. Finally, the actual data stored in each node are just some slices stored in encrypted form, which securely protects the date, and hence even if users providing the storage nodes has the opportunity to view the slices, the data segments they have seen are not meaningful. The distributed business model of blockchain, DAO, can accelerate the development of the distributed storage industry with the help of global resources and talents. Distributed storage based on blockchain is safer, faster, less costly, more censored and more widely distributed than the cloud storage, and it creates a market that allows people around the world to monetize their spare storage space, which will lower the storage prices of the market with the influx of the suppliers all over the world. The blockchain ensures that these are achieved in a secure, trust-free, peer-to-peer manner. From centralized storage to decentralized storage and from a centralized Internet to a decentralized Internet, we are at a turning point in history.

Advantages of distributed storage based on blockchain:

1) Distributed storage takes advantage of the sharing economy. Users can make full use of the free space of the hard disk and gain revenue.

2) The data are split into small pieces that are spread over many nodes only after being encrypted, which avoids the event of centralized storage "stealing" files, and even if users unlock a piece of data, it is only part of the data, not all. In addition, there is no need to worry about the risk of data leakage caused by the failure of the centralized server.

3) During the download process, the fragments will be reorganized, and the parallel speed of the download will be much faster than the centralized storage.

4) Through smart contracts, the network can automatically determine the situation and incentives of the use.

02 What is IPS?

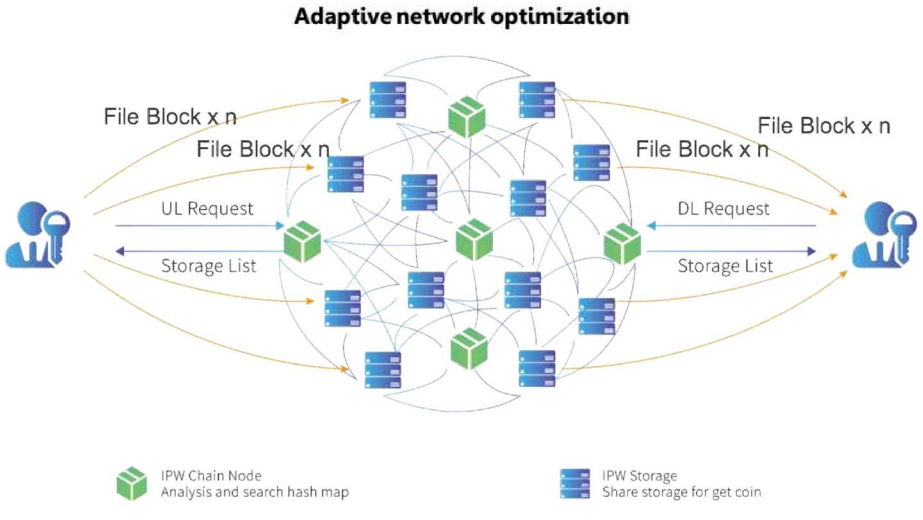
IPS is a high-performance public chain based on P2P distributed storage.

Built on the public chain, the distributed storage service platform is developed to achieve decentralized storage, which is faster, safer and less costly than the centralized storage. Files will be divided into multiple small parts (guaranteeing certain redundancy) and stored in a number of nodes on the network. As long as a certain number of nodes are functioning, files can be secured and complete.

When a user enters a URL in a web browser to obtain information, the URL is parsed to an IP address which will find the server that stores the information the user is looking for. Almost every publisher, vendor and service provider on the web store information in the servers of the particular data center they control, which makes the network centralized today.

IPS network protocol enables users ‘files stored. As a by-product of the IPS mining process, the innovative encryption and proof of work create a set of useful and valuable service for customers. The miner’s hard drive space needs to be verified on the IPS network protocol firstly. After verification, the miner will be eligible for storage on the market. The more he stores, the more proof of stake (Token) he earns, which motivates miners to use their hard drive space to get paid from verifiable storage market of IPS.

We believe that the addition of decentralized storage space will enable customers to reduce network storage costs and enjoy better storage services. Since it is a decentralized protocol, the data and the link stored on the network are not controlled by a central point, which improves reliability. Compared to single centralized servers and content distribution networks, information that is transmitted on a large scale between IPS miners is stored closer to users, making information search faster. The data, retrieved by the encryption algorithm on the IPS, enable customers to manage and update a large amount of data more efficiently. Finally, as an open source project, unlike most cloud storage and distribution platforms today, IPS is openly subject to inspection, verification and promotion. With the continuous upgrade of IPS and the addition of the new features, we hope that IPS network can be a platform for the mass (even if not everyone) to store and distribute network information.



03 IPS Mission

The mission of IPS is to provide a secured, flexible, scalable and lower cost decentralized storage and decentralized Internet.

IPS will always adhere to the following principles in the development process:

·The principle of value sharing:

IPS will realize the value transfer of sharing ecosystem. Through an effective motivate mechanism, users are encouraged to share idle storage space, which will continuously expand the scale of the storage network, and form a benign ecosystem.

·The principle of data security:

The data are distributed to the distributed storage network through the process of blocking, encoding, etc., so as to enhance the security to a high level to enable that no other people and company in the network can snoop the users ' data.

·The principle of platform development:

By providing the standardized underlying technology platforms and supporting standard tools, IPS provides distributed resources to companies and organizations in need, including storage resources, computing power, and more. Companies or organizations can develop their own DAPP (distributed applications) on this platform.

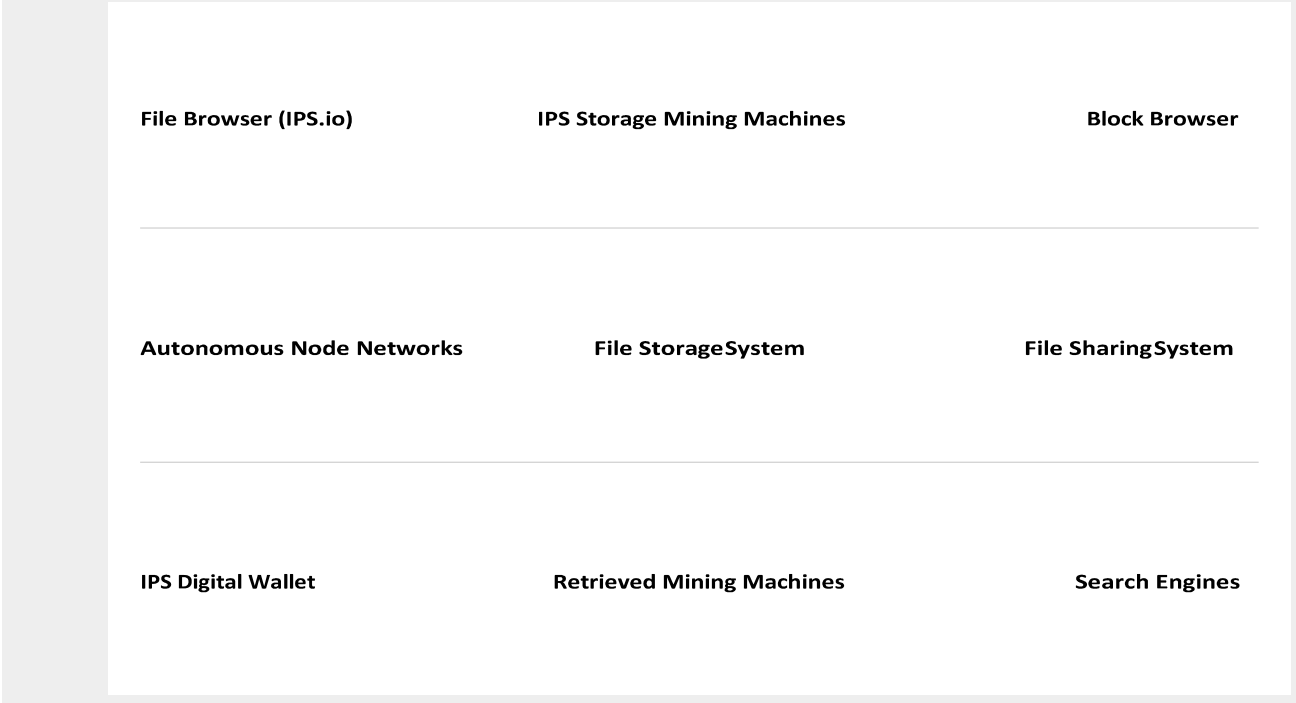
·The principle of scalability:

IPS can simultaneously multiplex many peer-to-peer connections. With such flexibility and scalability, IPS's scalability will be the same as HTTP, enabling unlimited expansion.

04 IPS Infrastructure

IPS will provide a variety of infrastructure for all participants of the ecology:

- P2P cloud storage services based on the sharing economy model;
- P2P data trading platforms connecting global data;
- P2P decentralized Internet (domain name system and browser under IPS protocol);
- Decentralized service and content platform;
- High-performance public chain, customized side chain;
- A cross chain ecosystem
- Digital currency based on decentralized Internet ecosystem.



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5.1 Architecture

The Hash of the file computed by IPS is the unique identifier of the object in the system; the fragment generated by the file is encrypted and encoded as the object data. The storage nodes store the object data in their own storage units, and the super nodes are responsible for maintaining the mapping relationship between the object data and the storage nodes, among which the storage nodes are completely peer-to-peer and can transfer data to each other through a set of P2P transmission protocols. As schedulers, the super nodes accept the information of the storage nodes and updates the real-time information of the storage objects according to the broadcast, so that the users can quickly return the object location when accessing the storage objects.

5.1.1 Double-layer Network Design

IPS separates the storage network and the retrieval network into two layers, improving network efficiency and reducing mining thresholds. To mining machines, the requirements for storage and retrieval are different, among which the retrieval requires expensive computing power and energy consumption, while storage requires storage resources and bandwidth resources that are idle. Separation of storage and retrieval is more conducive to contributing to IPS with low-cost mining machines.

5.1.2 Multichain Structure (Main chain and Side Chains: Multichain and Multi-consensus) The main chain of the IPS Chain uses PoRep (proof of replication) system and PoE (proof of extract) system. IPS Chain provides the Consensus interface and entities such as POW, POS, DPOS, etc. Developers can create and complete the deployment of their own nodes through the Consensus interface provided by the main chain. For side chains, DPOS can be used with high performance requirements, while POW can be used with requirement of high decentralization.

5.1.3 Crosschain Structure (Polkadot chain and IPS chain) IPS will build a bridge smart contact to allow IPS mainnet could interact with Polkadot mainnet Through this tintegration, the subchains of IPS could take the advantage of cross chain as well.

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5.2 Storage Network

5.2.1 DHT

The essence of P2P is a new network communication technology, which breaks the traditional structure, gradually decentralizes and flattens, so as to achieve the future trend of node equality. The application of P2P file sharing (BTs/eMules, etc.) is the most concentrated embodiment of P2P technology. With P2P file sharing network as the entrance and around a file network system, IPS combines its operability with blockchain formula algorithm to design a new flat and decentralized cloud storage network, while retaining the open and transparent characteristics of blockchain.

Distributed Hash Table (DHT) is a distributed storage method. In DHT, a type of information that can be uniquely identified by a key value is stored in a plurality of nodes according to a certain convention/protocol, which can effectively avoid the collapse of whole network caused by a single failure of the "centralized" servers (such as Tracker). Different from the central node server, each node in the DHT network does not need to maintain the information of the entire network, but only stores its neighboring subsequent node information in the node, which greatly reduces the bandwidth occupation and resource consumption. The DHT network also backs up the redundant information on the node closest to the keyword, avoiding the problem of single node failure.

There are many technologies/algorithms for implementing DHT, such as Chord, CAN, Pastry, Kademlia, etc. Considering the technology maturity and market utilization, IPS uses the Kademlia algorithm. Kademlia, often referred to as the third-generation P2P technology, is a P2P universal protocol that is suitable for all distributed peer-to-peer computer networks; it defines the structure of the network, and plans the communication between nodes and the specific information interaction processes. In Kademlia, network nodes use UDP to communicate. By a distributed hash table used to store data, each node has its own ID, which is used to identify the node itself and also to assist in implementing Kademlia algorithms and processes.

5.2.2 KAD Network

Nodes in the KAD DHT storage network include the following features:

- NodeID needs to be 160bits or 20bytes in KAD;
- Contact contains NodeID (NodeID), Address (string), and UDP Port Number;
- Bucket [VaugeKConst]*Contact is used in Node's Routing, a bucket can contain k Node, and all Nodes disappear after 60 minutes;
- VaugeKConst is statistically set to 20;
- Router contains Contact and KBucket; KBucket has a bucket in every bit of the ID.

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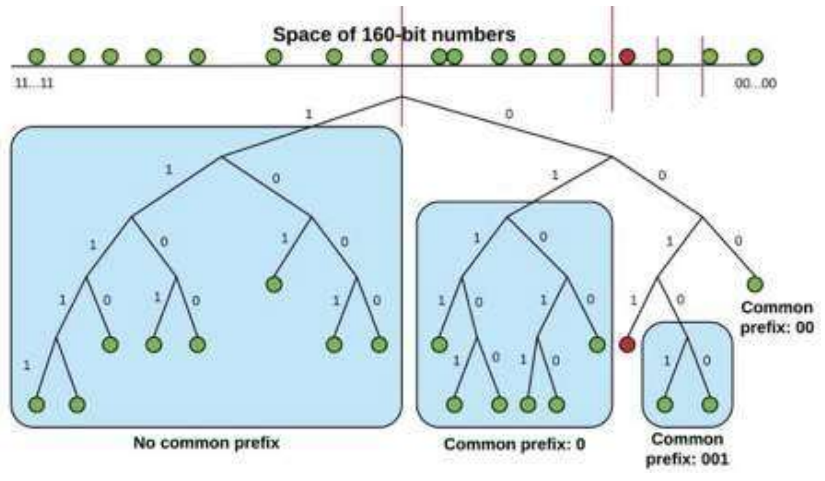
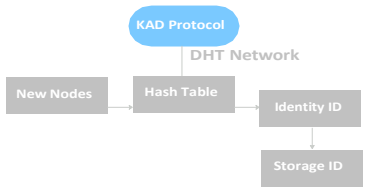


Kademlia uses key values to identify nodes and data on the KAD network. The key value of KAD is invisible and has a length of 160 bits. Each computer that comes in will have a key value that is called NodeID and populated in the key-value space with 160 bits. Since the KAD stores content by a KV (key-value) pair, each data in the KAD DHT is also independent of the space corresponding to the key in the 160-bit key value. At the beginning, a node has no connection with other nodes. After a new node is registered, the link of this node will find the node and save the new NodeID. When the storage overflows, the contact is selectively removed and then organized inside the bucket. The way to find a NodeID from a node is to find another nearest node from a node in a known routing table until the RequestNode is found.

Each KAD node has a 160-bit NodeID, and the key value of each data is also a 160-bit identifier. In order to determine which node the KV pair exists in, the KAD uses the concept of the distance between two identifiers. Given two 160-bit identifiers, x and y, KAD determines the distance between them by their XOR and expresses them as an integer $d(x,y)=x\oplus y$. What XOR (exclusive OR)obtains is the distance that the system binary tree framework defines. n a full 160-bit binary tree ID, the size of the two ID distances is the smallest subtree containing two nodes. When the tree is not a fully binary tree, the leaf closest to IDx is the leaf that shares the longest common prefix withx. For example, the distance between 0011 and 1001 is $0011\oplus 1001=1010$, and 1010 is 10 by integer expression, so the distance between the two nodes is 10.

5.2.3 Node Identity ID



The identity information of the peer node and the routing rules are generated and formulated by the Kademlia protocol. The KAD protocol essentially constructs a loose distributed hash table, referred to as DHT. Everyone who joins this DHT network must generate their own identity information that allows them to be responsible for storing the resource information and other members' contact information on this network. If the new node A needs to find the contact information of the node B without the contact mode, the node A can obtain it by contacting any node that is associated with the node B.

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5.2.4 Search Algorithm

The node lookup process in KAD is to locate k nearest nodes by the given key value. KAD chooses to use a recursive algorithm in node lookup. The party that initiated the lookup first finds a node from the non-empty k-bucket (or if the bucket has fewer key-value pairs than α, it can only get the α nearest nodes by key value.). The initiator sends FIND_NODERPC to the selected α nodes in parallel and asynchronous mode; α is a concurrency parameter of a system. In the recursive phase, the initiator resends the FindNode to the node that had previously sent the RPC, and the nodes that cannot respond quickly are removed unless they are replied.

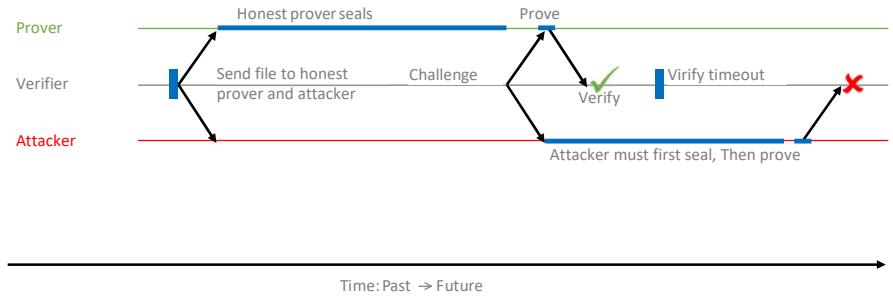
If a round of looking for a node does not find any closer to the nearest observed node, the initiator will resend the FindNode to find k most recent ones that have not been requested. The search process will not end until the initiator receives a reply from the k most recently observed nodes. Each node knows at least one node in each of its subtrees and can locate other nodes through the NodeID. To store a KV pair, the node needs to locate the corresponding k nearest nodes by key value and then send STORERPC; to find a KV pair, the node needs to find the k nodes with the closest key value. However, the value lookup uses FIND_VALUE instead of FIND_NODE, and this process stops as soon as any node returns a value.

5.2.5 Storage Dispute Resolutions

In a distributed storage network, data nodes are scattered in an untrusted edge network, so it is necessary to ensure that the data are stored on data nodes and can resist cheating attacks such as witch attacks, outsourcing attacks, and generation attacks. In the case of considering the existence of malicious nodes, distributed storage systems need to guard against various attacks. IPS implements proof of replication (PoRep) and proof of extract (PoE) through the Zero-Knowledge Succinct Non-Interactive Argument of Knowledge (zkSNARK) and the Seal, enabling storage certification with low resource consumption and high efficiency.

Proof of Replication (PoRep)

Different from proof of work and proof of stake, proof of storage is a consensus algorithm used in the field of distributed storage. It incentivizes users according to the storage space contributed by them to the distributed cloud storage platform, as well as traffic, bandwidth, and online duration. The proof allows the user of providing storage services to convince the verifier by providing a proof of copy (π). When the verifier issues a random challenge, the users need to provide the proof to prove that the proof data X relative to the specific copy Y of the prover has been stored in a unique dedicated physical storage district. The PoRep algorithm ensures that each piece of data is stored independently, preventing witch attacks, external attacks and generated attacks.



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Three construction phases of PoRep system:

·PoRep.setup() -->copy Y; copy Hash root, Merkel root of Y; proof of seal πSEAL;

·PoRep.prove() -->proof of storage πPoRep;

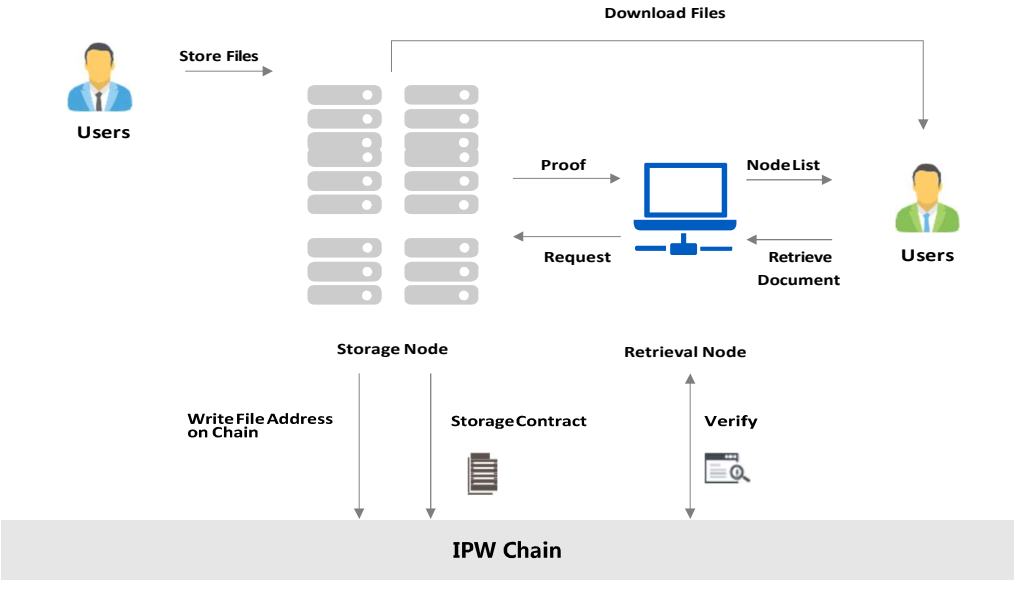
·PoRep.Verify()--> bit b (proof of storage validity b1(πPoRep) ^ proof of seal validity b2(πSEAL))

Proof of Extract (PoE)

In order to avoid the waste of computing resources caused by the storage node repeatedly searching, IPS has designed a new proof algorithm, Proof of Extract. Driven by the benefits of the token economy, the storage node proactively provides a proof message back to the retrieval miners when it responds to the user's retrieval and download requirements. IPS does not need to frequently retrieve whether a storage node stores files correctly since only when the file can be successfully retrieved, the network executes a reward smart contract, and the storage node can be rewarded.

The whole process is as follows:

- IPS first signs a storage contract with a storage node;
- The storage node starts to store files;
- The retrieval node sends a request to the storage node according to the storage contract when the user retrieves the file;
- The storage node returns a proof of storage to the retrieval node after receiving the retrieval request;
- The retrieval node verifies the proof fed back by the storage node;
- The user successfully calls the file of the node from the list of verified storage nodes;
- The storage node obtains the storage incentives for storing this retrieval.



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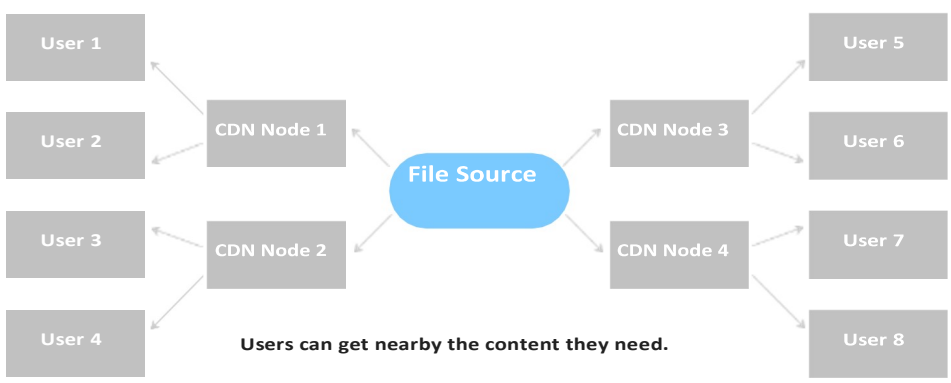
5.2.6 Redundancy Processing

If a node fails to patrol, the system initiates a network replication process by transferring an existing copy of the network to a new node; therefore, the network can return to normal after each inspection. Each fragment is uniquely encrypted, which means that a malicious user cannot pretend to have multiple redundant copies when he has only one copy of a file. Wecan do this by adding deterministic obfuscation values when centrally encrypting fragments. Even if the decryption key is a known specific file, the malicious user cannot complete the audit of the fragments they are not assigned to. In this way, we can prove the redundancy of a particular fragment, because each redundant copy is unique.

In addition, both users and applications are controlled by the parameters of K-M erasure code technology, and by the distributed redundancy. For simple data storage, users can choose the recommended file storage level setting; however, if the data are particularly important, users can choose a high-level file storage setting to spread the data across multiple storage nodes (including multiple super nodes), which protects the data from special situations (such as natural disasters).

5.2.7 File Distribution Network

The core idea of the file distribution network is to avoid bottlenecks and links on the Internet that may affect the speed and stability of data transmission, so that file transmission is faster and more stable. By placing a layer of intelligent virtual network consisting of node servers throughout the network, the CDN system can redirect user requests to the nearest service node in real time based on network traffic, the connection and load status of each node, as well as the distance to the user and response time. The purpose is to enable users to obtain the required content in the vicinity, solve the congestion of the Internet network, and improve the response speed of users visiting the website.



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5.3 Encryption Security (Searchable Encryption/IP Concealment)

In data protection, the privacy of personal information needs to be prioritized. The second thing to support is the change of dynamic data, that is Dapp's modification of decentralized data storage. Based on the business scenario, IPS uses a searchable symmetric encryption (SSE) method consisting of five algorithms, as follows:

K=KeyGen(k) : Enter the security parameter k and output the key K randomly generated. This operation is usually performed locally on the data owner side.

(I,C)=Enc(K,D) : Enter the key K and the plaintext file set D=(D1,D2, ...,Dn), and output the index and ciphertext file set. This operation is performed locally on the data owner side.

TW=Trapdoor (K,W) : Enter the key K and the keyword W and output the trapdoor corresponding to the keyword. This operation is performed locally on the data owner side.

D(W)=Search (I,TW) : Enter the index I and the trapdoor TW of the keyword to be searched, and output a set of identifiers of the file containing the keyword W. The Search operation is performed by the key distribution control in Genaro.

Di=Dec(K,Ci) : Enter the key K and the ciphertext file Ci, and output the plaintext file Di corresponding to the decryption. This operation is performed locally on the data owner side.

Furthermore, IPS separates the storage network and the retrieval network into two layers, improving network efficiency and the user experience. However, the retrieval node is the most easily searched and attacked part of the entire P2P network; therefore, it is necessary to provide additional protection for the retrieval node by encrypting the IP address and preventing the user from directly querying through the IP.

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5.4 Other Technology Innovations

5.4.1 Decentralized Storage

The distribution of files into fragments can better ensure the security of the data since no user has a complete copy as long as the stored file is of standard fragment size. We define the people who rents his or her hard disk space to the network as a user, and define the standard fragment size as a multiple of bytes (8KB/16KB/32KB/256KB/1024KB, intelligently filter the scatter standard based on file size). These are kept at pre-set sizes to prevent malicious storage of small files (For large files, large numbers of fragmentation are more advantageous; for small files, especially for files smaller than a certain size (such as 64M), the P2P transmission efficiency is very low, and it is easy to impose an additional burden on the network).

5.4.2 Peer Rating / Node Classification

All nodes in the network are peer, which brings more decentralization, but at the expense of efficiency. IPS will classify storage nodes according to the reliability, and initially decides to divide storage nodes into mobile phones, personal computers, professional mining machines, enterprise-level nodes, and super nodes. Because super nodes and enterprise nodes have very high reliability, fragmentation of all files will be backed up on them first to improve the efficiency and reliability of the IPS network.

5.4.3 Storage-level Settings

Users can set the level of the file storage according to their needs. For example, users can set the file loss recovery ratio to 1/3, 1/2, 2/3. The higher the level is, the higher the security (the lower the risk of loss).

5.4.4 Anti-cheating Mechanism

Storage node A and user B may collude to cheat to defraud storage incentives. For example, storage node A lied that it stored 1T file F, and user B lied that he successfully retrieved file F stored in A. We have multiple precautions against this type of cheating. Firstly, we will adopt a dynamic IP mechanism (preventing cheating in brushing machine, retrieval and storage) (change of Peer every time). Secondly, large files are also divided into a larger number of parts on many nodes as they are easier to use for cheating. Moreover, user B may pay for the retrieval, but node A can only get few incentives, while other nodes can get the most storage incentives, which can also effectively inhibit the arbitrage behavior of the brush machine.

5.4.5 IPS Browser

The IPS browser can access the IPS protocol network and is also compatible with the HTTP protocol. Not only that, but users can set the storage space of their personal devices for mining through the browser. The browser will be able to dramatically increase the number of IPS users and expand the community. More people can contribute to the IPS network and become a consumer of the IPS ecosystem. IPS will also come with a wallet feature. All browser installed users will also have their own wallet. When necessary, the IPS browser can also be compatible with the IPS protocol and become the traffic entry for the IPS ecosystem.

07 IPS Application Scenarios

8.1 Distributed File Storage

The IPS distributed storage platform provides the basic cloud storage service. Customers can easily access and use the IPS cloud storage service through OpenAPI, which makes the service safer, more reliable and cost-effective.

8.2 Distributed File Sharing

The distributed sharing platform is based on the storage service of the distributed storage platform. Users can share their files such as digital media or other valuable content, and they can set a certain amount of IPS incentives for the sharing according to the specific content. If other users want to download or view the files in full, they will need to pay the corresponding amount of IPS as incentives to the uploader. As a file sharing service platform, IPS will review and manage content uploaded by users in strict accordance with the legal requirements of the location where it operates.

8.3 Multimedia Applications

At present, the traditional online video websites adopt the centralized storage service that requires high storage costs and bandwidth charges, and the related expenses are converted into watching long-time advertisements and restricting non-members' viewing. However, the use of IPS as the storage service will greatly reduce the redundancy of the same resources, and at the same time save a lot of bandwidth costs generated by users when playing video, which makes watching video more efficient and cheaper.

8.4 Digital Content Trading

Thanks to the blockchain technology and the distributed storage technology, the IPS storage platform is ideally suited for copyright transactions of long-tail content to store. Distributed ledgers can provide open, transparent and unalterable records for transactions, and also leave an unalterable and unique digital signature on the blockchain for the digital content work as a copyrighted logo. With the support of the IPS platform, a large number of long-tail videos, audios and photography creations have a low-cost and sustainable trading platform.

8.5 Social Applications

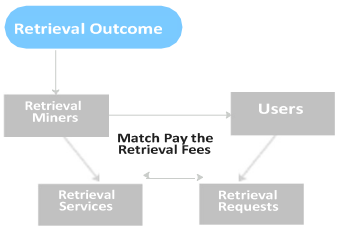
A decentralized social network can be created by the technology of IPS. As a decentralized application, the IPS network allows social applications to work without any central point and is completely peer-to-peer.

08 IPS Ecosystem

9.1 Storage Ecosystem

Storage miners provide data storage for the network and participate in IPS operations by providing disk space and responding to customers ' requests. To become a storage miner, users need to provide storage space and bandwidth resources. Miners earn IPS by storing the users ' data segments into the sector, and respond to the users ' requests of storage by storing the data for a specific time. Miners generate proofs and submit them to the blockchain network to prove that they have stored the data for a specific time. If the data fail or are lost, the storage miners will be fined for partial IPS. The workflow of storage miners is as follows:

- Storage miners store the mortgaged IPS on the blockchain to ensure stable storage to the network. The mortgaged IPS exist to guarantee the service. If miners generate the proof of storage for the stored data, the mortgaged IPS will be returned; in contrast, if failing, they will lose the mortgaged IPS.
- Once the mortgage transactions occur on the blockchain, miners can provide storage services on the market.
- Once orders are matched, storage miners will receive customers' data. After the data are received, miners sign the transaction orders with the customers and submit them to the blockchain.
- When storage miners are assigned data, the proof of storage must be generated repeatedly to ensure that the proofs they are storing data are published on the blockchain and veri ied by the network.
- After the veri ications are successful, storage miners will receive the corresponding storage incentives.



9.2 Retrieval Ecosystem

The retrieval miners provide data retrieval services for the network and participate in the IPS operations by providing the data needed by retrieval requests of users. Unlike storage miners, they don't need to mortgage IPS, submit storage data or provide proof of storage.

9.3 Application Developer Ecosystem

IPS needs more business to prosper the entire ecosystem and requires corresponding application developers to run the business to allow more users with storage requests to come in.

9.4 Application Service Ecosystem

IPS provides users with the services of file storage and retrieval; users use various services provided by IPS through IPS browser.

10 IPS Planning

2021 Q1

·IPS Project Approval
·IPS Team Building

2021 Q2

·IPS Main Chain (Beta)
·Block Browser (Beta)
·File Browser (Compatible with HTTP)
·Picture Sharing Website (www.IPS.io)
·IPS Mining Machine Prototype
·Engage with

2021 Q3

·IPS Mining Machine Presale
·Open Beta Test of IPSChain Main Network
·Open Beta Test of IPS Browser
·Open Beta Test of IPS Wallet
·Open Beta Test of Application Layer Products
·Build ecosystem

2021 Q4

·IPS Mining Machine Sales and Ecosystem Construction
·Ecosystem Construction of Application Layer Developer, etc.
·Browser Online (Browser Mining)
·Domain Name Promotion
·IPS Wallet Online and Promotion
·IPSChain Main Network Online

11 Team Structure

Nelson Sakamoto
team leader & architecture

IPS architechture. Rich experience in software development, including 5+ years Blockchian development.

Participated in a couple of blockchain related development projects and played as a architecture and developer's roles. Through the projects, he acquired not only blockchain but also industry expeience. In addition, he has rich experience of enterprise application development.

11 Team Structure

Rie Miyazawa

Project Manager

IT consultant, system architect, proficient in business proposals. Since 2013, it has developed blockchain products and designed ICO issuance. Served as chief researcher and lecturer of enterprise blockchain.

Tom Sato

Full stack engineer

Internet full-stack engineer. Good at website development, mobile APP application development. Backend application, server settings.

Peter Yokoyama

Full Stack Engineert

More than 20 years of system software research and development experience, familiar with a variety of open source software technologies. Focus on the development of Internet application systems. We have rich experience in research and development on the front-end, mobile and back-end of WEB.

Sunny Watanabe

Full Stack Engineer

15 years of experience in the design and actual construction of platform architecture for large-scale systems. Obsessed with open source software technology. Served as a technical partner of an electronic music sharing community. Rich practical experience in application development.

13 Disclaimer

IPS is a non-profit system. The system's internal incentive mechanism and the operation and maintenance mechanism will use virtual digital assets (ie, virtual goods) rather than monetary incentive mechanisms as the incentives. The digital tokens generated by the system itself can be used as rewards for system maintenance, but in order to exchange resources between the system and other systems or other social entities, a certain amount of Bitcoin or other virtual assets are needed. Accordingly, the assets acquired from IPS are only similar virtual digital assets, such as Bitcoin. The white paper only intends to convey the purpose of the information and does not constitute any investment advice, investment intention or instructed investment. The white paper does not constitute or be construed as any purchase or sale, any invitation to buy or sell, any form of securities, or any form of contract and commitment. Participants in the IPS project, please be sure to read this white paper carefully to fully understand the technical risk-return characteristics of the blockchain, consider your own risk tolerance, judge rationally and make prudent decisions. Once you participate in the project, it means that you understand and accept the risk, and are willing to bear the corresponding results or consequences.

IPS - High performance public chain based on P2P storage