
A Decentralized Global Network Infrastructure Project

# White Paper

*V 1.0.7*

*CHELECOM FOUNDATION*

*(distribution is prohibited)*

# Contents

## Summary

In the modern era there are 3.6 billion people who cannot connect to the internet due to network coverage and payment gateway issues. The fact is, it would take an astronomical amount of resources for these people to all connect to the internet, an amount most communities could not spare. The CHELECOM Foundation will commit itself to letting those 3.6 billion connect to the world at a low cost and embrace the convenience it brings.

Next CHELECOM will strive to stop the monopoly of information held by internet providers. Currently, while providing internet services, the internet monopolies obtain and control large amounts of personal information. Through the distributed information sharing network and providing customized and personalized information services for everyone, we will change the current framework which the internet is understood to be.

Ubiquitous internet access around the world has paved the way for technologies like fiber optic networks, 4G macro sites, 5G micro sites, and soon SpaceX's Starlink (space-based Internet communication system) to permeate into our lives. Against the current, CHELECOM connects idle wireless access networks (3G/4G/5G) resources, idle fixed access networks (FTTH/ADSL) resources, idle communication satellite channel resources, idle user storage and computing resources through blockchain technology and provide these resources to those most in need. Every user will become a public node of CHELECOM's unique but ubiquitous network and enjoy reduced internet data fees. At the same time, users will contribute to the shared network and improve resource utilization for wireless and wired internet service providers, improve network coverage, as well as decrease broadband and data storage fees.

The mission of the CHELECOM Foundation is to create a world-class decentralized shared network and shared content ecosystem through blockchain, network acceleration and network sharing technologies. By connecting users and encouraging public access, CHELECOM solves internet cost and accessibility issues so that access to the internet is no longer bounded by service providers' network coverage or high cost services. Instead, everyone on the network is by definition a provider when they contribute data to the network and data is distributed across this decentralized network. This establishes a new business model where each participant contributes data which benefits everyone on the network. This is contrary to the mainstream model where users provide data and the internet providers reap all the benefits.

The global production capability forecast for the next 10 years will surpass that of the last few thousand years. Along with technological advances and the possible rebalance of world economics, old infrastructure and business models may all be replaced. Through decentralization, CHELECOM will connect the world and provide a platform where everyone has equal status and equally benefits.

Keywords: decentralized network infrastructure, blockchain, shared networks, decentralized content distribution

# Concepts

## 1. The Internet and Access Methods

The internet, also known as the world wide web, originated from a US Department of Defense project known as ARPANET. The goal of ARPANET was to create an international network of computers which allowed communication between one another through a fixed set of protocols. This design allowed for the development of the internet to the extent we now know of.

Below are some internet access technologies.

- telephone line access (dial-up)

  Used to be the primary way via which families connected to the internet. Through connecting to your phone line and accessing the internet via your phone service provider. Dial-up data transmission rate is limited to 56Kbps.

- ISDN

  Commonly known as "the do-it-all line." It uses digital transmission and digital switching technology to handle telephone, fax, content and graphical data on a unified digital network for transmission and processing. ISDN uses two 64kbps channels for data transmission and a 16kbps channel for signaling.

- ADSL

  One of the most effective types of technologies that provide digital services over local loops is Digital Subscriber Line (DSL) technology, which is currently the most widely used copper wire access method. ADSL can directly use existing telephone lines to carry digital information transmission through ADSL MODEM. The latest VDSL2 technology can achieve 100Mbps upload and download rates.

- HFC ( CABLEMODEM )

  An access method that uses the copper wire network of cable TV networks. With a dedicated connection line, users with cable TV can access high speed internet.

  Passive Optical Network (PON) provides fiber to the end consumer. A PON's distinguishing feature is that it implements a point-to-multipoint architecture, in which unpowered fiber optic splitters are used to enable a single optical fiber to serve multiple end-points. The total transmission capacity of the access system is 155 Mbps/622 M/1 Gbps upstream and downstream

- Mobile Communication

  Communications between mobile objects or between mobile and stationary objects. These objects can be people, cars, trains, boats, radio or anything in

motion. The frequency bands used include low frequency, medium frequency, high frequency, Very High Frequency (VHF) and Ultra High Frequency (UHF). Mobile communication system consists of a mobile station, a base station, and a mobile switching station. Mobile communications follow GSM, 3G, 4G, 5G and other international standards.

- Satellite Access

  Internet access through satellites is suitable for users who need higher bandwidth in remote areas. A small terminal (VSAT) needs to be installed along with an antenna and a receiving device. The download rate is normally around 1 Mbps.

## 2. Ad Hoc Network

Ad Hoc network is an autonomous, multi-hop network. The entire network has no fixed infrastructure. The nodes in the network have the functions of routing and packet forwarding and as a result any wireless network topology can be formed. Thus even when the existing network infrastructure (such as base stations, APs) cannot be utilized, users at different endpoints can still be connected.

Due to the random movements of each endpoint, the powering on and off of endpoints, the variable changes in transmission power of the wireless transmission device, the interference across the wireless channels, and different terrain features which may affect transmission, the resulting network topology may change at any time for better or for worse, and this change can be very sudden and unpredictable.

Strictly speaking, the ad hoc network does not have a command center. Every endpoint is equal. It is a peer-to-peer network in which users can join and leave at any time. Failure of any given node will not affect the normal operation of the network, and thus it is highly resilient.

## 3. Wireless Mesh Network, WMN

WMN has inherited characteristics of the wireless Ad Hoc network such as being decentralized, having no need for infrastructure, multi-hop, self-organized. It has also developed a new architecture to provide additional broadband access. As shown in Figure 1, a wireless mesh network consists of two types of nodes: mesh routers and mesh clients. Mesh clients can access the network through Mesh routers, and can also form a Mesh network with other Mesh clients. A backbone network composed of Mesh routers provides clients with connections to other network structures, such as the Internet, WLAN, WiMax, cellular, and sensor networks. In this type of wireless mesh network architecture, the mesh client's routing capability can be used to enhance connectivity and expand network coverage for the Wireless Mesh network.

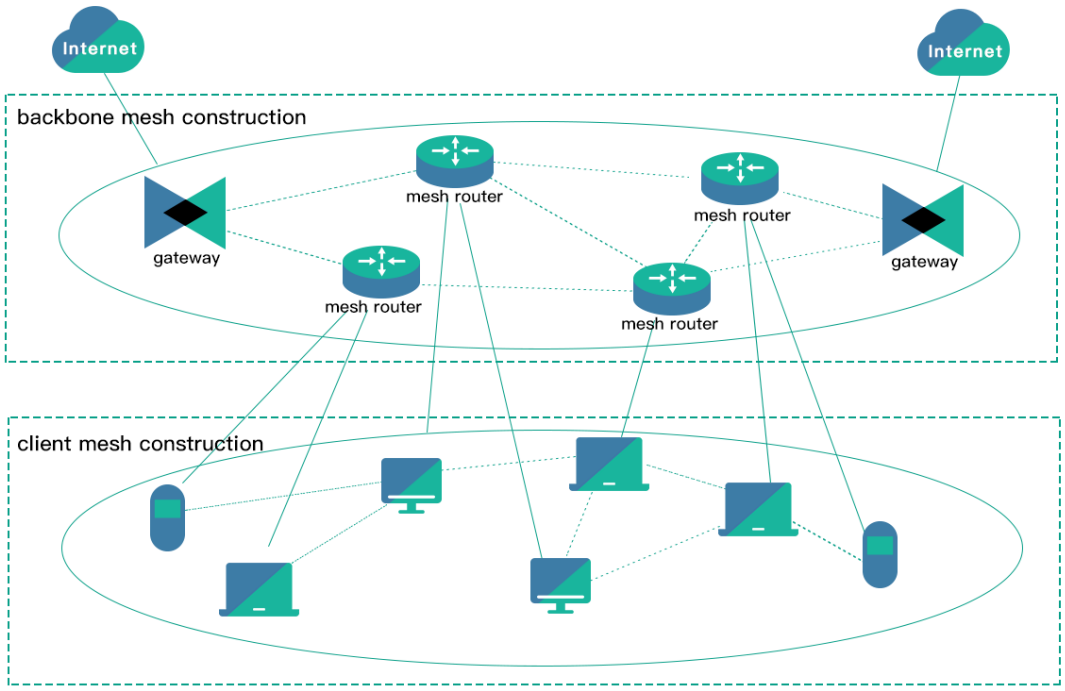


*Figure 1 Schematic diagram of wireless Mesh network*

Characteristics of the Mesh wireless network:

- Supports Ad hoc networks, is self-managed, self-healing
- Is a multi-hop network, but consists of mesh routers which serve as fallback
- Mesh router is mostly static and assumes most of the routing responsibilities, which greatly reduces the pressure on Mesh clients and other non-Mesh endpoints.
- Supports roaming endpoints
- Mesh routers support different wired and wireless networks and provides respective access points.
- Power consumption for Mesh routers and Mesh clients is different
- WMN cannot function isolated, requires the cooperation or other wireless networks

## 4. 5G Access

5G is the 5th generation of mobile networking. It's estimated that 5G will deploy for domestic use in 2020. So far, narrow-band Internet of Things (NB-IoT) related protocols in 5G have already been implemented through transformation of 4G LTE. In the 2018 Pyeongchang Winter Olympics, South Korea's KT provided the world's first 5G commercial network. 5G exhibits low latency, high reliability, and low power consumption. It is no longer a single wireless access technology, but an integrated mixture of new wireless access technologies and existing wireless access technologies (4G backward evolution technology) solutions.

Three major applications of 5G are (1) enhanced mobile broadband (eMBB); (2) ultra-high reliability and low-latency communications (uRLLC); (3) large-scale machine-based communications (mMTC). Examples include Gbps mobile broadband access, smart home, smart building, voice call, smart city, 3D video, ultra high definition video, cloud work, cloud entertainment, augmented reality, industry automation and autopiloted cars.

## 5. Shared Economics

Sharing economics refers to a new economic model based on receiving remuneration for sharing resources. It's based on the premise that idle resources and services which have a certain value can temporary shift ownership from one to another to overall improve utilization rate and reduce network costs.

## 6. Shared network

Network sharing refers to mediums such as computers or cellphones openly exchanging information and sharing resources via connecting to the Internet.

## 7. Content Delivery Network

A CDN, Content Delivery Network or Content Distribution Network allows data to be transmitted faster and more consistently than self-hosting. This is realized by a virtual assessment network that assesses according to the real time network traffic conditions, load status of each server, the distance and response time to users and redirects the user to the server that would serve the user the required resource the fastest. Overall this reduces network congestion and improves response speed when visiting websites.

## 8. Centralization and Decentralized Content Distribution

Mobile networking has brought a revolutionary change to the playing field of content distribution.

In the era of the mobile Internet, content distribution platforms have undergone a fundamental change. Social, editorial, and algorithmic platform types are three dominant styles seen in the market. These different styles dictate how content is produced and also strongly influences user consumption behavior and the service environment. The editorial style is advantageous in that there are knowledgeable editors who filter for the highest quality content and compiling before releasing the content. However the downside is everyone sees the same content and is not

personalized for the user. As social media platforms like Facebook, Weibo and WeChat grew bigger and bigger, content distribution became more and more decentralized and advanced to an era of "self-media", where every user can distribute content as long as they have subscribers. The algorithmic distribution style is relatively new and these platforms uses algorithms to determine and push user preferred content based on user data and user behaviors. However this style again returns to a centralized system.

## 9. Blockchain

Blockchain in essence can be viewed as a corporately maintained data storage solution which is decentralized and reliable. The technology uses block-chain data structures to verify and store data, uses consensus algorithms to generate and update data, uses cryptographic methods to secure data transmissions and access, and uses smart contracts to implement business logic to result in a completely new distributed infrastructure and computing paradigm.

In terms of economics, blockchain is a system with decentralized power and is close to being full autonomic. It has the following features:

- Corporately maintained (transactions and account info synchronized across all participating parties, efficient and hack proof);
- Distributed storage (increased cost of tampering)
- Decentralized (eliminated middleman, raised transaction efficiency, lowered transaction cost);
- Removed trust issue (Participating parties operated under a unified standard to reduce management costs).

Due to the above characteristics, blockchain will have the potential to achieve two major goals that the Internet has not yet achieved: 1) low-cost, 2) trusted environment, 3) high-speed data transmission

The consensus mechanism is core to blockchain. In the consensus process individual nodes communicate with one another to decide whether data is admissible or not and act accordingly. The consensus mechanism refers to the algorithm that controls the consensus process. There are two types of consensuses, one is Dynamic Equilibrium where consensus is reached for everyone eventually, such as Proof of Work. The second type reaches consensus after everyone affirms the data, like Practical Byzantine Fault Tolerance (PBFT).

Proof-of-Work (PoW) depends on every participant on the network to perform calculations to achieve consensus. At each time, the data chain is modified, a PoW must be submitted. As one can imagine resource consumption is high and efficiency is low.

Proof of Work's fault tolerance is 50% as anything over 51% means the Proof of Work system has failed. For Proof of Stake, the difficulty of obtaining the node's

bookkeeping rights is inversely proportional to the rights held by the nodes. Compared with PoW, the computational resources required is reduced to a certain extent, and the performance is correspondingly improved. However, hash competitions are still the way to acquire the right to write to the chain, which may hinder supervision. This consensus mechanism has the same fault tolerance as PoW. It is an upgraded version of PoW. According to the proportion of tokens occupied by each node, the difficulty of mining is reduced in proportion, thereby accelerating the speed of mining.

PoS and PoW are the two most popular consensus mechanisms presently. PoS consumes less resources than PoW but also has two disadvantages:

- "The rich get richer": as more coins get mined the owners of these coins get more chances to bookkeep and earn more coins, potentially alienating new users and stifling the development in the long run. If too many stakes are owned by the founding team, then team risk becomes high. The founding team does not own sufficient stakes, it will be hard to manage the community and deal with the fork in the chain.

- When it faces a malicious fork, it lacks resilience. For PoW's public chain, when the chain is forked, each node can only “mine” one of the forks, using the longest Merkel tree mechanism to naturally resist the other forks. For PoS, the owner with the stakes will benefit from both forks of the chain at the same time. When this happens, irreversible damage may be caused. There is not any proven mechanics to fix this but relying on community management and third-party services.

The principle behind Delegated POS and POS is the same. The main difference with DPoS is that nodes in a pool elect a delegate to represent nodes in that pool to authenticate and record each transaction. Its compliance, performance, resource consumption, and fault tolerance are similar to PoS. Similar to a board of directors vote, the delegate declares a certain number of nodes to represent to authenticate and record on their behalf. Each agent has an amount of influence proportionally to their shares, and the result of more than half of agents’ votes will be irreversible and binding.

The practical Byzantine fault-tolerance mechanism: In distributed computing, different computers try to reach consensus through message exchanges; but sometimes, computers might produce system errors and exchange false messages, disrupting the consensus. According to the number of faulty computers, General Byzantine's fault-tolerance would search for possible solutions by accepting the greatest common data amongst every node. This mechanism provides (n-1)/3 fault tolerance with guaranteed flexibility and safety.

In addition to the above-mentioned consensus mechanism, there are other consensus mechanisms that are at different stages of development and will not be described in this document.

# Market Analysis

## 1. Global Internet Market and Current Status

From 2005 to 2017 June, the internet browsing population grew from 1 billion to 3.89 billion, reaching 51.7% of the world's population. Two thirds of these people are from developing countries and China is leading the world with 751 million internet users. Mobile networking utilization rate has already surpassed the immobile broadband with 7.72 billion devices. The internet is becoming more and more to be an indispensable resource just like water and electricity.

However, the global expansion of the Internet is stalemating. There are still 3.6 billion people in the world who cannot connect to the Internet. The Internet has entered a period of conversion, and has changed direction from connecting 'people' to connecting 'everything'.

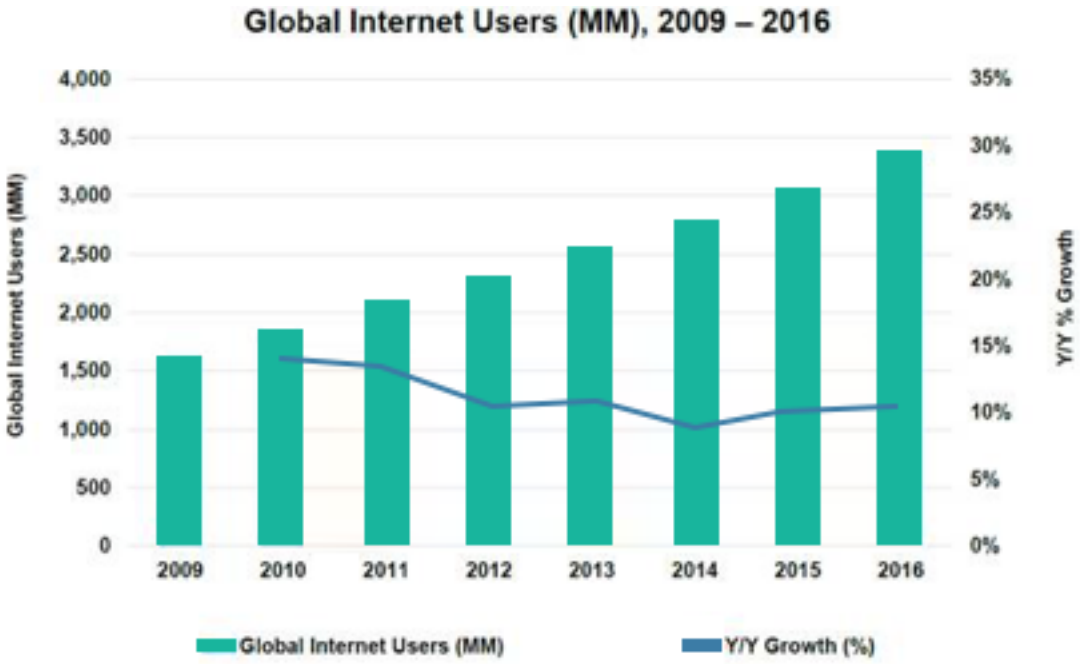


*Figure 2 Number of Internet users worldwide（note1）*

*（note1：《INTERNET TRENDS 2017》，Mary Meeker，May 31, 2017）*

## 2. The State of the Modern Internet

The internet was created with a decentralized design to solve long distance information transmission and has become the greatest invention of mankind over

the past 30 years. However, it also became more and more centralized with authority over internet access given over to large telecommunication companies around the world. Among the hundreds of major telecommunication operators in the world, the total number of customers from the top ten has exceeded 2 billion.

While taking advantage of political agendas, capital, and its user base to establish a monopoly, these service providers have brought about the following drawbacks:

- Due to the competitive nature of the market, service providers must have their own infrastructure and this results in fiber optic networks, wireless base stations and other infrastructure to be excessively and extensively built, and these wasted resources are billed to the customer.
- Instead of a truly open network, each provider goes out of their way to make sure competitors are operating at the highest costs, lowering overall network efficiency and hampering user experience.

## 3. Half the World Still Lacks Access to Internet

Even though the internet has rapidly becoming a necessity in the past 30 years, the trend has not developed itself in every part of the world. In developed countries, 80% of the population have access to the internet, but in developing countries only a third of the population meet the basic requirements for internet access and in undeveloped countries only 10%. There are still 3.6 billion people in the world without internet access, these people are mainly spread across Asia, the Middle East and Africa.

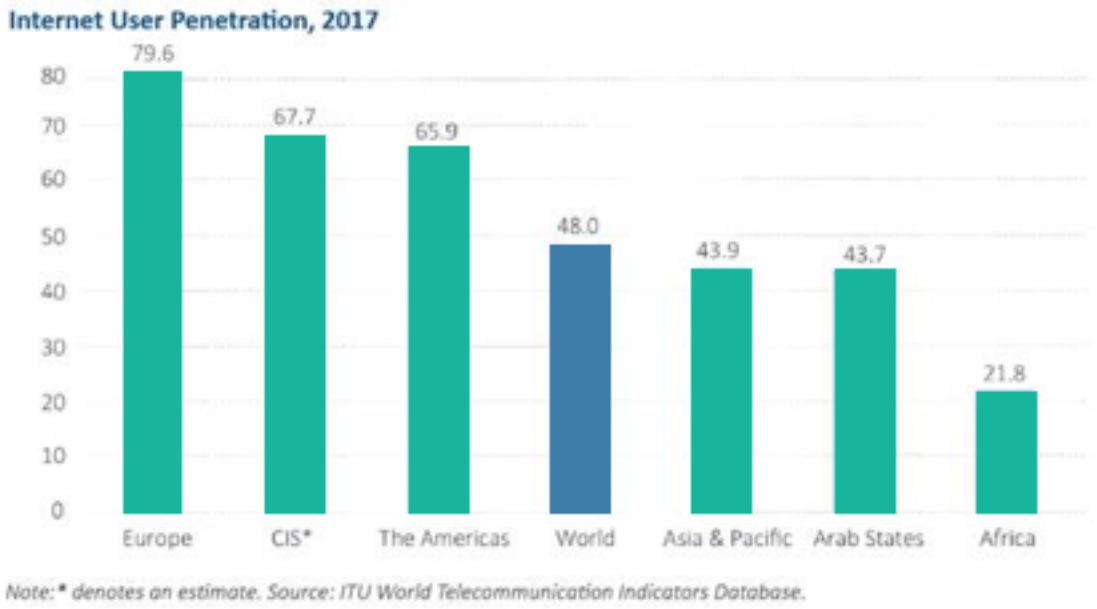


*Figure 3 Global network user access ratio（note 2）*

*note2：The state of Broadband 2017, ITU/UNESCO Broadband Commission*

There are two reasons why half the world are still not connected to the internet:

- Lack of infrastructure and coverage in the area
- Lack of finances (consumer)

To address the lack of internet access in poor and undeveloped countries, many attempts have been made:

- Google Project Loon

Project Loon is a project born out of Google X Labs. Through sending computers and telecommunication infrastructure 60000 feet into the air, Project Loon would provide 3G network access for those with mobile devices.

- Facebook Free Network Project (Internet.org)

In this project, drones in the air emit data carrying laser to provide network access. Each drone will be connected to a terminal on the ground. Data sent to drones will be propagated through LTE or Wi-Fi networks. These drones are powered by solar energy so there is no need to worry about drones falling. Facebook plans to use 1,000 drones to help 5 billion people worldwide access the Internet.

- OpenCellular

OpenCellular's target is widespread network coverage through extensive networks of cheap infrastructure in places like the city streets, the countryside and poor areas.

- Starlink

Starlink, if it succeeds, will become a broadband satellite network. Patricia Cooper, vice president of satellite affairs at SpaceX, said at a senate hearing in front of the Commerce, Science and Technology Committee that the company will use its own Falcon 9 recyclable rockets to send 4425 satellites over 6 years into orbit to provide high-speed broadband Internet services to customers around the world. In 2017, this program was expanded to include 12,000 satellites in low-orbit tracks and two-communications (K/V) bands, providing Internet access with speeds up to 1 Gbps, far surpassing the current 4G speed, and the future 5G wireless network, and even most of the wired network. This kind of super Wi-Fi is bound to rewrite the entire networking era.

## 4. The importance of Micro Sites in 5G

3G and 4G mobile networks are mainly built using macro sites. There are issues associated with macro sites:

1) Macro sites coverage field varies in signal strength. Specific locations can have weak or no signal. Macro sites are usually located on top of buildings or

towers for better coverage however it is often adversely affected by buildings and trees leading to inconsistent and variable signal strengths. As frequencies rise to avoid the crowded 2.4GHz, 4G and the future 5G signal strength will become worse especially in cities where there is plenty of signal obstruction due to construction density. In China a study done suggests over 80% of complaints against internet service providers signal strength related.

2) Hot spot overcrowding

   Even if macro sites did not have signal consistency problems, it is hard for a macro site to deliver enough data to populated hot spots such as airports, stadiums and hotels.

3) Densely placing macro sites creates more problems than it solves

   Macro site placements take into account the geographical location, the physical environment for the server room, the site's atmospheric conditions, and the variable cost factors associated with the localization of the base station. As such, site resources are limited and precious, especially so in densely populated areas where many of the mentioned factors cannot be satisfied.

   Intuitively it seems 5G brings an increase in the magnitude of network speed, but this is also accompanied by an increase in the frequency of communications. In China, it has been determined that 5G will be deployed in the frequency bands of 3.3-3.6 GHz and 4.8-5 GHz. At the same time, opinions are being gathered on the high frequency bands of 24.75-27.5 GHz and 37-42.5 GHz. Currently, the world uses 28GHz frequency band (wavelength of 10.6mm) as a temporary standard to conduct experiments. This frequency band may become the first commercially available frequency band for 5G. The higher the frequency of the electromagnetic wave, the shorter the wavelength, the closer to straight-line propagation ( diffraction decreases ), and the greater the attenuation in the propagation process which means 5G micro site coverage area will be significantly reduced so multiple micro sites would need to be set up to cover the same area.

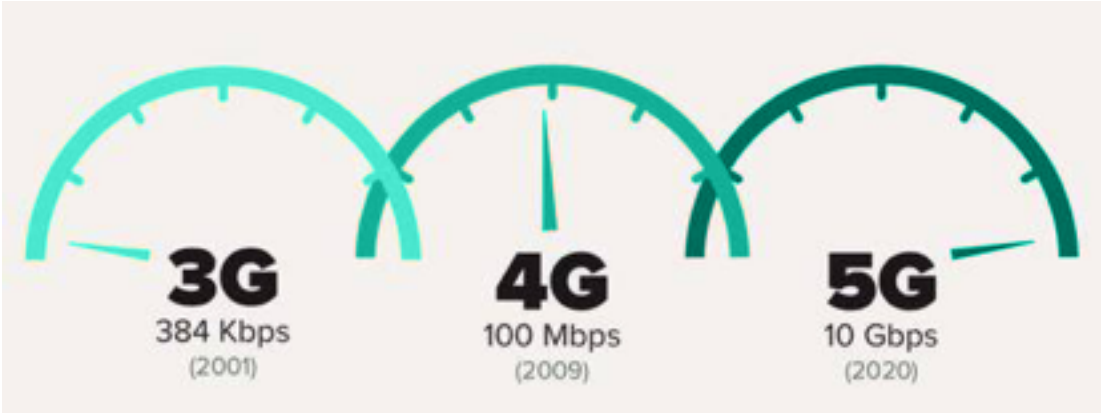


*Figure 4 3G, 4G to 5G Network*

Compared with 3G and 4G, the emerging 5G is mainly based on millimeter wave and beamforming. In addition, there has been a new advances in 4G technologies

such as carrier aggregation and Multiple Input Multiple Output (MIMO). The carrier wavelength of 3G/4G is on the decimeter level, and the antenna length of the micro site is also similar. But for 5G, the carrier wavelength has become millimeter-level so the antenna can be made smaller. As a result, 5G site deployment will no longer follow the old path of macro base stations and tower companies. A small cell, a micro cell, a nano cell, a pico cell, or even a femto cell will appear in large numbers. Their main application is in densely populated areas, covering peripheral communications that macro sites cannot reach.

Self-organizing network (SON) technology is another mechanism implemented by micro sites. SON is used in order to better configure, optimize, and repair groups of micro sites because of its self-managing aspect, as the name implies. Researches in 5G usage pointed out that more than 50% of network resources are occupied by 1% of users, and this 1% is often in the city centers and commercial areas. The use cases in these areas are complex and require highly configurable networks. What's more, the Internet of Things network in these regions is also extensive. SON can be seen as a bridge between 5G communication and IoT communication, providing a more effective communication system for such areas. If service-oriented SON networks become possible, future micro sites operation rights may shift from large corporations to the hands of small businesses whom CHELECOM can partner well with.

## 5. The Revolution of Internet Access

The United Nations estimates that in order for the world to have internet by 2020, 35 to 50 trillion dollars needs to be invested annually over 3 years', or 100 trillion to 150 trillion dollars total. No state or corporation is able to fund that amount. Divided by everyone without internet (3.6 billion), that's an average of $3000 - $4000 for each to pay.

As we can see, Wi-Fi users represents the majority of users on Mobile networks.

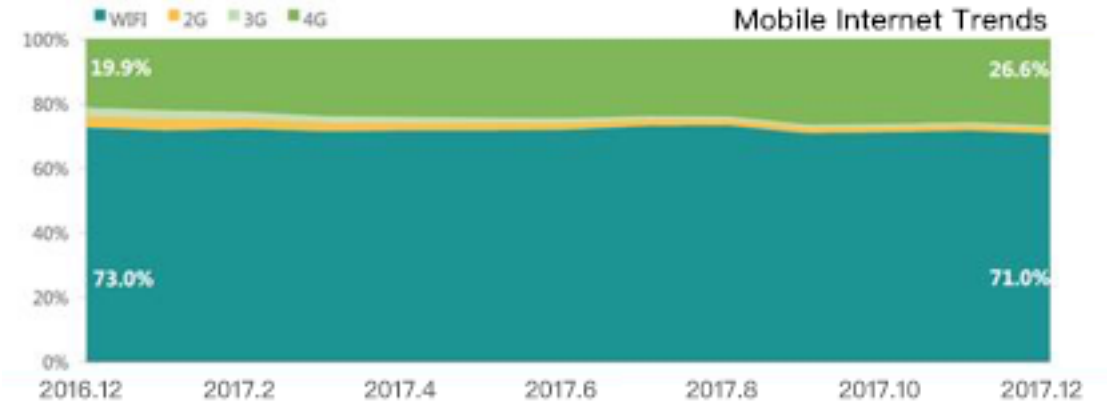


*Figure 5 Global network user access mode（Source：Trustdata 2017 移动互联网行业发展报告）*

Internet access centered around telecom providers does not address the needs of the remaining 3.6 billion people yet to be connected. The service providers' profiting from providing services based on proprietary infrastructure which have continued for decades needs to change.

Is there a way for telecommunications operators to share infrastructure with third parties (including consumers) to avoid duplication of efforts and wasting of resources? When building one network is enough, why do you need to build 10 or even hundreds?

Can consumers participate in the construction of network infrastructure? Can we lower the money needed per capita from 3,000-4,000 U.S. dollars to 100 U.S. dollars so that everyone can afford it?

## 6. Prospects for Decentralized Content Sharing

With the rapid growth of mobile Internet, the form, content, and consumption patterns of Internet content have undergone tremendous changes. What's most noticeable is the fragmentation of users' time and the new emphasis on individualism and behaviorism, and new standards are also imposed on the style and speed of content distribution. The mode of distribution is rapidly changing from a traditional centralized style to a decentralized style and the content creation process has changed along with it. People use apps on their phones to directly transfer music, videos, photos, or any other digital content with their friends. This type of transmission has already become a mainstream approach.

*Figure 6 Point to point Mesh*

In a decentralized content distribution platform, everyone is a distributor and recommender. Therefore, when another person learns about a movie, a TV drama or a fun game, the person naturally becomes an information distributor, and can quickly share it with friends and thus spreading the information exponentially. In 2010, Facebook's home page traffic exceeded Google's traffic, meaning social

distribution has become the mainstream distribution method. Citing one of few Research Center's survey, 62% of American adults get news through social media, 18% are highly dependent on platforms, and 44% of people read news through Facebook.

Social distribution also brings new problems:

After the platform has garnered enough popularity, content distribution becomes monopolized again with the most popular people having lots of influence and controlling the distribution rights. For example, most of the traffic on Weibo is occupied by marketing companies, and the cost for new content creators to get traffic increases dramatically.

On the other hand, as users continuously expand their social circles and subscribe to more and more sources and the quality of content also gradually declines.

Social distribution frees people from information scarcity but brings information overload. In order to optimize the user's information consumption experience, Facebook first applied the Edge Rank Algorithm in its News Feed to filter out garbage content. Facebook then devoted itself to improving the sorting algorithm through machine learning. In addition to the Edge Rank ranking, it added new features and sorting methods, such as Story Bumping, Last Actor, and so on. Studies show the AI content distribution methods developed based on deep learning has shown great effect in retaining new users and has been the deciding factor in what people see when they log in. However, how do we reward each contributor as they generate content? How do we combine artificial intelligence and decentralized content distribution? This is a topic that CHELECOM hopes to explore.

## 7. CHELECOM's Vision

Equitable participation and development are universal aspirations for citizens around the world. Equal opportunity is the basis and prerequisite for all other equality. CHELECOM is committed to applying the latest information, communication, and blockchain technologies to promote equal opportunities and create an equal access network for citizens around the world. In this network, we will heavily promote AI based decentralized content distribution and information sharing so that each customer will receive equal access to information services as a consumer, a contributor, and a distributor.

On the one hand, CHELECOM strives to eliminate the disadvantages brought by a centralized system as mentioned above. On the other hand, CHELECOM hopes to be able to break traditional geographical constraints and broadens the way people connect in underdeveloped and remote areas.

CHELECOM believes that decentralization is not about removing a central power, but that each node is free to choose a center. In the CHELECOM decentralized

network system, any device, any person is a node and can also become a central power but these central powers have no authority over any other node. No central power is permanent but is transient. All information and content are not sent out from a certain center but are created by users in the network. Each person and each device is an independent node with the power to create.

# Introduction to CHELECOM

## 1. CHELECOM's Development Phases

The CHELECOM network ecosystem will experience two major phases.

The goal of the first phase is to use decentralized mechanisms to provide a low-cost, universal, and convenient mobile access network for the general public. "Connecting more people" is the main goal of this phase. In this phase, in line with the downsizing of mobile network base stations, the development of the CHELECOM network will be combined with the development of 5G networks. With the accumulation of years of resources, CHELECOM plans on using its nodes to establish mini service providers who will host micro sites for 5G networks. At this stage, CHELECOM's reward incentives will be biased towards nodes that provide a lot of traffic and low-cost traffic. At the beginning of the first phase, CHELECOM participants and communities will set up non-profit foundations to complete their DNET Passport crowdfunding through private equity and overseas public offerings. Under the leadership of the community, the foundation will direct the distribution of capital raised and investment.

The second stage goal is to make CHELECOM a decentralized content distribution platform. With the convergence of traffic on CHELECOM, the decentralized information flow will become one of CHELECOM's core values. After completing the first phase of the mission, CHELECOM will introduce new incentives to encourage the distribution of content and the dissemination of information. Integration of artificial intelligence will become one of the highlights of this stage, enabling smart recommendations and customized information distribution.

## 2. First phase technology overview

CHELECOM blockchain system is built from a basic blockchain framework with application level toolkits and apps based on smart contracts. Our core values are:

- Supporting the smooth establishment of the CHELECOM community. As a public chain tightly integrated with network access, CHELECOM's technology architecture needs to comprehensively consider the needs of equipment manufacturers, home users, individual users, application developers, regulatory authorities, and existing Internet access agencies to achieve wins for everyone;

- Support Delegated (Proof-of-Stake+Proof-of-Traffic) consensus mechanism, which not only allows community managers to express their function, but also rewards new and active participants. It also is more resistant to hard forks

- Support the circulation of the DNET token, and establish an economic system around it. The economic system needs to be able to provide services for those who need wireless access at the cheapest price. At the same time, service providers will be rewarded through digital asset appreciation. Ultimately, the appreciation of the value of the entire economic system will further promote more content and content distribution in a positive feedback cycle.

## 2.1 CHELECOM Blockchain structure

CHELECOM's blockchain can be broken down into 3 layers. Application layer, middle layer and the chain layer.

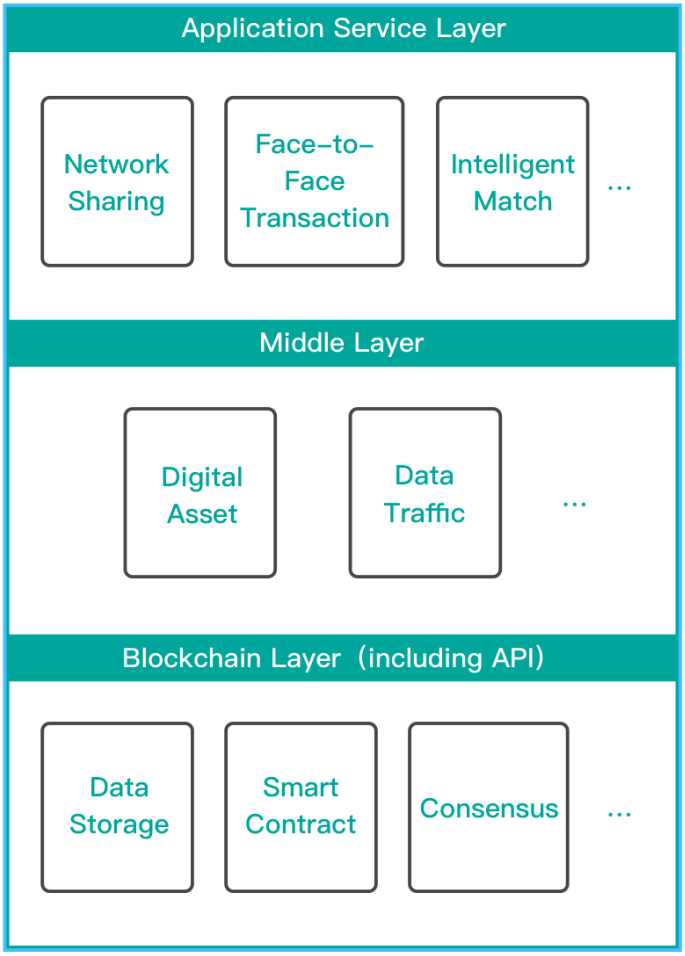


*Figure 7 CHELECOM blockchain structure*

CHELECOM's blockchain products will include the above modules. It can be integrated into mobile WiFi hotspots in the form of pocket mining machines, smart

homes/commercial routers, common computers or servers, smart light poles, 5G micro sites, satellite communication terminals, and iOS or Android mobile apps.

## 2.2 Chain Layer

### 2.2.1 Data Storage

CHELECOM uses the Merkle tree structure for compressed storage of blockchain data. CHELECOM nodes are divided into light nodes and data service nodes. The types of light nodes include pocket miner nodes and family nodes, where only the latest block data and the Merkel tree's final value are stored. The data service node is a distributed data storage server that contains all the data generated in the blockchain and the complete Merkel tree hash. When the light node needs to use earlier block data, it will send a request to the data service node and verify the authenticity of the obtained data through the Merkel tree hash.

Data traffic is the credential for traffic transactions. The traffic sharing smart contract will determine the authenticity of the traffic transaction through traffic transaction credentials. ID is the unique identifier of the data unit. ID is used to identify that the data unit belongs to the data segment sequence in traffic sharing. The basic data traffic unit is an arbitrary number based on data size. For example, a basic data traffic unit of 1M.

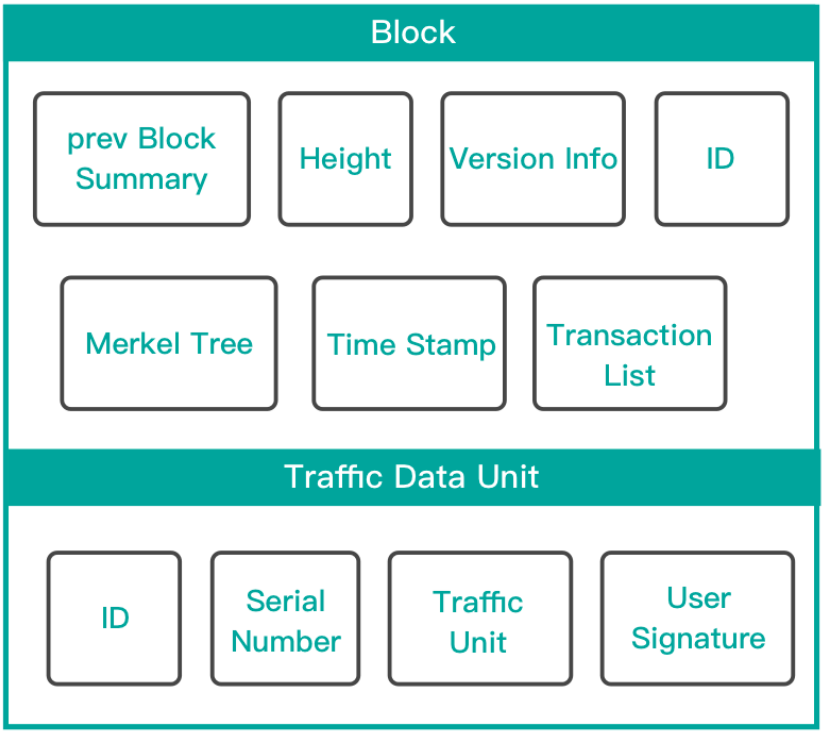


*Figure 8 CHELECOM data structure*

### 2.2.2 Smart Contract

CHELECOM achieves the initiation, execution and publication of transactions through smart contracts. Users can define the logic of smart contracts through a variety of programming languages. After publishing the smart contract to the blockchain, the user can customize the conditions of the contract for a digital asset transaction.

Figure 9 shows the traffic sharing contract of the CHELECOM network. The traffic sharing contract is a smart contract with a fixed contract address that has been built into the network since the CHELECOM network was born. Traffic distributors provide free smart contract access for ordinary users who need to access the Internet.

When an ordinary user needs to access the Internet, the user issues a request to the traffic sharing contract and submits a DNET deposit. The deposit amount is determined by the cost of the traffic and the amount of traffic the user needs. The CHELECOM system will assign users to eligible traffic distributors.

During the period when the user uses the traffic to access the Internet, the user needs to periodically send the traffic usage certificate to the traffic distributor. The traffic distributor obtains the due fee by submitting the user-supplied traffic usage credentials to the contract.

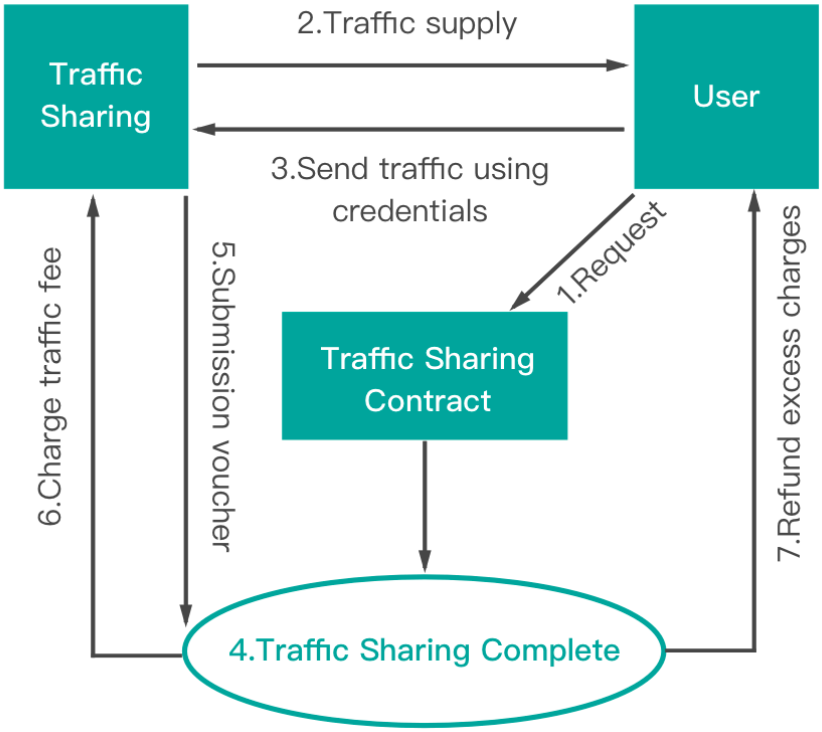


*Figure 9 CHELECOM data sharing smart contract*

### 2.2.3 Consensus Mechanism

In the first phase of the CHELECOM community development, the core requirements of the consensus mechanism are as follows:

- Need to ensure verification speed is on the seconds level. Taking into account the wireless access scenarios, a new user purchasing DNET to obtain services and similar transactions needs to be completed within a maximum of 15 seconds.
- Need to encourage wireless traffic providers, those who provide traffic should get the corresponding token or token reward. And the more traffic you provide, the more rewards you should receive. However, it is necessary to avoid directly associate distribution with tokens. Otherwise, it is very easy to generate invalid traffic for the purpose of obtaining tokens and trigger the collapse of the shared economic system.
- In addition to the amount of traffic, the price of traffic is also an important factor to consider. High-priced traffic is unpopular in most cases, and only inexpensive and high-quality traffic is worth encouraging.

Considering that both mobile nodes (ie. cell phones) and the static nodes (family PC's) have relatively low computational performance and the current major PoW

blockchains have all transitioned to using application-specific integrated circuits (ASICs) to increase effeciency, PoW is not a suitable consensus mechanism for CHELECOM. PBFT and other mechanisms are inefficient in the complex network environment faced by CHELECOM. CHELECOM will focus on optimizing the DPoS mechanism.

About transaction authenticity

On the blockchain of CHELECOM, an average block is generated every 10 seconds. Based on the DPOS consensus mechanism, after a block is generated and broadcasted, it is considered that the transaction contained in the block has been finalized. So for a small transaction, when the block is received, there is about 10 seconds before the transaction is confirmed.

In some extreme cases, such as network congestion, malicious fork constructors performing double spending attacks, etc., when the node continuously drops two blocks, there is a large probability that it is in a fork. When a node drops three blocks in a row, it can basically confirm that it is on a fork. So node users should wait for at least three consecutively confirmed blocks to ensure that their transactions are actually confirmed.

About fork

When bifurcation occurs (chain fork), DNET delegates actually can benefit from both forks. However, due to the uniqueness of the traffic, users of the traffic node cannot provide the same traffic to different users on the two forks at the same time. In order to ensure that their work is recorded in the block, each node will choose the most publically recognized forked of the two. In this case, as traffic converge into one of the forks, the fork becomes the most recognized and the longest fork in the chain. Other forks are eventually abandoned because nobody uses them.

## 2.3 Middle Layer

The middle layer of the CHELECOM blockchain abstracts some typical blockchain applications, provides framework with basic capabilities and implementation for typical applications, and users can easily build blockchain applications that match their own business logic on said framework.

### 2.3.1 Digital Assets

Blockchain is an asset-chaining value-propagation network. Asset-chaining, where assets are published to the chain, is a key step in the distribution of digital assets such as pictures, music, and game equipment. Users can use the digital asset framework to manage existing assets through operations such as pricing, splitting,

and transferring. Once on the chain, all operations on the asset, including transactions, leave signatures that provide the foundation for CHELECOM's stage 2 focus: content distribution.

For example, gamers can use digital asset frameworks to build a blockchain-based equipment trading system. Players' game asset transactions will be protected by the blockchain. Blockchains can also be used to implement cross-game transfer operations.

The Digital Assets Framework is an open source project. The CHELECOM community will work together with blockchain developers to jointly develop and maintain digital asset frameworks.

### 2.3.2 Data Traffic

Various data services, including traffic, need to be quantified by segmentation and encapsulation. The quantified data can then be stored as digital assets. In particular, traffic is an important asset in CHELECOM. The allocation of DNET tokens are based entirely on traffic flow. Therefore, the traffic framework must integrate statistical and qualitative anti-spoofing mechanisms to resolve trust issues between service providers and consumers.

For example, a consumer can charge traffic a fee by submitting a credential with the user's signature saying they received the traffic, thereby preventing traffic sharers from falsely reporting traffic flow. However, the user needs to periodically provide their signature (traffic credential) to the traffic sharer to keep the traffic transmission from stopping. When the user stops submitting traffic credentials, the traffic distributor will stop the supply of traffic. Through this mechanism, we effectively prevent inaccurate charging of traffic and the resulting consequences.

## 2.4 Application Layer

The application service layer provides application services to the customer based on the blockchain design. The current application service layer includes a network sharing interface. CHELECOM blockchain is based on the principle of open sharing. In the future, we will work together with related industry partners to explore more application scenarios of blockchains and jointly develop new application services.

### 2.4.1 Internet Sharing

The network sharing application is an open source SDK developed by CHELECOM. CHELECOM's traffic sharing devices all use the SDK to access the CHELECOM blockchain. As an example, devices such as mobile WiFi hotspots

and routers can access the CHELECOM blockchain through the built-in network sharing SDK. Manufacturers can also manage their own business model by changing the SDK code as they see fit.

The network sharing SDK provides users with the most basic CHELECOM blockchain access and contract calling abilities.

### 2.4.2 Face to Face Transactions

All devices that install face-to-face transaction applications can achieve face to face DNET transferring. Specifically, the sender can select a nearby device or input a target device wallet address, and then perform the transfer operation by setting the transfer amount and password. The sender then tell the receiver the password somehow (just like EMT). The receiver confirms the DNET by entering the correct password on their device. When the recipient fails to enter the password within the time frame set by the system, DNET will be returned to the original owner.

The face-to-face transaction application provides the user with a safe, reliable and convenient DNET environment for offline transactions. CHELECOM also supports the use of integrated DNET blockchain devices for other digital currency transactions.

### 2.4.3 Smart Matching

The CHELECOM network can dynamically and optimally route the user to most suitable traffic sharer to lower costs and increase network speed and network stability. This requires the integration of location-based traffic sharing services in the corresponding service nodes, thereby providing customers with the cheapest and most stable data flow. If the connection is not stable then the network will reevaluate to find a better network path.

# 3 Second Phase

In the second phase of Chelecom's development, the core value of the ecosystem shifts to decentralized content distribution and the content-based AI based mining and recommendations. At the center of this development is how we introduce a new DToken production mechanism.

The current challenge in the content distribution field is how to obtain a safe and effective decentralized information recommendation service without sending personal data to service providers. With the establishment of the CHELECOM network, each node becomes both a distributor and a consumer of information.

- CHELECOM allows many content miners to develop customized information recommendation services in the form of smart contracts.

- Requester of content describes his/her needs and pays a certain amount of DNET or is free of charge, depending on the settings
- Content miners uses the algorithms to process the information. This process is similar to mining, and provides recommended content for the consumer periodically.
- For content providers, if their content is chosen by the artificial intelligence engine, the smart contract will allocate the corresponding reward.
- For consumers, they can cheaply access smart recommendation service.
- For content miners, they receive advertising revenue and DNET tokens from content consumers

Lots of further testing and modeling are required to figure out what DToken/content ratios to use when rewarding distributors and content creators in the first phase of CHELECOM.

# The Establishment of CHELECOM Ecosystem

## 1. DNET and DToken Coin System

### 1.1 Before Mainnet

DNET is a public blockchain. Prior to the birth of mainnet, the temporary ERC20 passport tDNET will be created. Its main responsibility is to allow foundations and communities to practice the circulation and the economics system of the DNET. Within six months after the completion of financing, tDNET will conduct a 1:1 conversion with the final version DNET.

### 1.2 DNET Release Plan

#### 1.2.1 Summary

DNET will start with 750 million DNET tokens for no more than 149 non-mainland (China) and non-U.S. based institutions. Under the guidance of CHELECOM, DNET will be assigned to the community in batches to help offset CHELECOM platform technology, hardware and bandwidth costs, project operations, marketing and so on.

The founding team of the CHELECOM Foundation has done a lot of work in terms of project design, resource organization, technology development, and business incubation. At the same time, they have carried over many years of experience in fields such as wireless networking, WiFi operation and Internet of Things. Since its founding, CHELECOM has had a low-cost WiFi access network that covers millions of people as well as mobile WiFi hotspots supporting CHELECOM, 4G LTE micro sites, 5G micro sites, Wi-Fi and IoT industrial street lamps. CHELECOM has accumulated traffic for many years as a telecommunications service provider. These experiences and technological basis will be an asset in facilitating CHELECOM's smooth deployment and ensuing development.

The CHELECOM Foundation will reserve (α) DNET as a reward for the team and early stage contributors. More importantly, the successful development of D(PoS+PoT) system really depends on how the community grows. Some DNET tokens will be reserved as the cornerstone of the community to award their supervisory role and their efforts against cyberspace attack.

The total number of tDNET is defined as β.The Foundation uses reserved (γ) DNET as an incentive for important members of the community and business partners. In order to resist malicious intentions which will harm the network, CHELECOM reserves the right to retract DNET from any account.

### 1.2.2 DNET to Dtoken Ratio

By ensuring that DNET cumulatively generated by DToken is equal to or more than half of the total DNET, we allow the founding team and the private equity participants to guide the direction of the community at the beginning. Eventually as the community matures we will transfer these roles over to the community itself.

After there is a substantial volume of blocks, the ratio between the accumulated amount of starting DNET(α+β+γ) and its posterity DNET, and the accumulated amount of DNET initiated from DToken must converge to a fixed value via the adjustment of α，β，γ，δ and λ, where δ is defined as the ratio between the award of each block and the total number of DNET and λ is the ratio between .

From a business perspective, a 50% λ represents a 1:1 power between DNET and DToken in each consensus. This means that each consensus has 90 delegates from DNET and 90 delegates from DToken. This plan is not only allows the founding community and team to play a role in the construction and guidance, but also encourages nodes to actively share traffic and have a say in decisions. Therefore, we have set α, β and γ to 10%, 10% and 5% respectively.

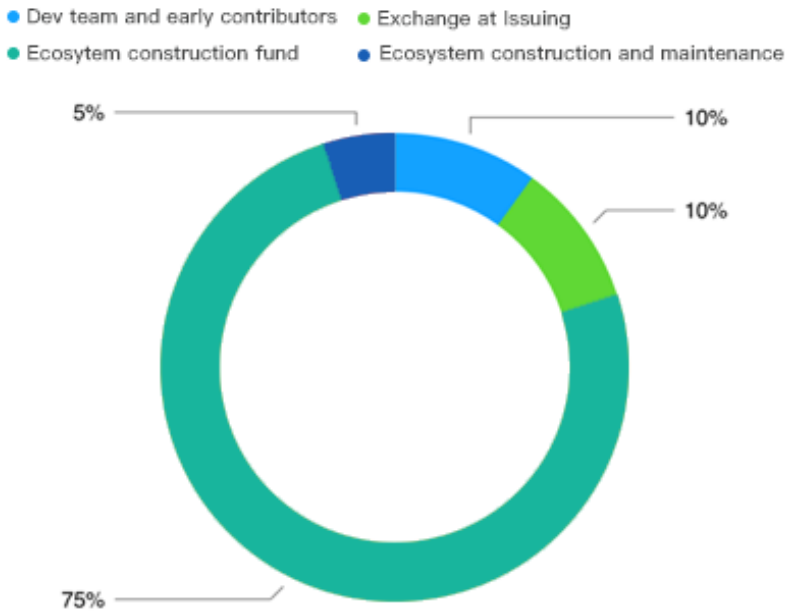


*Figure 10 DNET allocation at the beginning*

DPoT (Distributed Proof of Traffic) delegates are generated by two smart contracts each representing traffic flow and quality.

As such, DNET distribution is as follows:

- Exchange at Issuing : 10%
- Ecosystem construction and maintenance : 5%
- Dev team and early contributors
- Ecosytem construction foundation: 75%

## 1.3 Initiation Valuation

As mentioned before, when a substantial amount of blocks have been mined, initiation DNET will converge to a fixed value which allows the community to readjust the number of rewards per block without changing the structure of the model above. In the first phase, the total number of DNET is fixed. Thus the change to the block reward will affect the time needed to release all tokens from CHELECOM foundation.

After the initial ecological establishment of CHELECOM, a total of 5,625,000,000 tokens are to be distributed. Currently, the whole network is producing about 3,153,600 blocks a year (assuming exactly 365 days a year). Each block has 180 delegates. If we assume that all tokens are received within 10 years, the following formula will be true:

$$= 0.99 \approx 1$$

$$t = \frac{\text{Total Token Count} \cdot (1 - E_0)}{\frac{\text{Blocks}}{\text{year}} \cdot \text{Duration(yr)} \cdot \text{Delegates Count}} = \frac{750000000 \cdot (1 - 25\%)}{3153600 \cdot 10 \cdot 180} = 0.99 \approx 1$$

At each consensus, every delegate will receive 1 token on average. Since only one delegate is involved in each consensus and 5% of the block rewards are delegated to the current production block, the delegates currently participating in the consensus receive 5% * 180 * t rewards. Thus the entire community has a value of 7500000000 * t.

To encourage traffic sharing and the participation of the community, *t* is recommended to be set at around 0.0625 USD. In this case, delegates can receive 0.5625 USD which should cover basic running costs such as electricity and storage (if applicable) and generate some profit. The cost for traffic can be negligible as the rewards for traffic distribution are enough to cover it. If DNET tokens appreciate rapidly, the rewards for distribution will surpass basic running costs and traffic can become free. With free traffic, communities can then build their own AdHoc network and traffic providers will receive both rewards for traffic itself and the traffic quality.

When t is $0.0625, the entire community is initially valued at $468.75 million. Since only 25% of the actual tokens have been allocated, CHELECOM's actual valuation

is $1.171875 billion. 10% of the tokens are released at issuance which is $46.875 million of BTC. This relationship can be expressed by the following formula:

$$\text{Valuation at Issuance} = \text{DToken Value} \cdot \text{Total Token Amount} \cdot E_0 \cdot \beta$$
$$= \frac{\text{Delegates hourly income}}{t} \cdot \text{Total Token Amount} \cdot E_0 \cdot \beta$$
$$\delta = 180 \cdot \text{t}$$

## 2 Block Rewards and Adjustments

With changes in token value, rewards also change in value.

If token value appreciates, traffic sharers will have incentive to draw in new nodes and the network will grow. At the same time, it will be harder to earn tokens through traffic distribution since a token is worth so much. Somewhere between these two states lies an equilibrium state which the system will always gravitate towards.

If token value depreciates, distributor nodes will have less incentive to provide service but will entice more investors to enter the token market. These new token bearers will reinvigorate the market and the service quality will start to rise again as there is more demand for high quality traffic. Like a sine wave, the network will always attempt to reach equilibrium.

The premise is all block awards will be issued within 10 years. Theoretical speaking, in 10 years, CHELECOM should be able to perfect the community establishment and network construction, and have access to enough people and IoT nodes. By then, each traffic sharer node will have enough stable traffic purchasing customers to profit. Block rewards are not the main purpose for traffic sharing. It should be emphasized that 90% of the transaction costs in each consensus pool will go to the DNET and DToken owners, while 10% will go to their elected delegate in this situation.
In any case if it is deemed necessary to amend the above arrangement, more than two-thirds of the DToken holders in the network must pass the smart contract vote

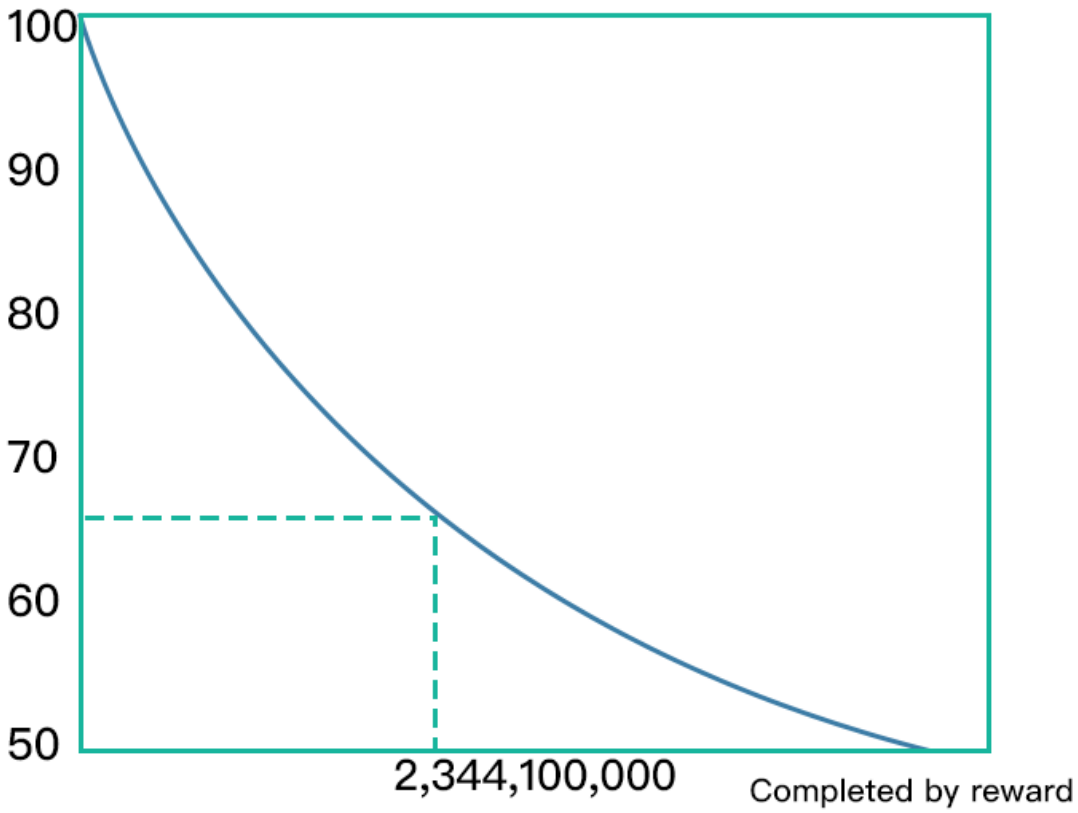


*Figure 11 The voting proportion of initial interest holders decreases with the generation of blocks.*

According to the ecological design, after about 230 million blocks, community creators/initial token holders will lose the right to amend based on the above arrangement (< 2/3). This also means that the community is expected to mature in about four years after the mainnet goes online.

# 3 Possible Adjustments in Phase 2

In the second stage, we will consider if the reward system need to be adjusted to fit the framework of decentralized content distribution, content mining and AI based smart recommendations. In terms of the design, there will be more ways to produce DTokens, but the total count will remain unchanged. So the impact on the ecological design above is very limited.

# 4 DNET Use Cases

## 4.1 Network Sharing

Once on the network, each user can choose to turn on network sharing. Every month users have a certain amount of traffic they can share. Traffic consumers can pay for other users' unused traffic with DTokens through smart contracts. Traffic sharers can set their own prices for traffic. When consumers directly connect to traffic providers, the provider receives the full amount of the payment. If traffic providers share through Ad Hoc connection, then they can receive 50% of the payment, and middlemen along the Ad Hoc connection receives the other 50%. The community will receive no more than 0.5% of the payment as service maintenance fee to pass on to everyone in the consensus pool.

## 4.2 Construction of Shared Infrastructure

The use of micro sites brought by 5G enables home devices to act as cell towers of the past. Each user potentially can be a micro site operator. Telecom operators can rent home node devices to use as 5G nodes. Users can define their own rental price. The telecom operator pays the owner DToken per unit time rented. In addition, many Internet of Things (IoT) devices can assume similar roles, such as smart light poles, smart charging posts. These services charges will not exceed 0.5% of the pricing set by owner and again will pass down onto everyone in the consensus pool.

## 4.3 Network Resource Exchange

Most of the current content platforms have centralized structures. The content presented is determined by the platform, and the owner may lose ownership of his/her content at any time. The media network provides no opportunity for content authors to enjoy a fair and free environment. The CHELECOM eco-platform is based on a blockchain and strives to achieve a decentralized organization. Users can act with data as they wish without third party interference.

CHELECOM enables users in the coverage area of the node to enable the content sharing function. Content provider selects content to share and mark its price, then consumers can use DNET to obtain content such as videos, music, articles, novels, and live broadcasts from said sharers. These services charges will not exceed 0.5% of the pricing set by owner and again will pass down onto everyone in the consensus pool.

After the content is transferred, it can be traced back to the original owner. When it is forwarded twice or more, the initial content sharer can obtain 15% of the consumer's payment fee, and the direct sharer can obtain 60% of the consumer's payment fee. If additional middlemen exists, they will get altogether 20% of the payment. Each will receive 50% of the previous middle man's reward until the reward value is less than 0.0000001. If there is still unallocated payment it will go to the direct sharer.

# Team

## 1. Core team

The core team has many years of international work experience, and has deep industrial connections in Canada and Japan, which is conducive to the foundation's global operation.

With the deep understanding of the pain points and needs of all parties, the team has accumulated profound experience in the field of telecommunications and telecommunications operators, and WiFi/4G products.

The team also has a comprehensive technical research and development team in the area of blockchain, including the kernel of blockchain technology, the development of existing public chain, private chain and consortium chain.

**Hao Zheng**

Former senior investment manager and product development director of Aplus Capital、Partner of Evolution Capital.

Hao holds senior blockchain industry background / resources and owns extensive experiences in fund management, risk control and the internet / financial product design.

**Yan Zhang**

Entrepreneur. Dr. Zhang is a technical guru and pioneer in de-centralized applications. He successfully founded the world's first decentralized industry grade intelligent lighting network MeshSmart, North American cryptocurrency mining infrastructure company Consensus Core, blockchain-as-a-service company DappWorks, and financial behavior analysis platform MarketMemory.

### Yi Hui

Communications industry and telecommunications policy Expert, Angel investor. Yi Has worked in a series of China national central professional ministries and commissions. He has played critical role in the collaboration between Chinese telecom carriers and other global players in regards to the interconnection and payment system. He is also a venture partner of a few of venture capitals with the focus on angel or early stage investment.

### Daniel Bettridge

Daniel is a writer, editor, author, and social media expert with more than a decade's worth of experience working at the highest levels of the industry for publications including The Guardian, The Atlantic, BBC and The Times.

## 2. Investor and adviser

### Bitmain

Bitmain is now among the most recognizable companies in the cryptocurrency space and the proud parent of several brands, among them Antminer, Antpool, and Hashnest, all of which are ranked number one in their respective fields.

### Danhua Capital

a VC fund that invests primarily in early stage and growth stage company with disruptive technology/business model, big market and excellent team. The fund's areas of focus include Artificial Intelligence, AR/VR, Big Data, Blockchain, Enterprise Software and other disruptive technologies.

## Aplus Capital

Aplus focuses on angel and growth stage investment in fintech, artificial intelligence / big data, consuming, entertainment, smart intelligence, etc.

## Tfund

TFUND focuses on the high-growth Blockchain industry and invests in the potential market leaders. We also committed to raising and setting diversified entrepreneurial incubation and venture funds.

## Feng Ren

CEO of Lefeng Chuangxiang。Former co-founder and CTO of Storm Codec and Storm Technology Group (Shenzhen 300431), one of the largest Chinese on-line video service providers.

## James Cape

Head of Business Development at Orange, A global Telecom Provider

## Gregory Gundelfinger

CEO at Telna. He is a pioneer in IOT eSIM technologies for improved communication network quality.

**Avi Levy**

Former VP of Economics and Regulation in the Ministry of Communications ("MOC") of Israel, member of the Board of Directors of Bezeq – A Israel Telecom.

**Cameron Burke**

Managing Director of Technology Sector of PwC Canada. His team covers an extensive portfolio, including Blockchain, AR&VR、3D printing、IoT、big data, fintech and etc.

**Jianfeng Wang**

Founder and CEO of Entropychain Technology, Communications industry Expert, Member of Tsinghua Entrepreneur and Executive Club

## 3. Lock-up Scheme

All 10% of DNET held by the team will be frozen at the end of the pre-sale. The team first unlocked is six months after the fundraising was completed, and the monthly unlocking will not exceeded the team's total holding by 2%.