Hyper Speed Network

– WHITE PAPER –

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Contents

Abstract

5G technology is a vital force of the digital economy innovation. Due to its high throughput and concurrency, low latency and power consumption, together with Artificial Intelligence (AI), Blockchain, Cloud Services, and Big Data, 5G creates a new era of the global IT infrastructure. The interconnection of all things assisted by 5G will help improve the efficiency of the whole society and promote the large-scale penetration of the Internet of Things (IoT), AI, edge computing, Augmented Reality (AR), Virtual Reality (VR), UHD streaming, and other applications.

However, with the large-scale introduction of equipment, massive data growth, and dramatic increase of computing demand, the following concerns have come up:

- **Lack of data security, easy eavesdropping by hackers;**
- **Big data collection and GDPR enactment call for privacy protection responsibility;**
- **High cost of IoT application development on 5G networks;**
- **Apart from communication, value exchange between terminals is difficult to realize.**

Hyper Speed Network (HSN) is born to solve these problems. HSN is the world's first Public Chain + 5G Application value eco-network. What does HSN do?

- **Utilizes blockchain to build a network security and trust mechanism for connected terminals under the 5G architecture;**
- **Realizes value eco-network with high throughput and concurrency, concurrency,low latency and power consumption;**
- **Is able to support multi-source information interconnection and exchange, as well as diversified asset registration, exchange, interaction, and flow of the coming digital age;**
- **Realizes interconnection of all things, builds a data world on blockchain, and promotes the new information-driven economy.**

As the basic public chain of the 5G digital economy, HSN aims to make complex application scenarios network-enabled by using blockchain, so as to assist the industrial development in the 5G age. After the mainnet launch, HSN will be widely used in cloud VR/AR, Smart Security, Internet of Vehicles (IoV), Smart City, Smart Manufacturing, Unmanned Aerial Vehicles (UAV), SD-WAN + NAS, Mesh products, edge computing modules, and other applications of the 5G environment.

1. 5G Industry Development

1.1 Overview

5G (or the 5th Generation Mobile Network) is a new-generation wireless communication network standard. Compared with 4G, 5G has made a qualitative leap in mobile broadband, latency, reliability, and mass connection. Key improvements brought by 5G:

- **Supports tens of thousands of users at 10 Gbps data transfer rate;**
- **Simultaneously provides 1 Gbps data transfer rate to many users on the same floor;**
- **Supports hundreds of thousands of concurrent connections for large-scale sensor network deployment;**
- **Greatly enhanced spectrum efficiency over 4G;**
- **Increased coverage over 4G;**
- **Higher signaling efficiency;**
- **Greatly decreased delay over LTE.**

1.2 Key Technologies and Application Scenarios

According to the White Paper on 5G Concept by IMT-2020 (5G) Promotion Group, the technical innovation of 5G comes from massive multiple-input multiple-output (MIMO), ultra-dense networking (UDN), novel multiple access, and all-spectrum access — which have already become the focus of global industry in the field of wireless technologies.

What concerns network technologies, the innovation also comes from a new network architecture based on software-defined networking (SDN) and network function virtualization (NFV), which is the future standard of the field.

In addition, there are some other potential technologies for 5G, such as F-OFDM, FBMC, full duplex, flexible duplex, D2D, Q-ary LDPC codes, network codes, and polar codes.

Through integration of the above key technologies, 5G can meet the extremely differentiated performance requirements of diversified scenarios. Four typical application scenarios of 5G are: seamless wide-area coverage, high-capacity hot-spots, massive low-power connections, low latency + high reliability, which include cloud VR/AR, Smart Security, IoV, Smart City, Smart Manufacturing, UAV, SD-WAN + NAS, Mesh products, edge computing modules, and other applications.

1.3 Business Prospects

Since 5G is the standard of the future innovative technology, countries around the world attach great importance to it and have formulated a clear 5G commercial timetable. According to Gartner, by 2035, 5G will enable $12.3 trillion of global economic output. This equals to the total expenditure of all American consumers in 2016, and exceeds the total expenditure of China, Japan, Germany, the United Kingdom, and France in 2016.

The global 5G value chain will generate at least $3.5 trillion in economic output by 2035 while supporting 22 million jobs. These figures exceed the value of today's entire mobile value chain. The 5G value chain will spend an average of $200 billion a year building 5G technology base in the network and business application infrastructure.

Besides that, 5G deployment will support the long-term sustainable growth of global real GDP. The 5G GDP contribution from 2020 to 2035 will be the size of the economy of India.

In short, due to real-time communication among various devices at a very high speed, 5G will become the promoter of a new generation of innovative technologies such as AI, Big Data, and cloud services and will maximize the impact of these innovations. Data boom in the digital field can assist in large-scale business transformation and provide rich, meaningful, and immersive user experience. Full development of 5G data economy brings about fundamental changes in people's work and life style, and opens a new digital era for the global economy.

2. 5G Era: Blockchain

2.1 Blockchain Development History

Blockchain is a new type of computer technology which involves distributed data storage, P2P transmission, consensus mechanisms, encryption algorithms, and other technologies. Its technical features include decentralization, whole-network information recording, low cost, high efficiency, security, and reliability.

Since the genesis block mined by Satoshi Nakamoto on January 3, 2009, Bitcoin has been running continuously. With 10 years of uninterrupted safe operation, Bitcoin has proved the feasibility of the blockchain technology behind it. On January 23, 2014, Vitalik Buterin, the 19-year-old founder of Ethereum, published Ethereum white paper. In 2015, The Economist published an article titled The promise of the blockchain — The trust machine and introduced the blockchain technology globally. In 2017—2018, the concept of blockchain broke out. Companies and entrepreneurs began to step into blockchain increasingly; and blockchain projects showed blowout growth.

Large enterprises have also begun to enter the area. On August 10, 2018, Shenzhen, China, issued the first blockchain electronic invoice the underlying technology for which was provided by Tencent FiT blockchain team. On October 10, 2018, IBM announced that IBM Food Trust became commercially available. In February 2019, JPMorgan Chase announced that it would issue the banking system USD pegged stablecoin JPM. In March 2019, Bloomberg reported that Facebook, who has 2 billion users, is strategically shifting to blockchain and studies the use of WhatsApp to launch a stablecoin aimed at the remittance market.

The blockchain trend is irreversible. This technology is constantly improving and optimizing under its own operation law. Sharding, side chains, cross-chains, consensus algorithms, post-quantum cryptography, and other fields are also constantly breaking through. From the point of view of the blockchain industry, with the emergence of industry leaders, market division refinement, and gradual improvement of laws and regulations, the blockchain industry landscape will basically take shape in the next three years. The role of blockchain in promoting various fields of social economy will emerge rapidly; and it will have a wide and profound impact on human life worldwide.

2.2 Blockchain Empowers 5G

5G is the basic infrastructure of the future network. Blockchain is a new framework for business development. Integration of blockchain and 5G is a key research topic for blockchain designers.

1. Interconnection of everything brought about by 5G uncovers trillion market opportunities for blockchain

At present, 99.99% of the world's trillions of commodities are not connected to blockchain networks. One of the reasons is terminal immaturity. Many blockchain industry applications relying on IoT terminals cannot be commercialized. These include cloud VR/AR, Smart Security, IoV, Smart City, Smart Manufacturing, UAV, Software Defined Wide Area Network + Network Additional Storage (SD-WAN + NAS), wireless Mesh products, and edge computing modules.

5G technology can bring wider coverage, more stable licensed frequency bands, and more unified standards to the IoT, thus providing strong support for IoT-based blockchain applications. Therefore, with the development of high-speed 5G communication, the IoT, big data, and AI, blockchain will provide stable tracking, traceability, and distributed P2P transactions for trillions of goods worldwide.

2. Blockchain provides data protection for 5G application scenarios

5G era puts forward higher requirements for data protection. With the emergence of 5G, network speed will be improved greatly and the amount of data will also surge. In addition, more computing and storage will be performed by smart terminals and edge computing nodes.

Blockchain technology aims to break the current trust-endorsed transactions relying on central institutions, and provide technical support for transaction decentralization and information privacy protection, history tamper protection, and traceability by means of cryptography. It is naturally suitable for scenarios with strict data protection requirements.

3. Blockchain enables the real P2P value exchange under 5G

5G focuses on distributed scenarios, such as IoV, remote video surveillance, and Smart City. Blockchain can be implemented under a framework with distributed deployment. There is no need for a centralized agency to confirm the authority, since decentralized nodes on blockchain confirm and distribute information. This enables P2P value exchange without the need for centralized transfer and commission, which greatly improves the efficiency of terminal transactions and reduces transaction cost. Such business models as 5G bandwidth leasing, new energy meter trading etc. are very suitable to realize P2P transactions and value exchange on blockchain.

2.3 5G Challenges for Blockchain

5G is based on fiber optic networks, is 10 times faster than the current 4G, and provides lower latency and larger bandwidth. 5G-oriented application scenarios usually have technical requirements for high-performance and low-latency concurrent storage, cooperative network, and concurrent computing. Management of such a complex ecosystem requires improved computing and storage.

However, the blockchain trilemma has become a key bottleneck for its technological development. At present, consensus, transaction processing, and data throughput of blockchain cannot meet the needs of complex application scenarios. In addition, with the continuous emergence of blockchain platforms and more on-chain terminals, coexistence of multiple blockchain platforms is inevitable. Cross-chain demand is more urgent in the 5G era.

3. HSN's Solution

HSN is the world's first public-chain project focusing on 5G application scenarios. In response to the above challenges, HSN has put forward the following technical requirements and designed a perfect Blockchain + 5G solution.

3.1 Technical Requirements

1. Support of concurrent access of mass devices

In order to support big data uploading on terminal devices and edge computing in complex applications, HSN needs to be able to process concurrent data generated by mass user devices.

2. Support of mass data storage

With the increase of transmission bandwidth in 5G networks, big data and UHD video applications are able to store data on blockchain. HSN needs high storage capacity to meet the complex 5G data access requirements.

3. Super high performance

In order to realize on-chain storage and computing in the 5G era, HSN needs to provide ultra-high performance, including network access, data storage, sequential computing, concurrent computing etc.

4. Extremely competitive operating cost

With the development of cloud computing, cloud storage, and blockchain, conventional cloud computing companies such as AWS, Alibaba Cloud, and Azure, as well as third-generation blockchain application public chains represented by EOS are continuously reducing the use and operating costs for developers and enterprises. HSN needs to design an adaptive operating system on the level of technical framework and economic

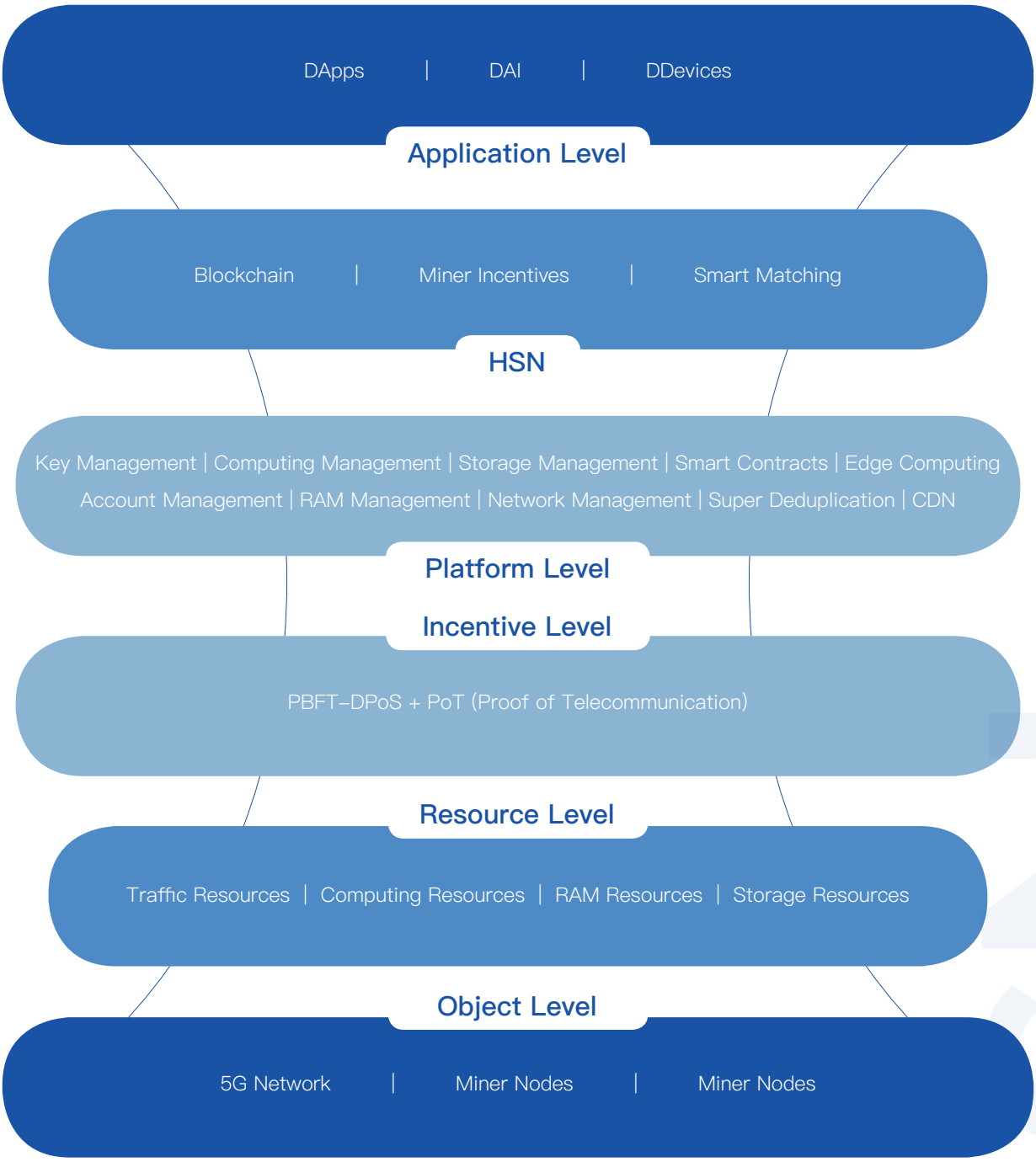
model, allowing users to access the network free of charge, allowing developers to release applications free of charge, and creating an effective profit model for developers and enterprises.

5. Support of new software development processes: Agile Development and DevOps

Diversification of 5G application requirements and blockchain infrastructure upgrading brings mainstream use of complex scenario applications completely independent of central servers. Therefore, DApps based on smart contracts should serve the fast iteration of user requirements and the developers' demand for modern software development, operation, and maintenance processes, such as the popular Agile Development and DevOps.

3.2 Overall Architecture

To meet the above technical requirements, HSN adopts the following architecture:



HSN Technical Architecture

HSN provides an integrated distributed accounting system with seamless 5G access, which includes a complete distributed deployment architecture, smart contract system, security system, and layered consensus mechanism. The system can meet the needs of high-throughput and high-performance complex decentralized 5G application scenarios and promote the 5G blockchain business ecosystem.

HSN adopts Miner (PBFT-DPoS consensus mechanism) and Edge Node layered consensus mechanism, which not only guarantees safe operation of the whole HSN ecosystem, but also promotes the flourishing ecology of edge computing and IoT terminals. At the same time, HSN has encapsulated and abstracted the underlying complex technology system and heterogeneous system, realized distributed privacy protection, multi-dimensional identity authentication, and also supports cross-chain and side-chain interactive mapping.

HSN innovatively proposes an automatic device authentication technology based on blockchain. On the basis of session and feature recognition, it realizes automatic device binding request and device authentication via smart contracts and challenge-response communication, and also supports user-level identity binding. It protects terminal device information from tampering and provides the most basic terminal equipment authentication for interconnection of all things and edge computing applications.

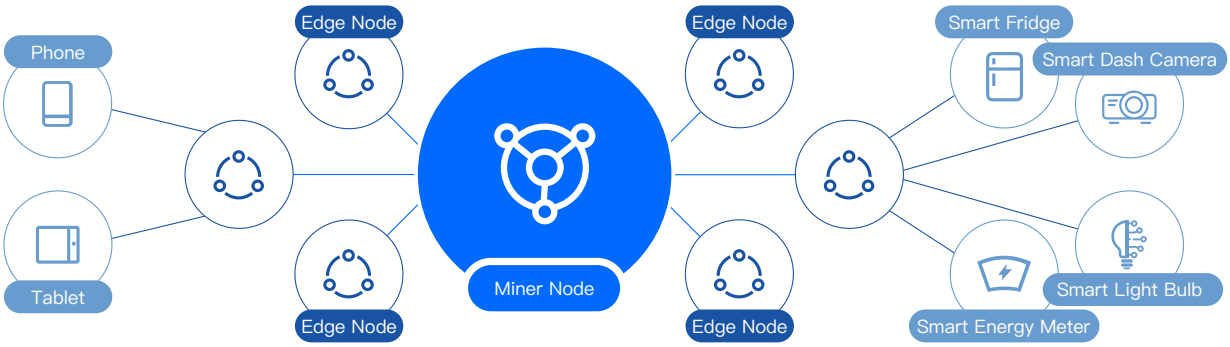
In order to meet the demand for high concurrency and network storage in the 5G environment, HSN chose IPFS as storage infrastructure. IPFS network provides support for dynamic, precise, and distributed network storage and can better meet the requirements of 5G content distribution network (CDN). Large HSN files are divided into small encrypted blocks which can be downloaded from multiple servers at the same time. In the object and file layers, most data objects exist in Merkle DAG structure and double hashing is used for deduplication, thus flexible support of content addressing and storage deduplication is realized.

On this basis, HSN network provides a series of application frameworks such as distributed data exchange protocol and distributed process management protocol etc. Using general API, SDK, and various functional components of applications, HSN network can realize convenient development and deployment, and support agile development of Internet products.

The highly encapsulated HSN distributed accounting architecture and fast storage structure supporting a large number of concurrent processes allows HSN to meet the needs of complex 5G application scenarios.

3.3 Deployment Architecture

The HSN overall deployment architecture is shown in the figure below. 5G network is the infrastructure. Miner Nodes are responsible for executing smart contracts and production of blocks. Edge Nodes are responsible for distributed computing and storage platforms involving smart terminals; they provide big computing and mass storage. Distributed ledger is responsible for core processing on and off the blockchain.

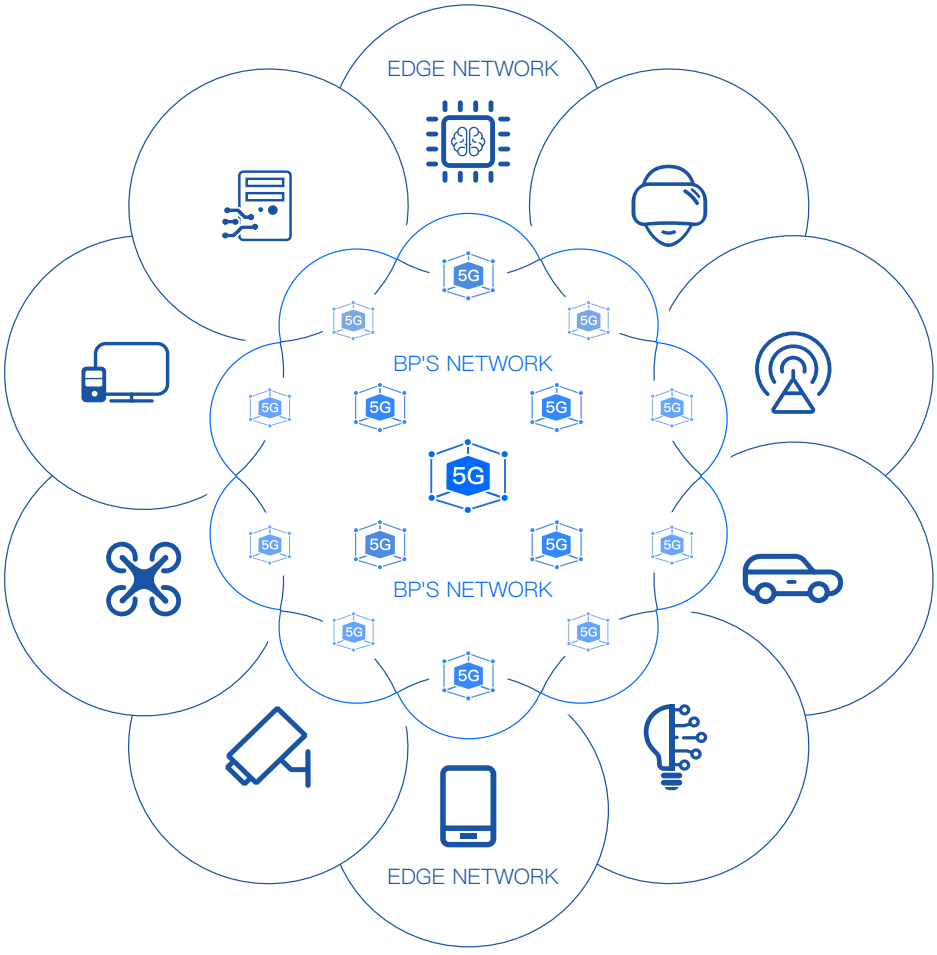


4. HSN Core Technology

4.1 Miner Nodes

HSN optimizes the Miner Node mechanism to better manage tasks of core network and system functions. These include running multiple services on a side chain, support of 5G module group expansion, tracking and measuring of equipment normal running time, and arrangement of miner payout schedule.

Unlike EOS, HSN Miner Nodes not only perform smart contracts and produce blocks, but also provide storage services for big data of the whole network. As the main nodes of IPFS–like distributed storage network, they ensure the efficient, reliable and trusted blockchain network services within the whole HSN network. Besides that, HSN Miner Nodes also have a device module which can access smart terminals and adapt to video, network and other access modes. Miner Nodes use PBFT–DPoS consensus mechanism responsible for block generation and storage of key data. They perform smart contracts and computational tasks of low complexity.



4.2 Edge Nodes

The demand for big computing will bring a heavy load on Miner Nodes. After a stress test of the Miner Node mode, HSN team found that it is not suitable for complex long-term computing in the interconnected environment. Therefore, HSN needs Edge Nodes to perform computationally intensive tasks. Apart from that, in some high-response IoT applications, cloud response delay leads to low overall efficiency.

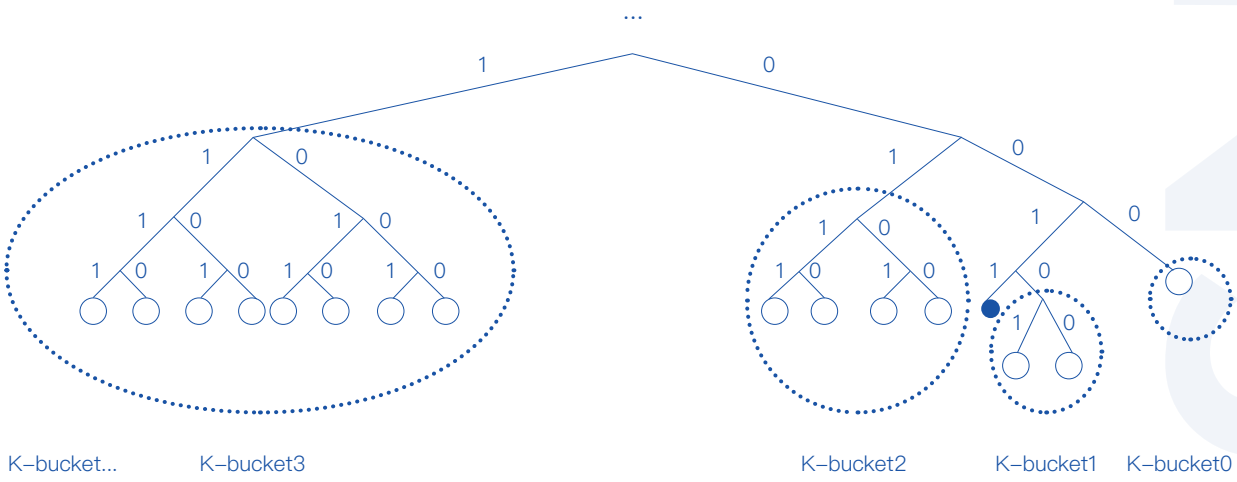
HSN innovatively introduces the Edge Node concept. As a vital supplement to Miner Nodes, Edge Node mechanism takes over the intensive computing services. It helps reduce the response delay and bandwidth cost, and helps meet the needs of various smart scenarios under the decentralized architecture model.

As Edge Nodes are the source of big computing and mass storage resources in the HSN network, in the future all terminal devices with certain computing or storage capacity can be Edge Nodes. By securing Edge Nodes with Miner Nodes, HSN ensures that Edge Nodes can provide efficient, reliable, and credible blockchain network services for big data storage and ultra-high-speed smart contract edge computing.

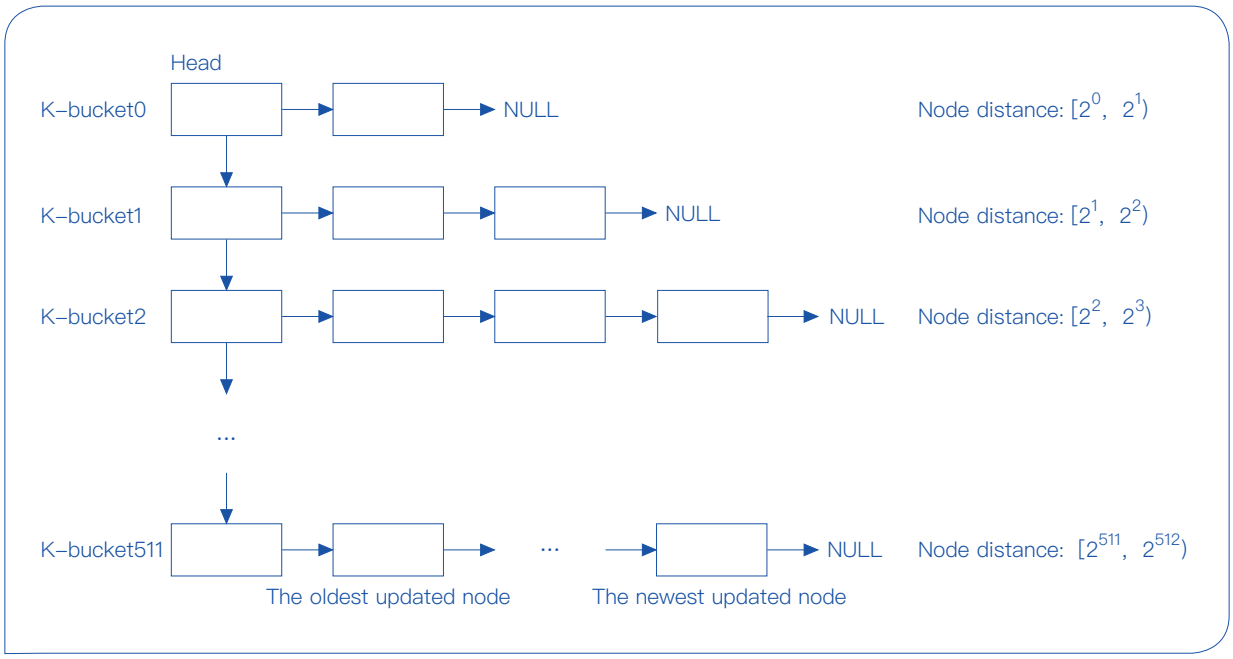
Time-consuming computing is performed by combining the idle computing power and storage capacity of numerous Edge Nodes into a distributed computing and storage platform. Edge node usage scenarios include AI applications, image processing, gene sequencing etc. After loading the intensive computing tasks off the cloud to the Edge, power consumption of the whole system is reduced by over 40%, and time of data integration, migration and other operations can be cut by over 90%.

Edge Nodes use the following algorithm to upload data to blockchain:

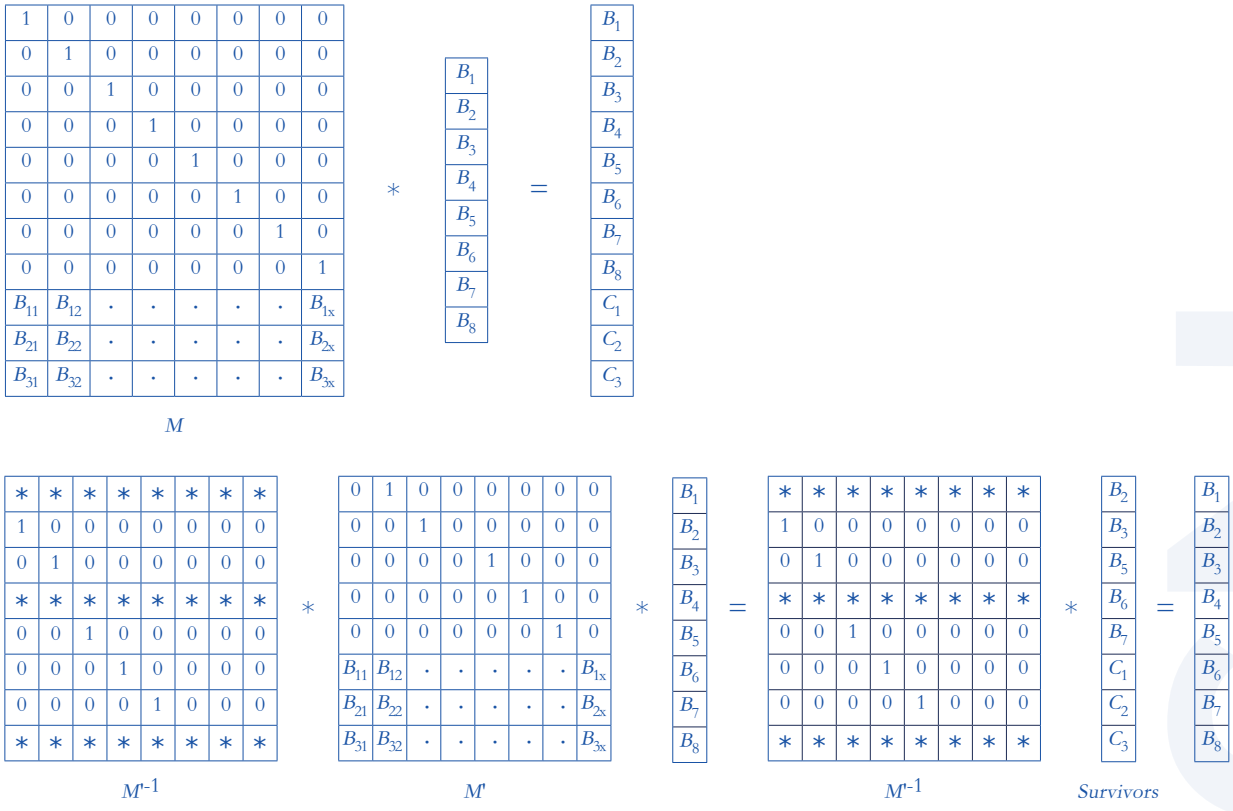
(HSN uses an improved version of Kademlia algorithm for data storage and retrieval. In HSN, node ID length N_ID is 512; node redundancy factor k is 32)



Kademlia binary tree



K-bucket storage scheme within each node



Reed—Solomon Error Correction Scheme

1) After joining HSN, Edge Node E_1 applies for ID from an HSN Miner Node. The nearest Miner Node H_1 selects a free node under from the ID pool and assigns it to the Edge Node (node ID is kept throughout the whole life cycle);

2) After Edge Node E_1 receives id_1 , node identifier is calculated: $Nid_1 = sha3 - 512\ (id1);$

3) When E_1 eceives 据 $Data_1$ data storage requirements from a terminal, $Data_1$ is segmented according to its size. Assuming node length is L, the resulting length after segmentation is expressed as $L = \sum_i n_i \cdot b_i$ (where b_i is extracted in 256M, 256K; succession; n_0 block count, n_1 为 256K block count) .The respective data segment is B_j, therefore $Data_1 = \sum_j B_j$;

4) According to the HSN token amount paid by user, matrix M is selected and redundant data is generated according to M:

a. When user chooses the normal security mode, the system generates redundant data in 10% ratio: $m_i = \lceil n_i * 10\% \rceil$, $(i=0,1)$;
b. When user chooses the medium security mode, the system generates redundant data in 20% ratio: $m_i = \lceil n_i * 20\% \rceil$, $(i=0,1)$;
c. When user chooses the high security mode, the system generates redundant data in 30% ratio: $m_i = \lceil n_i * 30\% \rceil$, $(i=0,1)$;

d. The newly generated overall data is recorded as

$Data_1^{'} = \sum_j B_j^{'}$ ($i \le n_0 + n_1$ 时 $B_j = B_j^{'}$, $i > n_0 + n_1$ 时 $B_j^{'}$ is redundant data) ;

5) $Nid_j^{'}$ is calculated for each j as follows: $Nid_j^{'} = h_j = sha3 - 512(B_j^{'})$, h_j is used to query Edge Node on existence of related data table items. If it already exists, the relevant HSN tokens are deducted and the next piece is processed. Otherwise, processing under step a. starts;

a. Distance between the storage-pending node E_{1,i_0} and the current node E_1 is: $d=Nid_1 \oplus Nid_j^{'}$, Its location is found basing on the Kademlia binary tree routing table;

b. Determine whether E_{1,i_0} survives using the ping command;

c. If it survives, store $B_j^{'}$ instruction is sent to E_{1,i_0} then the next j is processed;

d. If E_{1,i_0} node does not survive (the non-survivor node is reported to the Miner Node to deduct the relevant HSN reward), the first survivor node is selected for storage in the corresponding k-bucket set $\{E_{1,i_1}, E_{1,i_2}, \ldots E_{1,i_k}\}$ (here i_t denotes the distance between the storage-pending node and the Edge Node, $2^i \leq i_t < 2^{i+1}$, $t=1,2,\ldots,k$; the maximum value of k is 32; if the value is not found, the data will be discarded).

4.3 Layered Consensus Mechanism

Consensus mechanism is the technical core of each public chain. According to CAP principle, consensus mechanism cannot guarantee consistency, availability, and partition tolerance at the same time. We also need to ensure that all honest nodes are consistent and avoid forks. For HSN, the existence of Edge Nodes makes the consensus algorithm more complex.

To this end, HSN adopts a layered consensus mechanism:

- **Miner Nodes are generated by voting, produce blocks in turn, and are rewarded via via PBFT-DPoS mechanism;**
- **Edge Nodes use Proof of Telecommunication (PoT). Each node is rewarded according according to the communication services it provides. Note: the communication services are not just storage capacity, network traffic, or computing power, etc., but an aggregate of all communication-related services;**
- **In order to ensure the quality of service of Edge Nodes, Edge Nodes have to be secured by Miner Nodes through voting and collateralization;**

4.4 File Encryption & Deduplication

In traditional storage networks like cloud disks, CDN, and even IPFS, plaintext file deduplication technology is quite mature. It only needs to compare hashes of two files to determine whether the content is the same. But in encrypted storage applications, the above method failed. When two identical files are encrypted with different public keys, the generated ciphertext is different. There is no way for easy deduplication basing on the ciphertext hash. Besides that, data storage sharding complicates deduplication even more.

ciphertext hash. Besides that, data storage sharding complicates deduplication even more.

HSN uses asymmetric encryption and Zero-knowledge Proof to develop a set of file encryption and deduplication technologies. Based on the zero-knowledge verification and secondary hashing, the functions of secret key and file separation, full ownership authentication, and secret key transfer without third party are realized. It solves the problem of Convergent Encryption (CE) when useless encryption of duplicate data increases computational overhead with the increase of data deduplication ratio. Even if different users store the same file on the HSN network at the same time, the whole network only needs to keep one encrypted copy of the content, while content and privacy leak protection is in place. Therefore storage efficiency of the whole network improves.

4.4.1 Data Encryption & Deduplication Algorithm

a. When storing data, User A segments the storage-pending $Data_A$ from big to small (256 M, 256 K) (i.e. files larger than 256 M are divided into 256 M blocks, files smaller than 256 M are divided into 256 K, files smaller than 256 K are aligned by adding 0). It is assumed that segmentation results are $B_1,B_2,B_3,...,B_n$, respectively(i.e. $Data_A = \sum B_i$). Each block hash: $h_i = hash(B_i)$ is calculated separately;

b. If h_i exists in the related table items of the mapping table, the corresponding HSN tokens of user A are deducted, and at the same time the relationship between h_i in the mapping table and $Node_{E_{1i}}$ (the node which stores E_{1i}) is updated and returned; if h_i does not exist, proceed to step **c.** ;

c. Secret key seed is calculated for each block: $seed_i = hash(B_i + salt)$; according to the seed, key is calculated: $K_{1i} = Key\_expansionbyseed(seed_i)$; to prevent Rainbow Table Attack, salt extracts $seed_{i-1}$(when $i=0$, salt is "$#ADFGHFJ&^*678679&*)($^Gfg*^!!!@@#$#$#%XCGH^%&**(&(") ;

d. User A calculates $E_{1i} = E_{K1i}(B_i)$ (i.e. performs encrypted storage of data block B_i using key K_{1i}), Edge Node stores the encrypted data;

e. $E_{P_AK} = E_{P_A}(K_{1i})$ is calculated (i.e. user A's public key P_A encrypts ke K_{1i}), and stored in $Node_{E_{P_AK}}$;

f. The respective relationships are added for mapping table items h_i . $Node_{E_{1i}}$ (the node storing E_{1i}), and $Node_{E_{P_AK}}$(the node storing E_{P_AK});

g. The corresponding HSN tokens of user A are deducted.

4.4.2 Algorithm for Data Sharing among Users

Set p as big prime number; $a<p$ and a are primitive roots modulo p ; a, p are public;

a. User A selects a random number $R_A < p$, calculates $Y_A = a^{R_A} \bmod p$, and sends Y_A to C;

b. User C selects a random number $R_A < p$, calculates $Y_C = a^{R_C} \bmod p$, and sends Y_C to A;

c. A calculates $K_{share} = {Y_C}^{R_A} \bmod p$;

d. C calculates $K_{share} = {Y_A}^{R_C} \bmod p$;

e. A calculates $E_{1i} = E_{K_{share}}(K_{1i})$ and sends to C;

f. C calculates$K_{1i} = D_{K_{share}}(E_{1i})$, hen decrypts the original stored data using K_{1i} ;

4.4.3 User Group Data Sharing Algorithm

a. When users A. B and C enter user group G_1 , the system assigns a group key KG_1 to it, Each user calculates $E_{AKG_1} = E_{P_A}(KG_1)$, $E_{BKG_1} = (KG_1)$, $E_{CKG_1} = E_{P_C}(KG_1)$ separately (this step means that each user encrypt KG_1 with its own public key) ; the encrypted data is stored in the mapping table of the Edge Node accessed by user;

b. When user A stores data, the original data is encrypted and uploaded to blockchain, then $D_{AKG_1} = E_{KG_1}(K_1)$ is calculated (this formula denotes the key generated when group key KG_1 is used to encrypt K_1 and store data for user A ; K_1 is the key generated when user A stores data) ; it is stored in the mapping table of the Edge Node;

c. When B reads data shared by A::

c1. $KG_1 = D_{P_B}(D_{AKG_1})$ is calculated (i.e. B decrypts the encrypted D_{AKG_1} with its private

key P_B to get the group key）；

c2. According to the file hash value, B finds the original storage files$Data_A$ and D_{AKG_1}; in the HSN mapping table;

c3. $K_1 = D_{KG1}(D_{AKG_1})$ is calculated（ i.e. D_{AKG_1} is decrypted using group key KG_1 ）；

c4. $Data_1 = D_{K_1}(Data_A)$ is calculated（ i.e. the original storage file $Data_A$ is decrypted using key $K_1$to obtain the original storage data.）；

4.5 Blocking Technology

HSN preprocesses the stored data by dividing a data file into several shards and storing them on different nodes. Each node only needs to deal with a small part of the incoming transactions. Through parallel processing, it can complete a lot of verification work together with other nodes on the network.

In the HSN network, blocking technology is used on multiple levels: 1) in the Miner Node network, sharding improves TPS and smart contract execution speed; 2) in the Edge Node network, the computing and storage capacity of the whole network is improved by sharding of the respective resource–intensive tasks.

4.6 Side Chain Technology

Side chain technology can provide transaction efficiency. Basing on the HSN parent chain, new functions such as privacy protection are also available. When users use new services, they do not affect the parent chain — this meets the application needs of different industries in the future 5G era.

By means of side chain anchoring, circulation on more blockchains is achieved. Developers can develop different side chains connected to HSN as per business needs. Side chain technology further expands the application scope and innovation space of blockchain. It allows HSN to support a variety of asset types and create side chain smart contracts to develop DApps.

4.7 Key Advantages

To sum up, HSN has the following key advantages:

- High throughput: with the improved TPS implementation combined with sharding and and side chains, the target TPS on HSN can reach tens of millions;

- Big capacity: with the improved implementation of the underlying network file system combined with encryption and deduplication, in theory, HSN can provide unlimited storage space;

- High reliability: with the improved blockchain network structure combined with the double-layer consensus of Miner Nodes and Edge Nodes, a reliable and feasible value system is built to ensure the stable operation of the whole network;

- Diversity: with the improved smart contract implementation and task scheduling model combined with edge computing grid, HSN smart contracts can adapt to the application scenario of big data computing;

- High compatibility: specifications for smart contract writing are compatible with the the mainstream public chains in the market and multi-contract virtual machine mechanism is used, therefore smart contracts are cross-chain compatible and developer threshold is lower;

- Low cost: economic model optimization and integration of multiple incentive mechanisms help HSN realize the virtuous circle between consumption and production. The operating cost is much lower than that of other centralized & competitor products.

5. Application Scenarios

In the 4G era, data is usually accessed via the access layer, convergence layer, and core layer; and service data is centralized in the core network. This centralized work mode cannot meet the demand of 5G application scenarios for low latency, large bandwidth, and multiple connections. In the 5G era, operations will be distributed for processing across different nodes according to different business scenarios. The decentralized work mode will improve the efficiency and reliability. With the rise of distributed AI, 5G edge network platform will carry more computing power and data traffic.

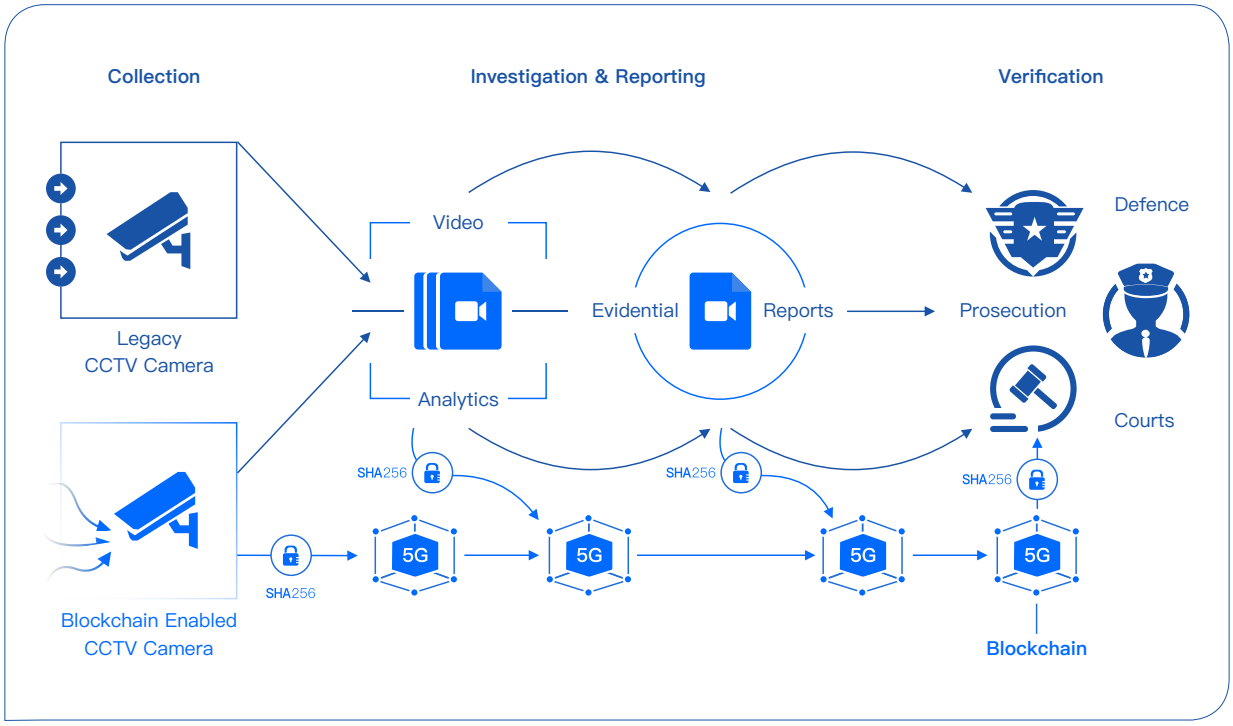
5.1 Video Streaming

4G technology has promoted the popularity of mobile video. Text and static photos have been replaced with cameras, video blogs, YouTube channels, Facebook Live, Snapchat, TikTok, and other channels of communication. Now, 5G is the foundation for UHD video. With the expansion of 5G, real-time video streaming will become more popular in mobile applications and social media.

HSN supports video stream uploading to blockchain under the 5G architecture. HSN transforms video content into hashes and stores it in the HSN network. It supports replacement of video index variables and storage variables. By using content-based indexing, HSN can upload the video stream to blockchain and execute smart contracts and intelligent interpretation of mass video and images.

Under the 5G architecture, HSN can support the following video scenarios:

- **Multi-scene camera application: analysis of 100+ key points to generate detailed information about the gender, age, and clothing of each person;**
- **Information storage in the HSN network, use of blockchain for accurate and efficient image analysis;**
- **All kinds of live video applications, decentralized video copyright protection. HSN disrupts the existing centralized application copyright, truly protects copyright revenue of original live videos, and provides P2P value exchange;**
- **Encouragement of more terminals to contribute video storage space and activation of idle video storage resources through the token incentive mechanism.**



Blockchain for Chain of Evidence Management in CCTV

5.2 IoV & UAV

5G supports direct communication between devices and builds a D2D (Device–to–Device) network. As a result, all kinds of IoT applications will be rapidly popularized. The first one is the "killer" applications — the Internet of Vehicles. HSN has unique advantages in big data management, security, transparency, and P2P transactions, which enables collaboration on equipment for autopilots, unmanned vehicles, and in other IoV fields.

HSN can be used in the whole motor vehicle value chain: from supply chain management and vehicle hardware manufacturing to autopilot, vehicle life cycle data tracking, and provision of data for autopilot. It can also save costs and optimize the operating process. After the vehicle data is uploaded to blockchain through the PoT module, when an accident occurs in the future, HSN will ensure timely data collection via real–time IoT data transmission. HSN will complete such financial scenarios as insurance compensation and second–hand car dealing. In the IoV scenario, HSN supports Self–sovereign Identity: when an original identification label is stored on HSN, a unique identification label is created. Besides these, with the help of the programmable logic (smart contract) controller mechanism for devices, blockchains provides an encryption interface for chips, thus ensuring system security in the decentralized environment.

5.3 (SD-WAN+NAS) SD-WAN + NAS

SD-WAN (Software-Defined WAN) is a popular network solution for inter-enterprise, enterprise-branch, and home applications. According to Gartner, by the end of 2019, 30% of enterprises will deploy SD-WAN technology in their branches. The release of 5G will further simplify network connection strategy, e.g. provide high reliability for inter-enterprise video conferencing.

Through SD-WAN + NAS (Network Attached Storage) under the 5G architecture, corporate and family users can use the hyper fusion technology to provide services together. SD-WAN implements 5G data stream encryption and flow control in the application layer; and NAS is introduced to the HSN network for storage sharing and backup.

In the SD-WAN + NAS application scenario, HSN will provide high-privacy and P2P transactions, simplify trust building, and pave the way for highly autonomous, agile, and simplified applications. HSN is secure and inherently tolerant to faults, because it uses public key encryption and timestamps to verify each record or operation. With HSN smart contracts, authenticity of products or transactions is verified through the public ledger; and regulatory and audit-related risks are reduced. At the same time, a credible mechanism is established on both sides.

5.4 Wireless Mesh Products

Wireless Mesh is an important wireless networking technology in 5G. It is applied for continuous wide-area coverage and ultra-dense network scenarios. It establishes a fast and effective wireless transmission network between base stations, improves the coordination ability and efficiency between base stations, and reduces the delay of data transmission and signaling interaction between base stations.

Ethereum founder Vitalik Buterin believes that incentivized Mesh Network is one of the best application cases for blockchain. With the help of token incentives and IoT terminals, HSN can help self-organizations create a flexible, decentralized, distributed, and self-repairing wireless Mesh network, provide higher speed and broadband than the Internet. Moreover, it is normally free of charge, therefore it can provide social, amusement, and business services in a more quick, convenient, and power-efficient way.

5.5 Edge Computing

With the development of smart terminals and edge computing, big volumes of instant interactive computing will be completed in edge nodes. The main idea of edge computing is that storage, transmission, calculation, and security of data are handed over to the edge nodes. HSN network conforms to the edge computing architecture. It can make full use of the node's computing power, is about to meet the docking requirements for IoT computing and storage devices, and improves timeliness of the perception-computation-response process in the IoT. Among the IoT applications, many scenarios require low-latency response, which makes cloud computing unprofitable. But HSN's edge computing model provides a new solution.

6. Economic Model

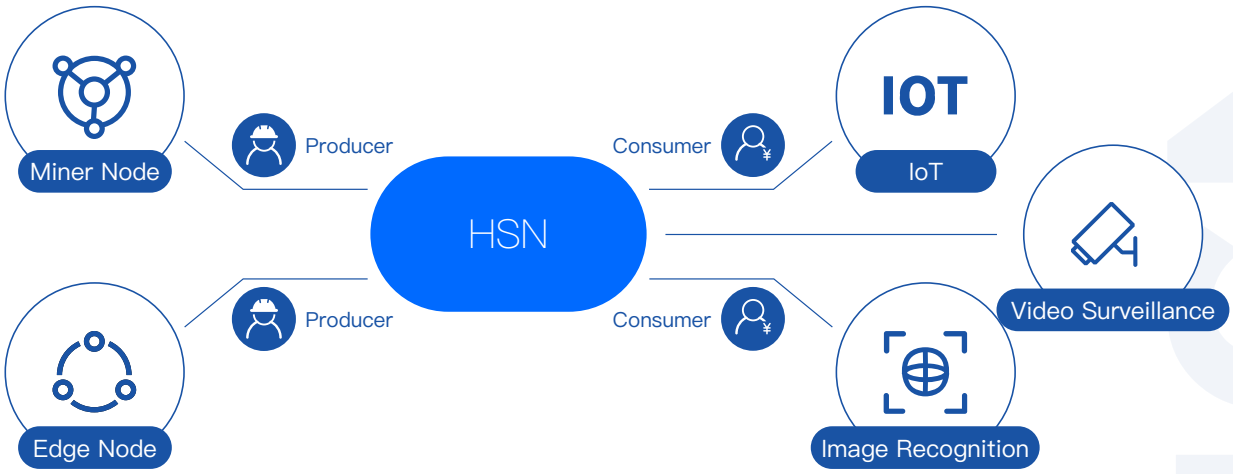
6.1 Value System

As a public chain for 5G application scenarios, HSN aims to support blockchain applications in complex 5G scenarios; therefore, HSN token will play a vital role. It represents the following main values of HSN:

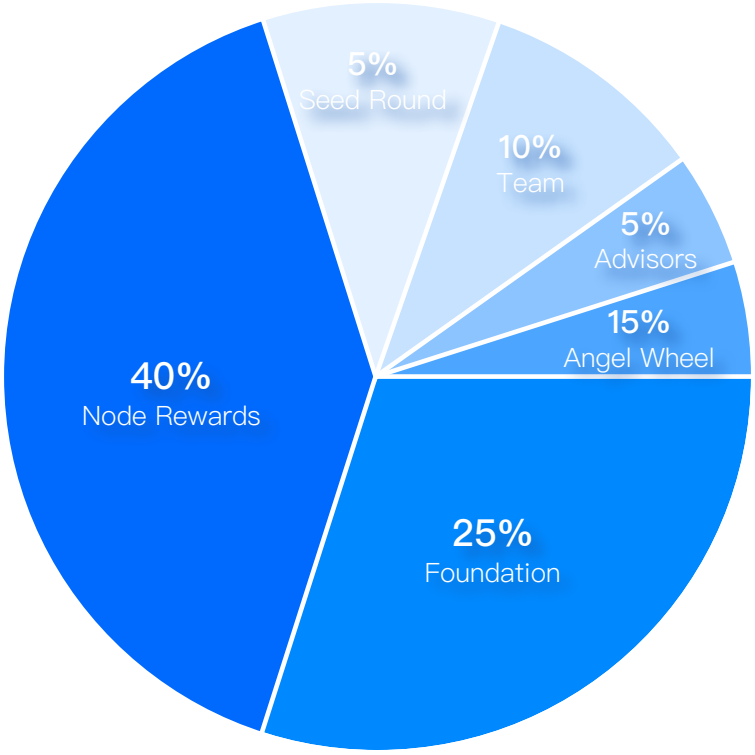
- Value carrier: when each application scenario is introduced or used directly, it consumes a certain amount of HSN or application's own tokens exchanged for HSN at a certain rate. With the gradual development of application scenarios, HSN will be used and consumed more and more; and its value will grow.

- Object of transactions : like on EOS, every transaction on HSN has no transaction fees. Its DApps also need HSN as collateral and a purchase resource. HSN supports smart contracts which interact with each other through atomic swaps.

- Incentive mechanism: with its active incentive plan, HSN encourages users to perform verification transactions actively in the system, create blocks, and generate positive feedback through economic means, so as to promote the steadfast development of the system. Token will be the incentive for the community's continuous contribution to the system.



6.2 Token Distribution



HSN Token Distribution	Qty	Release Rules
Total	1,000,000,000	/
Seed Round Financing	50,000,000	Complete release 6 months after launch on exchanges
Angel Wheel Financing	150,000,000	20%release before launching on exhcange, 40% release one month after launching on exchange, the rest 40% release on third month.
Team	100,000,000	Linear release one year after project development start
Foundation	250,000,000	Used for technical R&D, marketing promotion and community incetives
Advisors	50,000,000	Complete release 6 months after launch on exchanges
Node Rewards	400,000,000	50% will be rewarded on the basis of nodes event before mainnet goes online, and 50% will be rewarded on the basis of the regulation after mainnet goes online

7. Development Plan

Below are the basic milestones of HSN:

- **2018**
  - **Q4**
    - Project Establishment
- **2019**
  - **Q1**
    - Project Development Start
    - White Paper Release
  - **Q2**
    - Website Launch
    - HSN Global Community and Community Node Promotion
    - Project Release & Launch
  - **Q3**
    - HSN Enters Exchanges
    - SD-WAN Application Case Release
    - Wireless Mesh Network Application Case Release
    - Camera + Blockchain Storage Solution Release, Users Can Access Camera Data on Blockchain via HSN Cloud Platform
    - IoV + Blockchain Solution Release, Users Can Access IoV Data on Blockchain via HSN Cloud Platform
    - MiFi Product Release
  - **Q4**
    - Release of UAV Ecosystem Application Technology Based on the HSN Technology
    - White Paper 2.0 Release

2020

Q4

- The First HSN Hackathon, Third-party Development Platforms
  Ecosystem Partners Release an HSN-based Decentralized Value Circulation Platform

2021

Q1

- Release of 100+ DApps, User Activity and On-chain Data Interaction Rank First in the Industry
- 5G Blockchain Product Large-scale Commercial Use, Interconnection of All Things,
- Establishment of a Decentralized Reliable Business and Social Economic System

8. Management Team & Investment Institutions

8.1 Core Team

Richard Sheh

Computer Science MSc, Big Data and IoT expert, 10+ years in the telecommunications industry. Managed R&D of data communication and security products, served as core product Project Director in Sangfor Technologies Inc. Ex-manager of a high performance wireless communication product line in Tenda. The Key Technology of Ultra-high Speed and Large Capacity Intelligent Wireless Access Controller project developed under his guidance received the Shenzhen Science and Technology Project award of CNY 4 million. Has rich experience in the blockchain industry since 2017, led the development of key blockchain applications, such as traceability systems, digital wallets, digital exchanges etc.

Tommy Chai

10+ years in data communications, founder & ex-CEO of the data communications brand Tenhot, responsible for global brand marketing, and Cool House Technologies, together with China's leading provider of IoT solutions CoolKit co-founded the IoT + Communications company Kingway where he serves as CEO. Engaged in the blockchain industry since 2017. Has rich experience in operation and management of blockchain projects. Did in-depth research on cryptocurrency.

Daniel Sun

Computer Science MSc, data security expert, won many national and provincial awards in CUMCM (Contemporary Undergraduate Mathematical Contest in Modeling), graduate student tutor, published numerous academic papers during the master's study. After graduation, he worked in Huawei and VenusTech in R&D and management of cryptographic and communication systems. Has rich experience in product development and blockchain management, led the development of many systems successfully and widely used in commerce.

Peter Jia

Senior researcher of listed technology companies, serial entrepreneur in the Internet industry for 10 years, entered blockchain in 2013 for venture capital investment, main author of How the Blockchain is Changing Your Life.

Daren Yuen

Founder of Clicknews, early cryptocurrency investor, has years of experience in blockchain ecology, cryptocurrency mining farm, Project screening, Market analysis, and PR operations and business investment, successful early investor of Cardano(ADA)、UGChain、Loopring、Hcash、WaltonChain etc. qulity blockchain projects where he also participated in promotion and operation.

8.2 Advisors

Robert Van Aert

Master Degree in law from Tilburg University (Netherlands) and major in business law. Consultant for Fortune 500 companies entering China including Apple, Clorox and Oakwood, experienced in guiding Chinese investment and M&As in Europe in real estate and high-tech. Founder China Blockchain Partners and media platform China Crypto News and business consultant for several European and Chinese blockchain projects .

Mr. Michael Ott

Early blockchain evangelist, focuses on hyper-speed trading and chart analysis. Community builder and influencer within the European crypto community.

ZiTao Zeng

Blockchain technology expert, ET Wallet co-founder, Ethereum smart contract developer. Entered blockchain in 2013, successfully led the development of cryptocurrency wallets, cryptocurrency trading platforms, and public chains, has rich experience in the development and application of blockchain.

Alexander Jiung

Founder of Crypto Panda Capital, former Dell International computer company BSD Department Manager, serial entrepreneur of IT industry and pioneer of blockchain industry,participated in multiple blockchain project investments and mining farm investments, also assisted in the formation of China's largest blockchain alliance.Focus on Blockchain DeFi solutions and blockchain projects which can solve real problems。

Baoming Bai

Xidian University Professor and doctoral tutor (Xi'an, China), member of the Chinese Society of Electronics, Chairman of Information Theory Branch of the Chinese society of Electronics, Visiting Scholar at UC Davis, and ex-Deputy Director of the Youth Working Committee of the China Institute of Communications, IEEE ICCCAS '04 & ICCCAS '06 Wireless Communications Branch Technical Procedure Committee Co-Chairman, IEEE ITW '06 Technical Program Committee member. Research focus: information and coding theory, coding and modulation technology, wireless communication, and quantum communication.

Jiaheng Wang

Senior Humboldt Scholar (Germany), IEEE Senior Member, Professor of National Key Laboratory of Mobile Communications at Southeast University (China), doctoral tutor, expert in 5G mobile communication systems and blockchain. Long-term researcher of blockchain and wireless communication fusion technology, proposed the concept of Blockchain Radio Access Network (B-RAN), established a new architecture of distributed wireless access network, presides research projects of the National Natural Science Foundation of China, Jiangsu Natural Science Foundation, and the 973 Program. Maintains long-term cooperative relationships with Huawei, ZTE, NEC, Hisense etc.

Christina Chan

Zhejiang University Management Science and Engineering MSc, Senior Consultant, ex-Senior Consultant at Accenture, Senior Analyst at Dow Chemical, 10+ years of corporate management consulting and project management. Has served global top 500 companies in the US, India, South Africa, and Germany. Experienced in finance, energy, and chemical industry.

Chiyu Yu

Practicing lawyer in China, research focus: blockchain and cryptocurrency legal business. Member of the drafting team of the Cambodian Cryptocurrency Trading Act. Since 2017, studies legal systems related to the blockchain industry. Business areas: cryptocurrency trading platform and foreign investment application compliance services, token project framework design and legal due diligence, cryptocurrency investment legal services. Served blockchain industry customers such as exchanges, token projects and token funds.

8.3 Investment Institutions

嘉兰资本 GLORIOSA CAPITAL

极豆资本 Geekbeans Capital

智子基金 ZHIZIFUND

Chain Alliance Capital 链盟资本

CRYPTO CAPITAL 加 密 资 本

景晟丰合资本

算力猫 CAT.POW

TokenOWN 欧 / 旺 / 基 / 金

汉晨资本 HandSome Foundation

灯火区块链 LIGHTER BLOCKCHAIN

BSOEX

pk.top

Chain VC The wind of bitcoin freedom blows

托马斯资本 THOMAS CAPITAL LTD

銀 杏 資 本 GINKGO CAPITAL

cryptopanda CAPITAL

9. Risk Warning

9.1 Regulatory Risk

Blockchain technology has become the regulatory focus of the world's major countries. If the regulators exert influence, HSN may be affected: e.g. due to statutory restrictions on use, sales, tokens such as HSN may be restricted, hindering or even directly terminating the development of HSN applications.

9.2 HSN Application Lack of Attention Risk

It is possible that HSN applications will not be used by a large number of individuals or organizations, i.e. the public will not have enough interest to develop and promote the related distributed applications. Such lack of interest may have a negative impact on HSN applications.

9.3 Hacking and Theft Risk

Hackers or other organizations or countries may attempt to interrupt the functioning of HSN in any way, including DoS attacks, Sybil attacks, guerrilla attacks, malware attacks, or consistency attacks.

9.4 Vulnerability and Rapid Cryptography Development Risk

The rapid development of cryptography and science and technology, e.g. quantum computers, imposes the risk of cracking the cryptocurrency tokens and HSN platform, which may lead to loss of HSN.

9.5 Lack of Maintenance and Usage Risk

First of all, HSN should not be regarded as an investment. Although HSN may have some value after a certain period of time, it may be very small if HSN lacks maintenance or usage. In this case, if there is no platform in place, there may be no or few followers. Obviously, this is very unfavorable for HSN.

9.6 Uninsured Loss Risk

Unlike accounts in banks or other financial institutions, storage of assets in HSN accounts or on the Ethereum network normally has no insurance coverage. In case of any losses, no public organization will cover them; however, FDIC or private insurance companies are able to provide protection for buyers.

9.7 Application Failure Risk

Due to various reasons, HSN platform may fail and be unable to provide services normally. In serious cases, it may cause the loss of the HSN user blockchain.

9.8 Other Unforeseen Risks

Cryptocurrency tokens are a new and untested technology. Apart from the risks mentioned in this chapter, there exist other risks not mentioned or foreseen by the HSN team. Additionally, other risks may arise unexpectedly, including a combination of the above mentioned risks.

Hyper Speed Network