# POPCHAIN

## Pan Entertainment Ecosystem

POPCHAIN Foundation
http://popchain.org

## The earliest technological inventions have two categories

**Some arts** were invented directed to the necessities of life; **others** to recreation.

The inventions of the latter are naturally always greater than the former.

— Aristotle 「**Metaphysics**」

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# 1. Introduction

Entertainment is an eternal topic of humankind seeking a better life. Thus the size of the digital contents market continues to show high growth rate. According to Technavio's report released in 2016, the worldwide digital video contents market size will grow to $ 121 billion by 2020 and record an annual growth rate (CAGR) of about 26%. Also, the recently emerging live broadcast market is anticipated to grow to about $ 121 billion by 2023, in Asia alone. As of 2017 standard, the number of interactive live broadcast users worldwide exceeded 600 million, while the platform number went over about 1,000. The live broadcast market is expected to surpass the movie market and become the next big entertainment market after the gaming industry.

Such numbers make it look as if everything in the world of entertainment is prospering smoothly. However, we still have to ask ourselves the fundamental issues. Is the currently highly-developed entertainment industry really fulfilling the different desires of entertainment producers and consumers? Do individual live broadcasters have the spontaneity and creativity? Do game players have interest in independently creating value? Are entertainment stars expressing dreams and ambitions enough through concerts and movie screens?

Moreover, the current digital contents distribution market has many unresolved problems, such as market monopoly by large contents distribution platforms or enterprises, unfair reward payment for creators derived from the hierarchical relationship, copyright issues from illegal contents distribution, and qualitative deterioration of individual contents due to intensified competition. Is the world of digital entertainment really going in the right direction?

The block chain technology provides transparency, reliability, and openness necessary for the contents distribution system, and therefore can solve the series of problems. The POPCHAIN team seeks to solve the problems of digital contents distribution markets using the block chain technology and revolutionize the contents industry and entertainment industry in general.

## 1.1 Current Problems

The digital entertainment industry has already formed a global market with a wide range of users. While the stress and anxiety of modern people are increasing day by day, leisure and entertainment are playing an increasingly important role as a solution. Younger generation all over the world is strongly demanding for leisure entertainment like mobile internet / video / online games. As the level of demand increase and diversify, the problems of the general entertainment industry are also on the rise.

### 1.1.2 Lack of Value Circulation Mechanisms of Traditional Entertainment Economy

Different entertainment platforms mostly form closed, independent virtual economic systems. For example, the game currency of game A can be exchanged for game items in game A, but cannot be used to purchase items in game B, nor be given as a gift to the broadcaster on the live broadcast platform C. As such, transactions across different countries, regions, or servers are expensive, and therefore unfavorable for value circulation. In

addition, even though most countries protect virtual assets by law, virtual assets are still dependent on certain products or services. On special occasions such as bankruptcy of an online game or a live broadcasting platform, the user's virtual assets are most likely to become useless, which again undermines the value circulation.

### 1.1.3 Limited Market Accessibility for Producers due to Oligopolies and Monopolies

Meanwhile, the current trend shows the monopolization of distribution channels, public channels, users and data resources by partial giant game and entertainment companies. This serves as a strategic approach that can lower some costs for big companies, but results in scarce resources and therefore higher production and distribution costs for general producers. As competition for the left over resources becomes more intense, most small businesses and individual studios are to suffer from resource shortages. Securing funds and resources solely with excellent creativity and outstanding products is now impossible. Now that it is becoming more increasingly difficult to introduce new works onto the market, if the market becomes more monopolized, the companies will eventually impose costs on common users and the price of the contents will soar even more.

Platforms run by personal contents producers also have many problems. Specifically, market corruption by existing producers is due to overheating market competition. In the case of YouTube, management focus is on existing popular producers, which makes it difficult for newer creators to generate revenues. While YouTube generates revenues from ads embedded in contents, contents creators share revenue through separate partnership agreements under YouTube's screening only when they have 4,000 hours in 12 months and more than 1,000 subscribers.

### 1.1.4 Destruction of the Ecosystem by Existing Large Entertainment Platform Vendors

In general, large contents distribution platforms are dealing with high quality contents produced on a large budget. For contents creators, however, big budget contents are a great loss if they fail to get widely distributed. Therefore, contents creators often sign contracts in relatively unfavorable terms with large platform companies that have dominated the distribution chain from the pre-production stage. On the other hand, large platforms lose their customers if they fail to collect and distribute popular contents. In order to supply popular contents, they pour in a lot of budget or produce their own. Such competition for securing distribution networks give rise to indirect cost for contents production, and consumers who want to enjoy contents are the ones who must bear the cost.

### 1.1.5 Lack of Trust Mechanisms for Centralized Platforms

The third party virtual game contents transaction market is gradually growing as the gaming industry actively demands for game account transactions, equipment transactions, game currency transactions, gold point card transactions, and various types of activation code transactions. However, since the third party transaction platform is completely independent from the game system, many transaction disputes regarding high transaction cost, malicious cancellation of the seller after the contents transaction, and inability to verify the ownership of the game contents occur. Meanwhile, some platform operators modify their video playback history, online game partner account numbers, etc. in order to recommend their internet stars, and to improve the exposure and ranking of related e-sports athletes for their benefit.

### 1.1.6 Inefficiency of Centralized Platforms with High Complexity

In the music industry, music producers are at the bottom of the industrial chain. While the number of channels is increasing, producers' income is getting lower. Many of the album copyrights of music producers are in the hands of big companies at the cusp of centralization. Meanwhile, Record companies and tour promotions companies have begun contracting with big production companies to manage this complex mechanism, sweeping piracy to maintain copyrights. For example, one-third of employees of the Universal Music Publishing Group specialize in managing local royalties and copyrights in the global market. The cost of managing royalties increase as the business gets more complex, which is a direct burden to the producers. The current music industry is facing an important challenge to reduce the complexity and to simplify the key role of the record company in the ecosystem.

On the other hand, some consumers find a way to enjoy contents without paying royalties using P2P services such as BitTorrent, even withstanding the inconveniency to find torrent files. As such, contents creators are suffering a huge loss. In the case of HBO's popular drama "Game of Thrones," the number of illegal downloads is estimated to have reached 6 million in 2013, and it is hard to imagine how big the number of illegal downloads would be by now. In 2015, the number of torrent movie files downloaded was estimated to be about $ 48 billion, and the damage cost was estimated to have reached $ 160 billion. The global music market also shrunk from $ 40 billion to $ 15 billion due to illegal distribution of music through P2P servers. P2P decentralization is something that should be ultimately looked forward to, but managing the copyrights within the current centralized system is a great burden as well as cost.

## 1.2 Mission statement of POPCHAIN Team

"We are to accelerate the decentralization of digital contents distribution and create a comprehensive entertainment operating system which fully rewards each entity to generate mutual synergies."

POPCHAIN is a 'live-streamable' digital contents distribution service platform based on block chain technology which aims to create a new type of contents sharing economic system while protecting copyrights. Creators can present contents in various forms such as text, pictures, music, video, and software on the platform, and build a separate application programs using the platform's open source. Copyright owners can set prices for contents' distribution and receive royalties every time a consumer makes transactions even after the contents have been distributed. Consumers can autonomously manage the quality of the platform's contents, gain additional benefits, and receive contents recommendations through various algorithms by evaluating the contents. Unlike centralized large digital contents distribution platforms with unreasonable conditions or illegal distribution channels that do not give proper compensations, POPCHAIN eliminates the unnecessary intermediate distribution phase, records all distribution channels, and connects copyright holder with consumers directly to create a new system that solves the existing digital contents distribution problem by sharing its revenues to all contributors participating in the network.

## 2. POPCHAIN, A New Digital Contents Distribution System

Since the birth of the block chain technology, there have been many attempts along with several projects under way to overcome various problems of the current digital contents distribution system, such as DECENT, Primas, Po.et, YOYOW, and Steem. However, a complete solution has yet emerged to revolutionize the digital contents distribution ecosystem where many entities are involved from creators and distributors to consumers with different interests and consumption patterns.

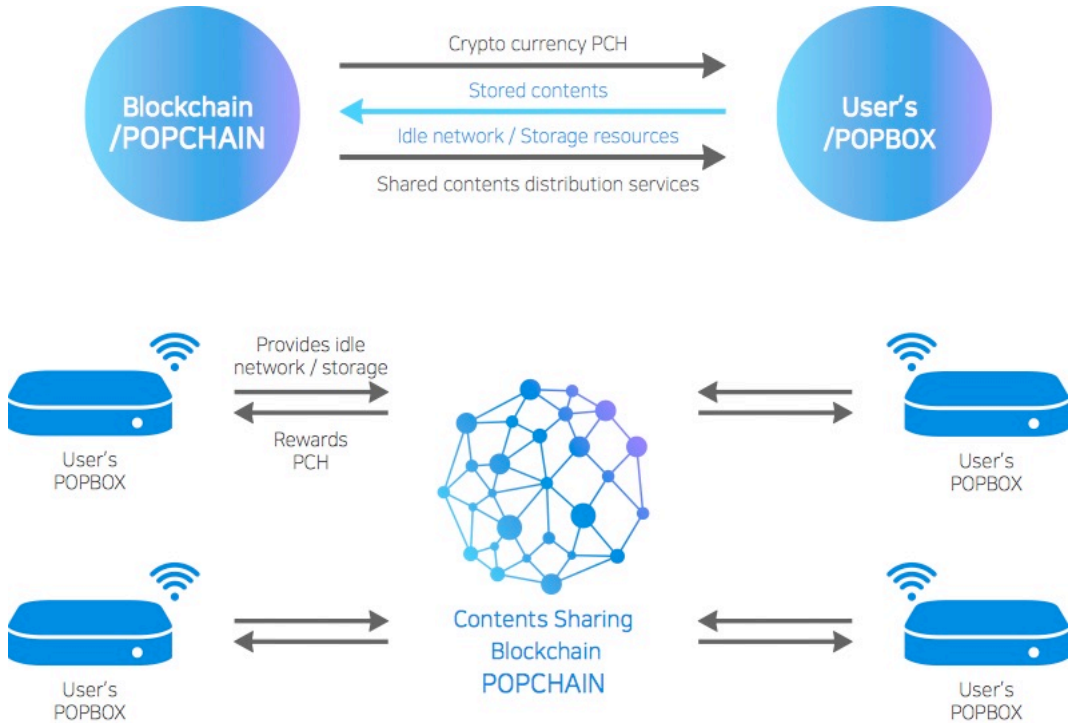
POPCHAIN utilizes the block chain technology and constructs a mutual contribution structure that existing digital contents distribution systems do not reach. The focus is on changing the profit distribution structure of the digital contents distribution system to creators and consumers (users), away from the distributors-focused traditional contents industry structure.

The ecosystem is operated through POPCHAIN in terms of software, and POPBOX, a set-top box and a router, in terms of hardware. While POPCHAIN's contents distribution platform allows users to access unique high-quality contents through Smart Push and consensus mechanism, POPBOX serves as a mining device for users to collect POPCHAIN CASH (PCH)[1], the basic coin of POPCHAIN, by simply connecting the hardware to the network to provide idle storage and bandwidth.

Consumers can purchase and enjoy pay contents without any additional effort, and contents creators can generate high-quality contents while generating revenue (PCH) by selling contents. Users who actively spread contents also get the revenue calculated by the POPCHAIN algorithm according to their level of activity. In this structure, the platform operator does not directly intervene in the contents distribution and profit distribution process between the user and the manufacturer, and performs only the role of improving the service such as the operating environment. Under such POPCHAIN ecosystem, contents creators and users can mutually perform fair and cost-effective contents transactions.

The followings are the detailed features of POPCHAIN.

[1] POPCHAIN CASH is a platform crypto-currency (coin) used within POPCHAIN economic system, and is used to maintain overall ecosystem operations. POPCHAIN CASH will allow the participants in POPCHAIN to fully demonstrate their abilities.




[POPCHAIN Ecosystem]

### 2.1 Fair Reward System

Contents creators can be freed from the impact of existing large retailers by using POPCHAIN and generate more revenue. Competent teams may create and distribute individual tokens based on POPCHAIN to secure even more revenue streams. A typical App Market charges 30% of revenue for platform usage and pay the producers 30 days after the date of payment, causing cash liquidity problems for contents providers.

On POPCHAIN, however, producers can immediately receive POPCHAIN CASH according to real-time payment. Users can use POPCHAIN CASH to consume various contents, including live broadcasts and videos, without any platform usage fees. They can also exchange POPCHAIN CASH with legal tenders through exchanges to purchase POPCHAIN external system resources (rent, wages, server purchases, etc.), or to increase business fluidity by developing individual digital products. In addition, they can store POPCHAIN CASH in personal POPCHAIN CASH Wallets and receive additional revenue when the value of POPCHAIN CASH increases with the growth of POPCHAIN.

### 2.2 High Transparency and Reliability

POPCHAIN is a distributed database that records all transactions related to contents or digital events as well as a public transaction ledger that anyone can access at any time. It continuously generates and maintains the backup data to prevent data loss, verifies the integrity of the data by recording the hash value of the recorded data in the block chain, and restores the original data with backup data in case of forgery. POPCHAIN has

eliminated the inconvenience of intermediaries during the value delivery process through an online P2P (Peer to Peer) format that connects consumers and suppliers directly, and therefore has enabled information disclosure, personal information protection, common decision making, protection of individual rights and interests, etc. These mechanisms benefit all stakeholders by ensuring high transparency and reliability while increasing the efficiency of value delivery and lowering costs.

### 2.3 Outstanding Network Speed and Reliability

Current HTTP protocol has issues of low resiliency, hyper centralization, and latency. POPCHAIN uses IPFS (Inter Planetary File System) [2]to ensure network speed and contents stability. POPCHAIN can deliver large files quickly and efficiently, and maintain a decentralized stable ecosystem even if some nodes are detached. Also, the name of the file uploaded on POPCHAIN will be permanently recorded and preserved if the user wishes.

### 2.4 Easy Network Participation through POPBOX

POPBOX is a hardware that makes POPCHAIN very special. Users are to easily provide idle storage and bandwidth, thereby to be rewarded with POPCHAIN CASH – the basic coin of POPCHAIN – by simply connecting their hardware to a network. Users can control POPBOX through mobile apps, and download movies and video contents as in BitTorrent, or watch live stream broadcasts. POPBOX allows people to enjoy contents more conveniently and inexpensively while getting POPCHAIN CASH, as well as to generate additional revenue by assessing contents. This is a very important feature of POPCHIAN that differentiates itself from existing services such as Steemit, where users gain coins only through active participation. The participation and evaluation of users through POPBOX improves the quality of the contents, and provides contents producers with more exposure opportunities and better resources. POPBOX plans to expand its range to include air purifiers in the future, so that anyone can easily participate in the POPCHAIN ecosystem.

### 2.5 High Scalability

POPCHAIN uses Side Chain technology to add diverse business models into the ecosystem. For example, popular idols and celebrities can distribute their tokens through side chains and smart contracts. Fans can use their tokens to buy tickets for concerts and merchandise, as well as easily organize diverse activities such as offline activities and ticket exchanges. A popular celebrity can simply link existing fan communities or websites with side chain protocols to absorb existing POPCHAIN users into his or her fan base and diversify sales routes.

POPCHAIN will be extended not only to digital contents and live broadcasts but also to the entire entertainment arena. The Side Chain technology may not yet be mature, but we will improve the technology in the long term to expand the ecosystem as a whole.

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[2] Juan Benet: IPFS - Content Addressed, Versioned, P2P File System(2014)

# 3. POPCHAIN Technical Details

POPCHAIN is a global platform in which anyone can participate, invest their own resources, and be rewarded for their resources' value. At the macro level, POPCAHIN integrates fragmented pieces and benefits from resources that constitute POPCHAIN so that game developers, entertainment publishers, video publishers, live broadcast creators, brokerage firms, viewers and gamers can all participate and contribute. POPCHAIN constitutes an open and democratic digital entertainment ecosystem.

The system is divided into 'basic operating system' and 'distributed application program'. Transparent and unchangeable smart contract infrastructures are built into the bottom tier, and the upper-level applications complete specific business logic such as distribution of live broadcast, games, audios and video contents. We will process out ingenious works, including, but not limited to the followings.

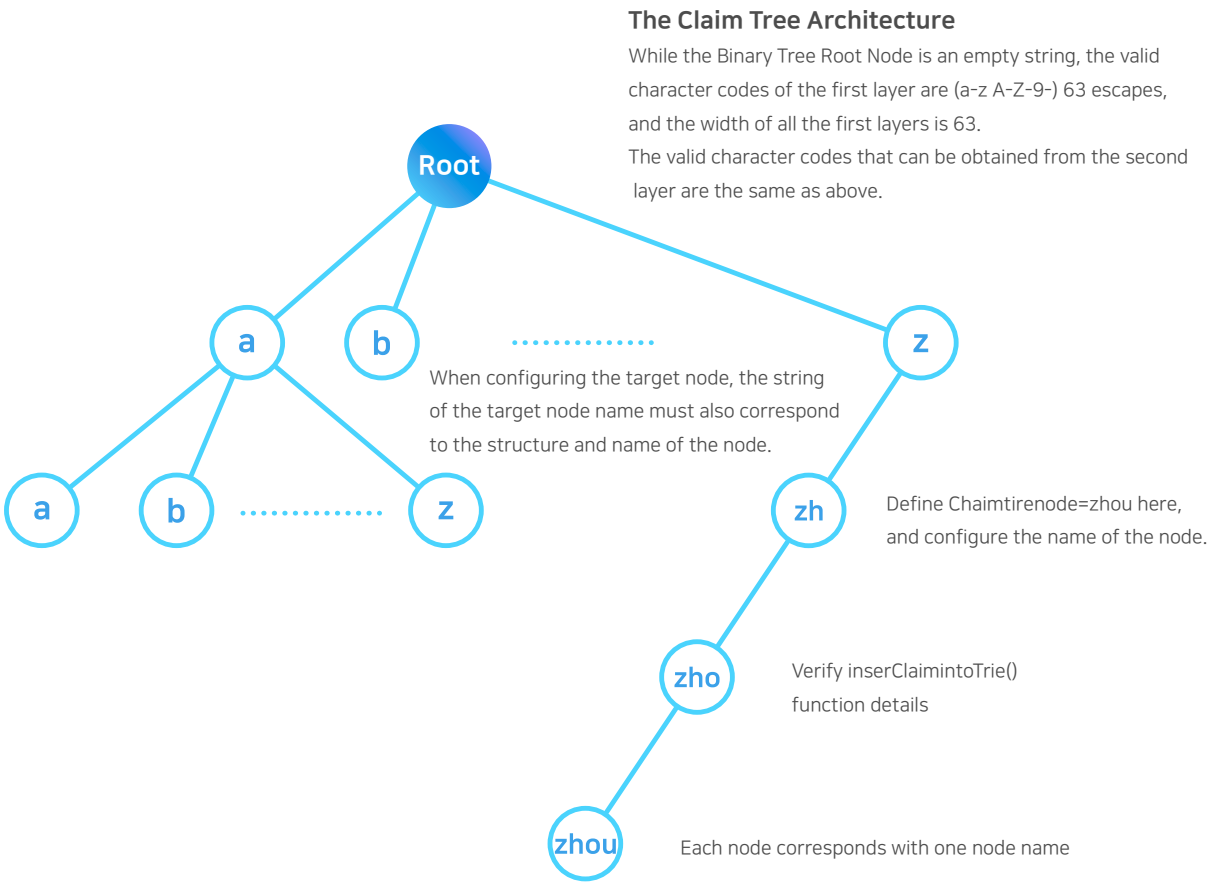
## 3.1 Master Node System

The Master Node[3] improves the stability, security and computing speed of the entire network and provides a stable QoS data storage service so that ordinary participants can easily build POPCHAIN network. It can support more than 2,000 transactions per second, optimize data storage and processing, and maximize user satisfaction by utilizing various applications including operating systems such as Linux / Windows / OS X.

## 3.2 IPDS (Interplanetary Domain System)

In the case of normal block chain data, it is difficult for a user to memorize the domain using a 34-character string address. These string addresses make the general public feel like they need a lot of technical knowledge when they approach the block chain technology. POPCHAIN provides a unique and efficient decentralized domain name resolution service through IPDS (Interplanetary Domain System). It improves the accessibility of ordinary users who are familiar with the existing HTTP protocol.

[3] Evan Duffield, Daniel Diaz, Dash: A Privacy-Centric Crypto-Currency (2017)




[The Claim Tree Architecture of POPCHAIN IPDS System]

### 3.3 Mixed consensus mechanism of PoW & PoSe

POPCHAIN platform designed a mixed consensus mechanism of Proof of Work (PoW) and Proof of Service (PoSe) to better run application programs. Miners, investors and others can participate directly in building POPCHAIN network and pursue common development.

PoW (Proof of Work) records the ledger and distributes profits according to the workload of the miners. PoW in POPCHAIN employs a specific CPU mining algorithm, Cryptopop, and utilize AES algorithm and our own additional algorithm to effectively combat a variety of unknown attacks. We designed a new algorithm to allow more people interested in POPCHAIN than just players who buy machines to participate in order to achieve fairness. The operation mode of the hash function H of this algorithm is as follows.

1) Initialization of work memory

The work memory M is initialized in the following manner.

Input: x

Output: M

Intermediate variables: a and b are vectors whose length is 5 words, and a[c1:c2] represents c1: c2 bytes of

them.

1. a=h0(x)
2. i cycles from 0 to |M|/16-1, // if |M|=2MB, it cycles 128k times.
2.1 M[16*i:16*i+15]=a[0:15];
2.2 t=reduce_bit(a[16:19],4);
2.3 a=ht(a[0:15]|i);

2) Modification of work memory contents

Input: M M [addr] indicates the byte of address addr.
Output: M
1. a=h0(inverse of M) r=0; // memory initialization must be all done before proceeding.
2. i cycles from 0 to C*(|M|/16-1) / total 2C|M| times random memory reads and writes.
2.1 seed (a [16:19]); // Initialize the random number generator.
2.2 j cycles through 0 to 15 // modify memory contents and create a new hash function input.
2.2.1 addr=rand() mod |M|+reduce_bit(r,5)<< reduce_bit(r,4); // Create a random address.
2.2.2 t=M[addr];
2.2.3 M[|M|-addr]= t XOR a[i]; // Modify the work memory.
2.2.4 r=a[i]=t; //Modify
2.3 t=reduce_bit(a[16:19],4);
2.4 The byte array formed with a is sorted in ascending order.
2.5 a=ht(a[0:15]|i);

3) The final result is generated depending on the work memory contents.

Input: M
Output: y
1. y=h0(M[0:16]|0);
2. i cycles from 0 to |M|/16-1
2.1 t= reduce_bit(y[16:19],4);
2.2 y[0:15]=y[0:15] XOR M[16*i, 16*i+15];
2.3 y=ht(y[0:15]|i);

Proof of Service (PoSe) distributes revenue according to the amount and quality of service provided by the end user. The PoSe algorithm is implemented as POPBOX specially designed for POPCHAIN ecosystem. This box is similar to a router in a typical household. A user can watch videos or contents through POPBOX and mine POPCHAIN CASH, the basic currency of POPCHAIN. This type of mining is different from existing routers in that it provides profitability by providing storage space and network bandwidth necessary for games and contents live broadcasting.

The factors considered in the PoSe are as follows.

1) Storage capacity: Calculate the profit ratio according to the size of storage capacity.
2) Storage value: Determine whether to store valid data in the platform and whether to pay the revenue based on the value of the stored data.

3) Storage IOPS: Measure disk random access performance with the number of Input / Output Operations Per Second (IOPS). Determine profitability based on disk performance.
4) Network contribution: POPBOX calculates revenue based on contribution to overall network bandwidth. In this way, the POPBOX owner gets a consistent return on investment while providing services for the entire network.

### 3.4 Smart Push

To implement various recommendation functions aiming at features such as complexity and timeliness, we designed a source knowledge extraction and correlation method based on our deep neural network which has its basis on the Entity Name recognition and Entity Attribute extraction for digital contents, creator and other elements information,

We recommend smart contents in different dimension to different users through recommendation method based on mixed model method, knowledge embedded based collaborative recommendation method, online real time feedback, etc., and push related movies, live broadcast programs and online games.

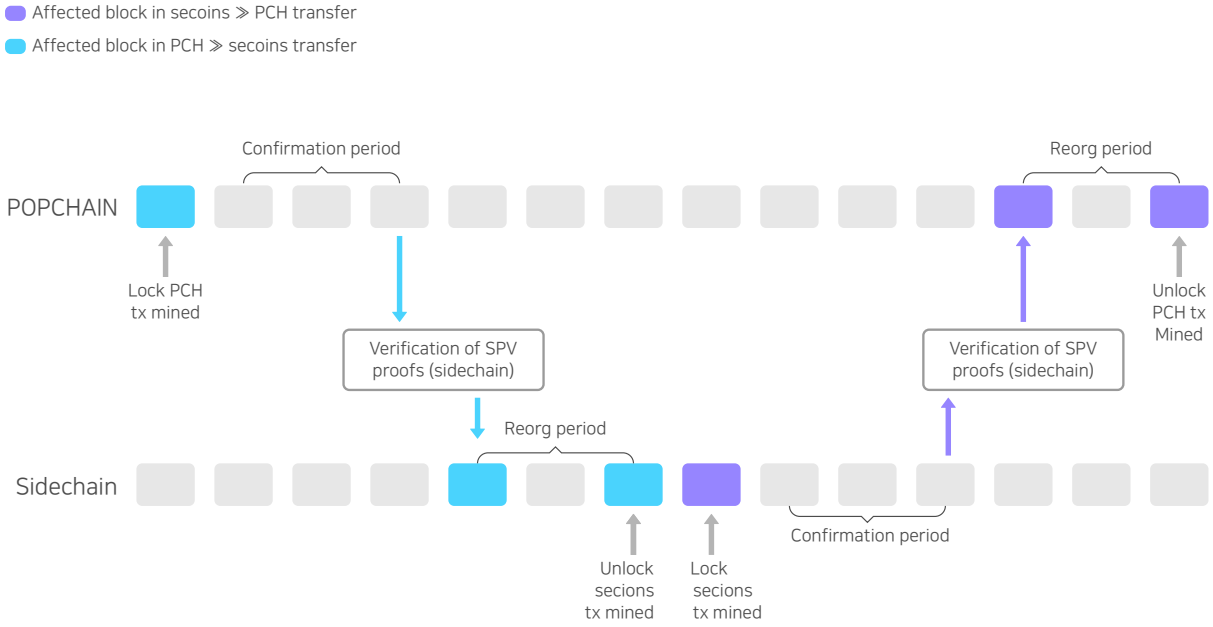
Based on the mixed recommendation method of the domain knowledge, the contents vector space modeling technology is used to integrate the Comprehensive Knowledge Structure Features, Topic Features, and Semantic Features, etc. and realize mix recommendation based on the contents recommendation method and the collaborative recommendation method.

### 3.5 Side Chain

Side chain essentially refers to any chain that complies with side chain protocols and rules, rather than specifying any particular chain. The side chain protocol of POPCHAIN is a protocol that allows POPCHAIN CASH to be safely transported from POPCHAIN to another chain, and to be redirected from a different chain to POPCHAIN. The purpose of the side chain protocol is to realize a Two-way Peg so that POPCHAIN CASHs can be mutually exchanged between the main chain and the side chain. All existing block chains can be side chains of POPCHAIN by following the side chain protocol.

The Two-way Peg is divided into the following stages.

1) Lock the PCH in the main chain by sending a lock transaction.
2) Wait for the lock transaction to be acknowledged to more blocks through confirmation period.
3) Constrain the PCH in the side chain and provide the SPV workload and output to its side chain address.
4) Confirmation period waits to prevent double spending. After the confirmation period, the constraint transaction is repackaged into a POPCHAIN block.




[POPCHAIN Two-way Peg Guide Map]

All DAPPs can create side chains and connect them to POPCHAIN as shown above. As side chains are independent, separate system, if a user experiences a serious problem with DAPP, it only affects the side chain and has no effect on the POPCHAIN itself.

### 3.6 Smart Contract

POPCHAIN enables smart contracts that are highly compatible with Ethernet virtual systems. Whether it's a game studio in Bangalore, India or a famous movie and TV star in Seoul, Korea, all entertainment product providers can publish their own tokens by building their own sites and providing entertainment services through a compatible API. People can also operate their own entertainment ecosystem individually through tokens. Tokens can be designed to be exchanged with POPCHAIN CASH at a certain rate. Such technological path and ecosystem's innovative design provides strong support for POPCHAIN while at the same time innovating the entire entertainment industry and helping to construct a free and equitable global ecosystem.

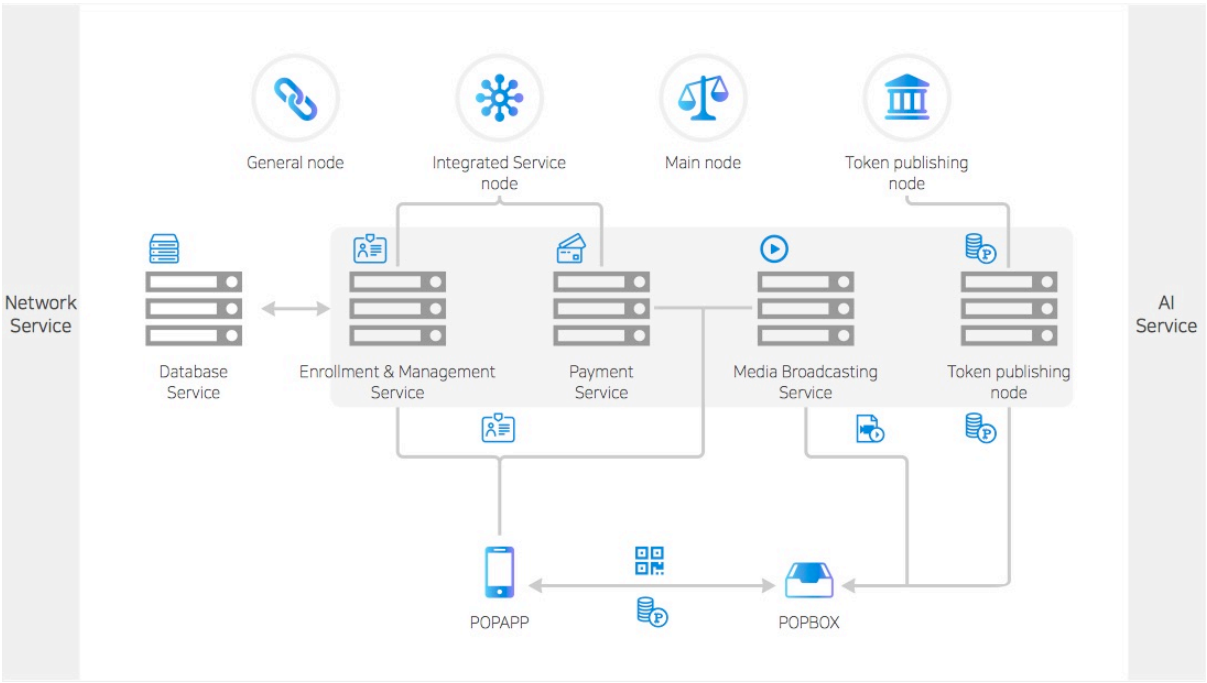
### 3.7 System Architecture

POPCHAIN adopts a modular design approach that is loosely coupled to the overall design, encouraging more developers to participate in the entire ecosystem. Through a number of interfaces, such as Web interfaces, desktops, and mobile applications, contents distributors can easily build their own websites and operate their own deployment services.

As described above, One-chain of POPCHAIN introduced a master node system to satisfy various entertainment requirements. It forms a stable Back-bone network and optimizes data processing to improve the quality of network services. POPCHAIN also uses a dedicated POPBOX to acquire a large pool of cloud storage resources

and provides storage space resources that are constantly and globally able to search address. POPCHAIN adopts a mining mechanism that mixes PoW and PoSe to prevent POPCHAIN network from being stolen.

The entire system of POPCHAIN is composed of Application Layer, Business Logic Layer, Original Chain Layer, Network Service Layer, and AI Service Layer.




[POPCHAIN System Layer Outline]

### 3.7.1 Application Layer

Application Layer includes POPBOX, POPAPP, and various mobile apps.

1) POPBOX Hardware
- Install a hardware driver on the lower layer. (eg USB)
- Used in communication with embedded Android system and lower layer hardware.
- Used in communication with embedded application and upper layer application.

2) POPBOX Software
- Operates in Android system and acquire POPBOX system information. (ex. Box system version information, and whether to activate IP address, POPCHAIN chain address, etc.)
- Connects with media broadcasting server to acquire media data and proceed with broadcasting.
- Sends its own data information in connection with POPBOX
- Obtains instructions and installation information for POP Applications.

3) POP Application
- Scans POPBOX's QR code and enters the user's information. Submits it to the backend server and use it for registration.
- Manage coin issuance and receipt.
- Manage POPBOX and user information.

### 3.7.2 Business Logic Layer

Business Logic Layer includes a registration service, a payment service, a media-player service, a coin issuance and reception service, a data service, etc.

1) Registration Management Service
- Receives registration requests from POP Applications and proceed with legitimate authentication.
- Provides POPBOX activation service.
- Proceeds POPBOX monitoring to record the online access time and contribution and send it to the comprehensive service node.

2) Payment Service
- A user pays for the paid videos with POPCHAIN CASH and watches them.
- The user's consumption is recorded in the database service, and the fluctuation of the balance is not implemented in POPCHAIN.
- When the user uses POP Application to charge and accept the coin, it is recorded in POPCHAIN.

3) Media-player Service
- Provides on-demand service within POPBOX through Media Broadcast Cluster.

4) Coin Issuance and Reception Service
- Calculates the logic according to the contribution of POPBOX, and then passes Daily Reward through POPBOX.

5) Database Service
- Provides data services to other logic layers.
- Database Service includes an MMDB cache.

### 3.7.3 Original Chain Layer

1) General Node
- As the most basic node among POPCHAIN, it provides universal basic services such as mining pool and wallet.

2) Aggregate Service Node
- When POPCHAIN CASH and POPCHAIN tokens input/output to and from the economic system of

POPCHAIN, the Aggregate Service Node provides the service and records on One-chain Layer of POPCHAIN.

3) Coin Node
- Provides coin node service according to the request of Coin Node.

4) Master Node
- Ensures stability of the entire POPCHAIN, resolves communication latency issues and improves transaction speed.
- Supports secure and fast payment functions such as instant tx and private send.

### 3.7.4 Network Service Layer

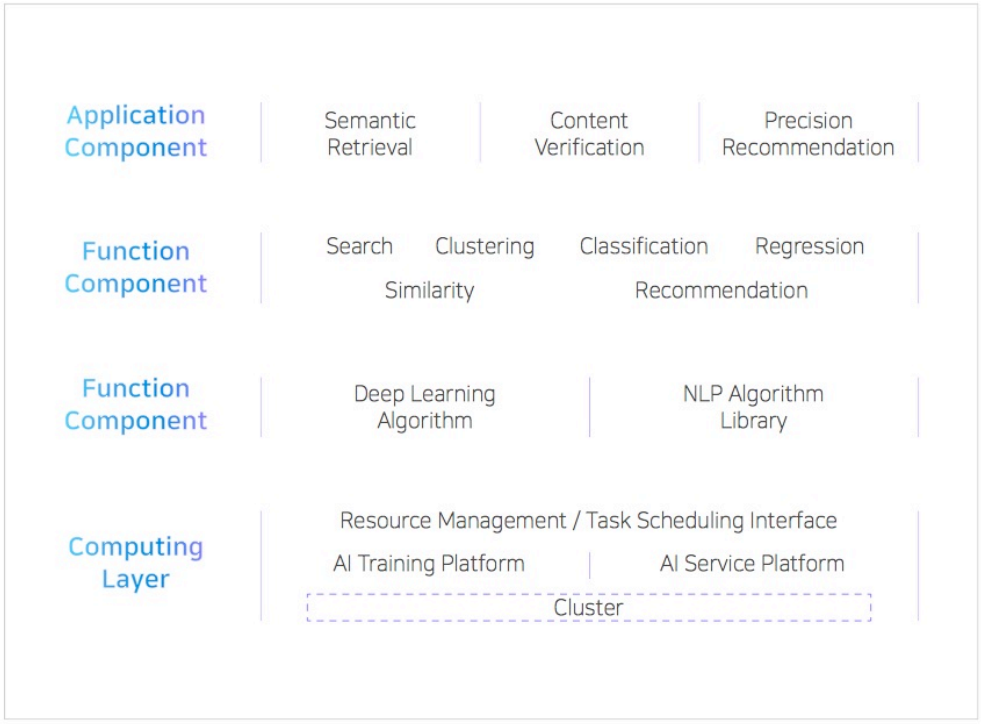
1) BitTorrent P2P Contents Distribution Service
- Utilizes BitTorrent P2P contents distribution protocol based on POPCHAIN block chain account.
- Use an efficient software distribution system and P2P technology to share entertainment materials such as movies or video games, and provide upload services such as network redistribution nodes to each user.

2) Distributed Hash Table Indexing Service
- POPCHAIN internet uses the Distributed Hash Table (DHT) to construct the namespace of the user resource and realize the relationship mapping to the DHT network node.
- DHT provides a distributed system based on [Key-Value] search function without a central node. Through this algorithm, the DHT finds one node following along one keyword. It also performs activities such as storing and retrieving data for the node.

3) Payment Service
- In POPCHAIN network, live broadcasts, pay-per-view movies, purchase of entertainment star concert tickets and game equipment sales are all treated as a single transaction and stored in a block chain.
- Most transactions in the network, such as resource publication and resource downloads, require transaction costs (mining costs).
- POPCHAIN networks encourage users to publish and distribute high quality resources, and POPBOX supports these entertainment resources.

### 3.7.5 AI Service Layer

The data under AI service layer's control can arise from two aspects. First, it occurs when the operation data of the application layer includes user behavior data and application behavior data. Second, it can be applied to improve the efficiency of the logic layer operational data, which makes the base system more secure and stable.




[AI Resource Creation and Distribution Effect Management Framework]

The AI supportive function of the first generation of POPCHAIN (v1.0) is mainly the entertainment resource creation management and contents distribution effect management.

1) Contents Creation Management

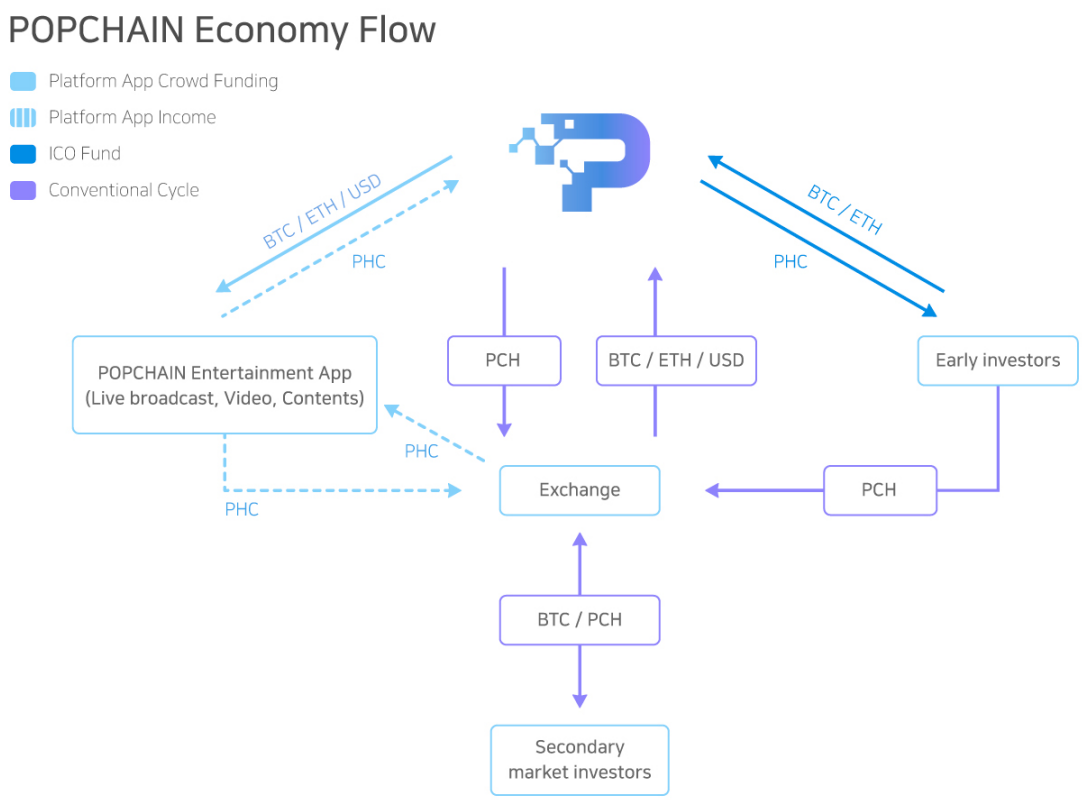
- Includes quick analysis of popular sites, real-time tracking of popular entertainment contents, and the contents' authority, influence, appeal, and game player behavior, and so on.

2) Contents Distribution Effect Management

- Personalize and accurately recommend entertainment contents through user access behavior (search order, live broadcast watch time, game online status, etc.) and point of interest mining.
- Select and optimize propagation paths based on knowledge maps to increase access frequency and improve user experience through a combination of related contents.
- Identify and remove malicious nodes from the entertainment contents distribution link to protect the legitimate rights and interests of real users.

# 4. POPCHAIN Eco-System

POPCHAIN CASH (PCH) is the common currency in the POPCHAIN economic system. POPCHAIN CASH is like the fuel of the POPCHAIN economic system, which keeps the entire ecosystem operating.




[POPCHAIN Economic Flow]

Unlike the existing centralized and closed platform, POPCHAIN CASH can be used within a wide range of applications based on POPCHAIN. The contents producers and contents consumers form a structure where they can both pursue mutual benefits within a decentralized platform. Such structure will overcome the fees and the inefficiencies of the existing centralized platform servers, and activate the ecosystem by giving a fair value to general contents.

## 4.1 Role Distribution

The main players in the POPCHAIN economic system can be divided into contents creators, contents consumers, POPBOX owners, and entertainment stars. Through POPCHAIN, players can eliminate many obstacles of the world of the entertainment and ultimately achieve the best opportunities and benefits from mutual synergy. A prominent economic system should benefit all stakeholders, including producers, consumers and investors;

POPCHAIN entertainment ecosystem provides such environment.

### 4.1.1 Contents Creators

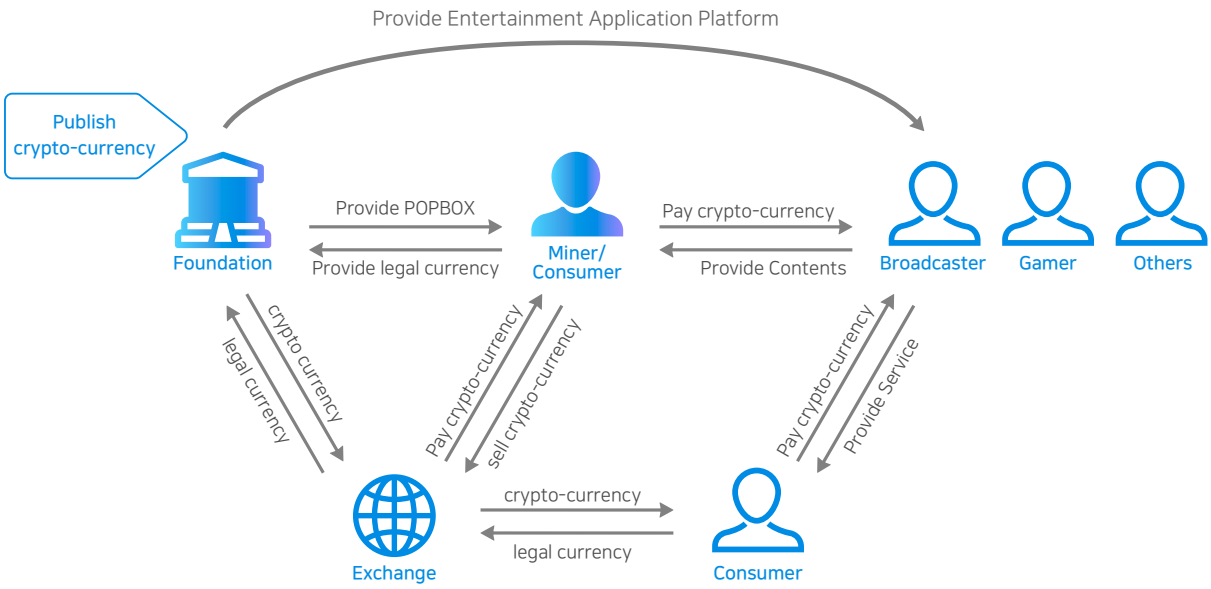
Entertainment contents creators can use POPCHAIN to remove dependence on large, centralized companies and gain more revenue. Some highly creative teams can issue their own tokens and have a path to better funding. POPCHAIN platform, which does not have any fees and can be cashed through instant payment, motivates creative and enthusiastic contents creators.

### 4.1.2 Contents Consumers

Contents consumers can watch not only free videos uploaded by contents producers, but also copyrighted high-quality pay videos by paying with POPCHAIN CASH. In addition, they can enjoy various entertainment resources more conveniently and cheaply, as well as additionally be rewarded with POPCHAIN CASH through a variety of activities including game installation, video and movie commentary, scoring for live broadcasters, participation in game contests and other qualifications.

### 4.1.3 POPBOX Owners

POPBOX owners enjoy contents through POPBOX and acquire POPCHAIN CASH while providing resources. They are a special entity of POPCHAIN that makes all resources easy to operate. POPBOX owners are the contents consumers while being the POPCHAIN CASH miners. They contribute in operating the POPCHAIN ecosystem by providing storage space and bandwidth of POPBOX while enjoying contents.




[POPBOX Structural Diagram]

### 4.1.4 Entertainment Stars

Entertainment stars can issue their own tokens using Smart Contract. Fans and fan clubs can buy concert tickets and other products with tokens, and realize value operations by conducting various online and offline activities with fans around the world.

### 4.2 Coin Model

#### 4.2.1 Issuance and Distribution

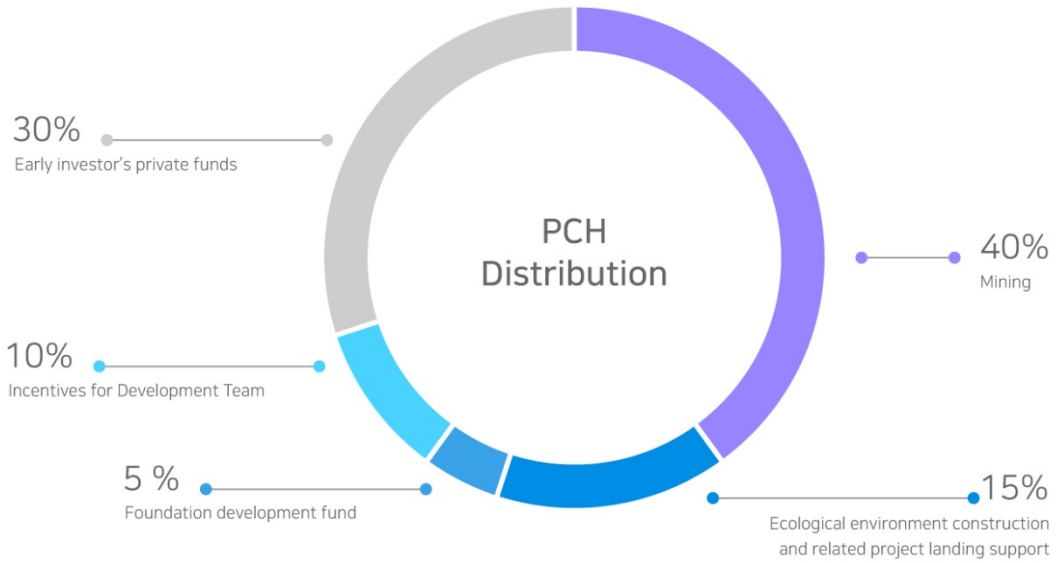
At the early stage of operation of POPCHAIN CASH, POPCHAIN TOKEN will be issued based on ERC20. The total issuance volume is 2 billion, which consists of 30% of early investors' private funds through Private Pre-Sale, 15% of the ecological environment construction and related project landing support, and the remaining 55% are held by the POPCHAIN foundation and remain in fixed position.

Initial funding for POPCHAIN TOKEN will be made through Ethereum (ETH). Early investors will receive a total of 600 million POPCHAIN TOKEN (30%) and the fund-raised will be used as seed funds to support the POPCHAIN development and to create a digital contents distribution ecosystem. 40% of the initial funds will be used to promote partner participation for contents supply and distribution. 15%, a marketing expense to form an ecosystem will be used to fund individual ecosystem participation and POPBOX sales. 10% will be used for POPCHAIN software development and POPBOX (hardware) development. 5% will be set to prepare for additional business development for an early ecosystem settlement.

Once the basic ecosystem is primarily established, POPCHAIN CASH will be issued on a public chain basis. The total issuance amount is 2 billion, and the prior ERC20 POPCHAIN TOKEN will be exchanged at 1: 1 ratio, and the fixed position part of the coin will be burned.

The coin distribution method is as follows:

- 30%: Early investor’s private funds
- 15%: Ecological environment construction and related projects landing support
- 40%: Mining (50% - CPU mining / 50% - POPBOX PoSe mining)
- 10%: Incentives for Development Team
- 5%: Foundation development fund




[POPCHAIN CASH Distribution]

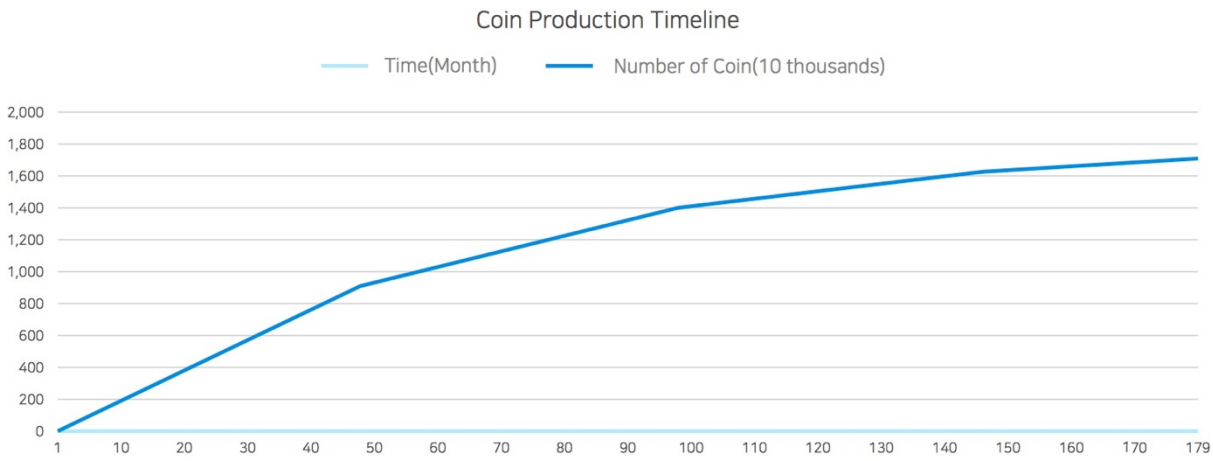
Ecological environment construction and related projects landing support part of the coin distribution will be specifically used for natural inflow of contents through decentralization. This is intended to prevent centralized operation through direct contents supply while being wary of the same alteration as existing platforms that can lead to the failure in achieving the vision of decentralization.

### 4.2.2 Network Role

The mining of POPCHAIN CASH is divided into CPU mining and POPBOX mining. The CPU mining method using the general mining node occupies 50% of the total mining profit of POPCHAIN CASH. POPBOX mining method adopts PoSe distribution method, which also occupies 50% of mining profit. Distribution revenue is transparently disclosed to PoSe mining pool addresses and redistributed to POPBOX owners. POPBOX provides contents storage and network services and contributes through contents and bandwidth resources.

### 4.2.3 Productivity Analysis

A POPCHAIN CASH block is generated every 2.5 minutes, generating 576 blocks per day, and about 210,240 blocks per year. The number of coins issued in the first four years is about 60% of the total, and the number of initially mined coins is 200 million. With an annual average of 100 million, each block can produce 476 coins, and the amount of coins generated is reduced by half every four years. (See Bitcoin)




### 4.2.4 Method Details for POPCHAIN CASH Acquisition

The method details for acquiring POPCHAIN CASH are as follows:

1). Participate in recording CPU computing resources ledger
2). Join to build network infrastructure using POPBOX
3). Contribute to community expansion and encryption
4). Provide valuable video contents, live broadcasts, and online games
5). Issue valuable smart contract token (side chain)

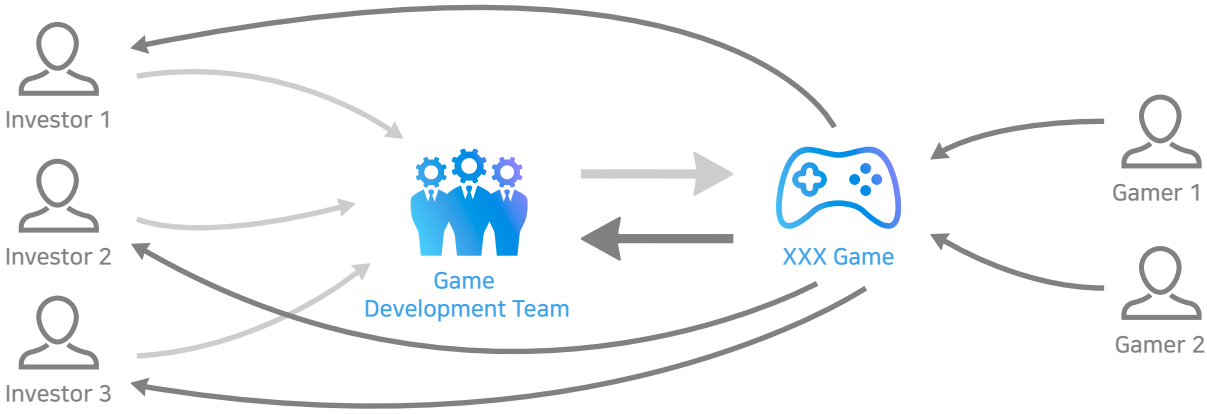
The first three of the above methods obtain POPCHAIN CASH in the "production" process, and the latter two methods obtain POPCHAIN CASH in the "distribution" process. POPCHAIN CASH assets are automatically recorded in the POPCHAIN CASH ledger, and having POPCHAIN CASH accords to joining a POPCHAIN community. The joint efforts of community members and users improve the quality of the entire community.

# 5. POPCHAIN Use Cases

POPCHAIN Team has explored the issue of delivering value among different entities through a variety of digital contents distribution systems. In the long term, POPCHAIN plans to provide an open, decentralized entertainment platform to various entities through a digital contents distribution system. The possibilities can be found by various use cases of POPCHAIN.

## 5.1 Contents Crowd Funding

Contents creators can earn initial funding for their contents through crowd funding through POPCHAIN. For example, if you are crowd funding for a game development, the game development team will be able to secure game development funds through many investors. On the other hand, the investors can receive the revenue according to crowd funding conditions after the game is released.




[Game Crowd Funding Capital Flow Chart / Light: Investment Inflow – Dark: Distribution of Profit]

## 5.2 A New Form of Music Sites

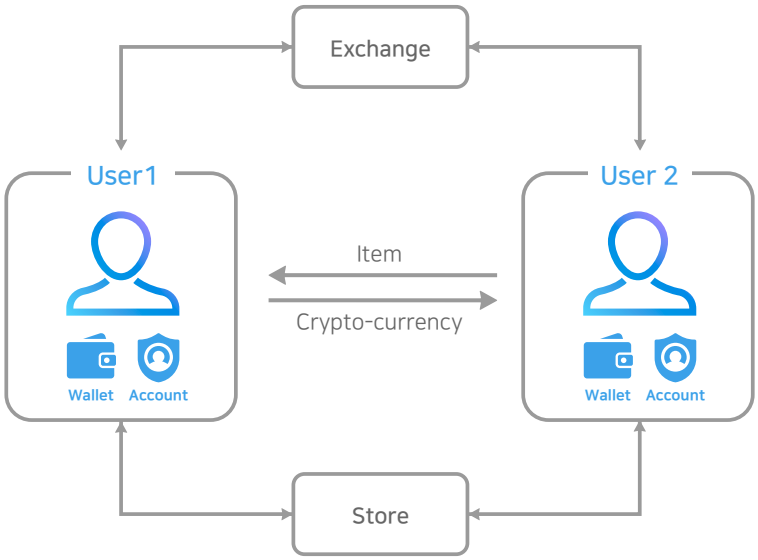
The smart contract of POPCHAIN can reduce the complexity of the music industry and simplify major roles of recording companies. Music producers can create a producer-centric model in POPCHAIN, and earn a reasonable return based on their production value. The revenue readily occurs when the users (listeners) pay with POPCHAIN CASH to share and appreciate the music.

These models regard producers as entrepreneurs and equal partners in value standards, respect agreements and regard them as indispensable parts of value creation. Therefore, we apply the concept of comprehensive royalty to distribute profits equally not only to composers and performers but also to professions such as engineers according to their contributions in the production process. In addition, the decentralized ledger of POPCHAIN ensures transparency by recording all the revenue generated by each music source, the time and size of the revenue earned, and the rate at which the revenue is gained. In addition, reputation points can be created at the addresses through address transactions history and AI services on POPCHAIN, and producers

can avoid contracting with certain partners who are below the standard reputation or lack funds in the ledger through the multi-signature smart contract.

### 5.3 Combination of Each Entertainment Service

Once an application that leverages the side chain of the POPCHAIN platform is deployed, internal value delivery becomes very convenient. Each token is traded in a Two-way Peg format in POPCHAIN and the previously inefficient third-party trader can be eliminated. Transactions between a user and a shop (seller) or between two users can now be carried out with each token without an intermediate trader. For example, assuming that live broadcasts and games are connected through each side chain, users using each service can easily exchange live broadcast tokens and game tokens at stores and exchanges.

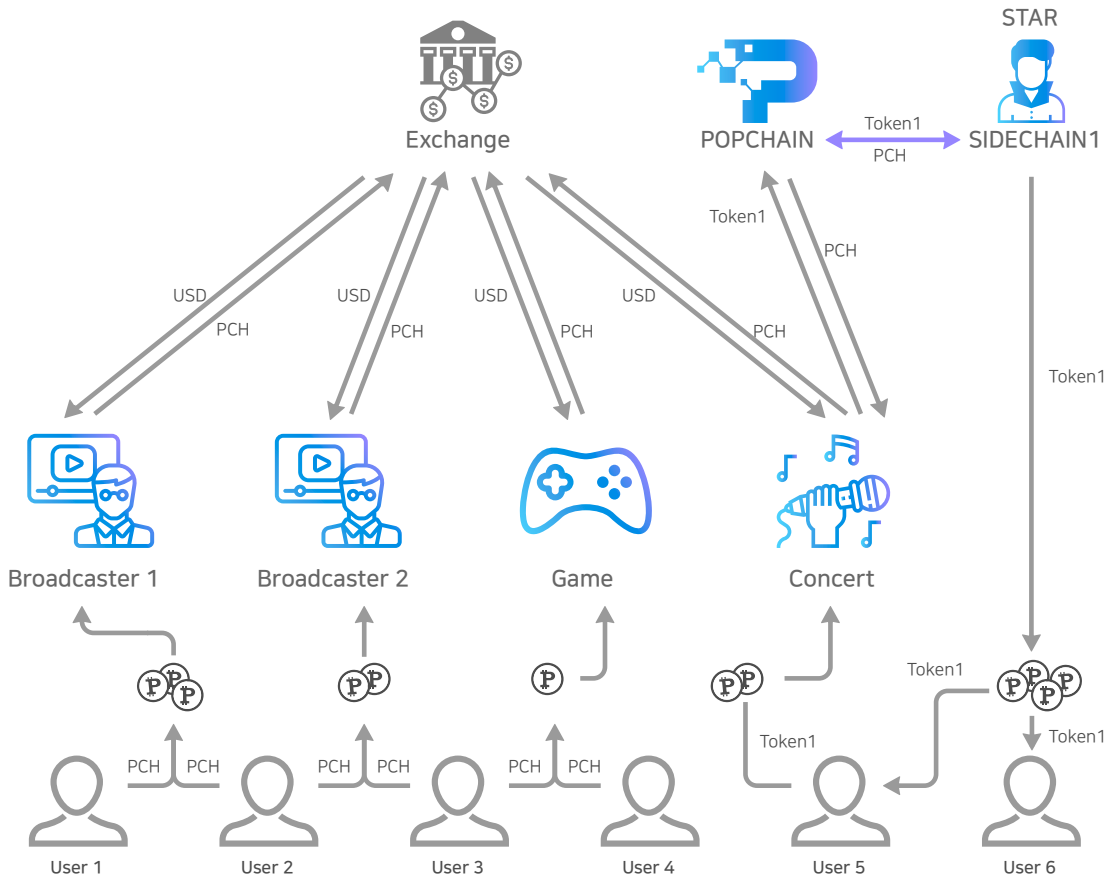



[Value Transmission among Applications]

### 5.4 Fan-based Entertainment Business

Users can watch live broadcasts using POPCHAIN CASH. Broadcasters can convert POPCHAIN CASH obtained from the profits into key currency and use it outside the POPCHAIN economic system. It can of course also be used for other users or fans. If the user is a gamer, it is also possible to purchase games using POPCHAIN CASH with other users. Some game users can sell the equipment gained from the in-game quests to other users and get POPCHAIN CASH. If some game masters have a good understanding of the game, they can respond to the game company's questions and suggestions, organize the game community, and vote for the game. After such proposal is adopted, the player can receive a certain amount of POPCHAIN CASH in exchange for participation in game ideas.

In the case of a popular celebrity, a programmer can be employed with POPCHAIN CASH. If a programmer develops a side chain that includes a smart contract using the API interface provided by POPCHAIN CASH, he can issue his own token in the side chain of that star. Fans can use tokens to buy star concert tickets in POPCHAIN and promote their products, food, clothing, games and electronic consumer products. These tokens can be distributed for free to star enthusiast fans in welfare form, or be purchased with POPCHAIN CASH by fans. If the token has enough influence, it can be applied to the virtual currency exchange, and the consumer can also buy it through the exchange.



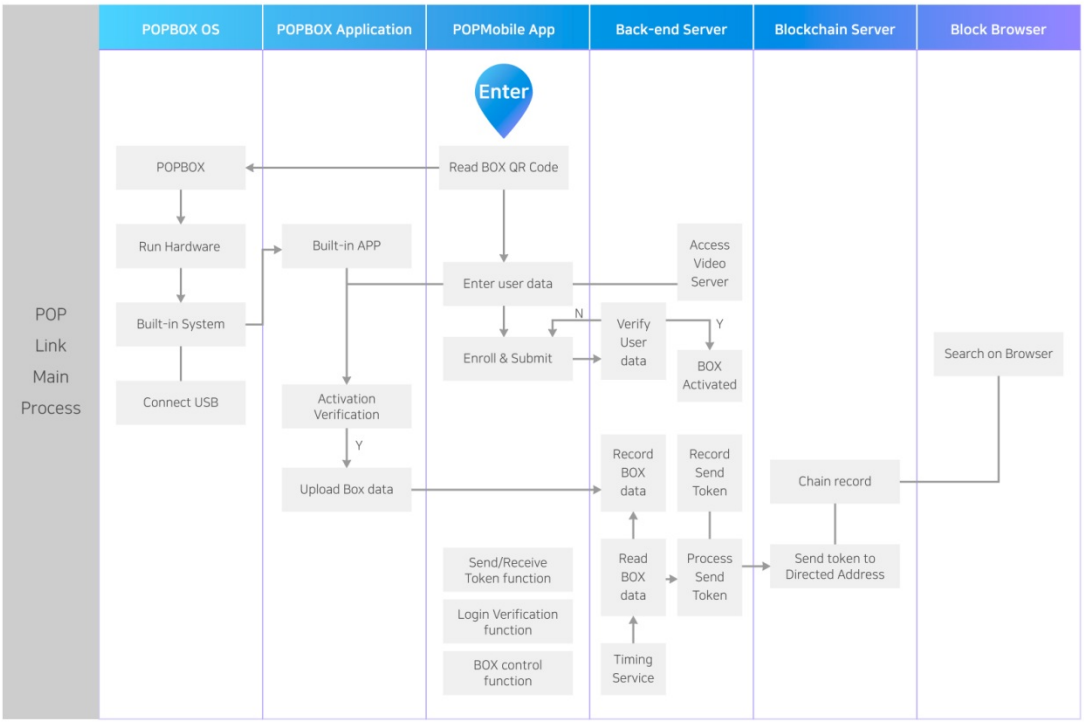

[Value Transmission of Fan-based Entertainment Applications]

## 5.5 User Application Use Scenario

User application scenario can be identified by assigning a basic framework. After a user downloads and initiates the POP Application, he or she scans the QR code on top of POPBOX. Then, when POPBOX and the POP Application are linked, he or she inputs the user information and submits the registration application.

The coin issuance and receipt service are processed through the relevant information recorded in the data service according to the regulation rules. The service contribution of POPBOX is calculated based on this information, and the coin issuing node dispatches a coin to each POPBOX.

Detailed framework is as follows:

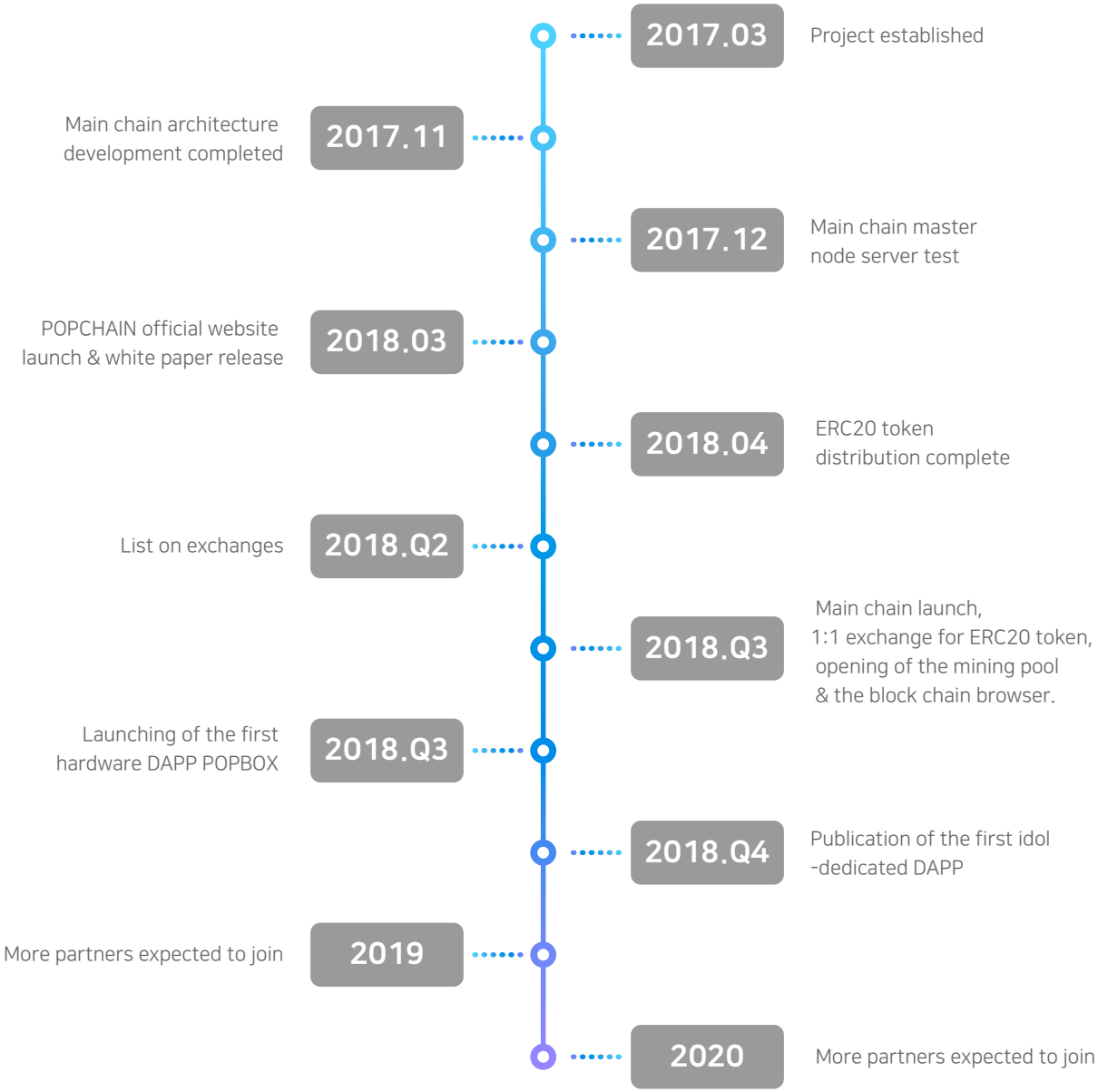



[Application Use Scenario]

## 6. Roadmap

POPCHAIN will build an initial system with live broadcasting and video distribution services. Then, we will expand the ecosystem to strengthen services by providing contents-related services such as movies and dramas, and introduce smart pushes to strengthen user convenience and technical aspects.

In addition, through the use of the side chain, we will create platforms and tokens dedicated to celebrities based on the fan community, and expand ourselves to the performance and music business. In the future, we plan to expand our services to webtoons and web novels to combine games, live broadcasts, webtoons, music and video contents and ultimately evolve into a large platform that encompasses all areas of entertainment.




[POPCHAIN Roadmap]

# 7. Team Members

The POPCHAIN team has gathered top-notch talent with a wide range of skills. It has the ability to develop a full-blown block chain technology with more than 10 doctors as leaders. Team members of the technology development team consisted of about 50 great programmers and algorithm engineers with backgrounds in block chain, cryptography, Internet information security, big data, cloud computing, artificial intelligence, finance and management. The consulting team consists of expert scientists of advanced block chain cryptography and professional block chain project investors who jointly develop key technologies for the POPCHAIN platform.

- Zheng Yang, Founder & Development Team Director

Dr. Yang has participated in the research and development of multiple block chain projects and has a deep understanding of the combination of the block chain, contents distribution and big data analysis. Zheng Yang's main research focus is on computer vision, machine learning, etc., about which he has an extensive knowledge. He has participated in many fields such as digital media contents analysis, cross-media contents retrieval, and big data video analysis. He has completed a number of national key scientific and technological research projects that have been highly evaluated and recognized by the government.

- Liang Liang, Founder & Development Team

Dr. Liang's main research focus is on the field of information system integration. He has published multiple sophisticated papers Over the same period, he has participated in several information system projects in both national and provincial-level. Recently, Dr. Liang has conducted in-depth research in system evaluation and optimization, system modeling, and block chain finance, while gaining a wealth of experience in block chain and system software design based on the block chain technology.

- Stephen Wang, Technical Director

Stephen Wang, co-founder of TalentWalker, has developed Happy Farm, China's first H5 game, and has accumulated over 10 million users on platforms such as Mocospace and Gree. The social games Happy Kitchen and East Village were then launched on renowned platforms such as Renren, Taobao, Facebook, Nate and Mixi, and accumulated approx. 50 million users. He has worked as a researcher in Lenovo and MS Asia Institute in China and won the Best New Artist Award in 2007 BAFTA ONCE TO WATCH AWARD.

- Neil Han, Product Manager

Neil Han is the co-founder of OraStream (the world's first self-adaptive High Fidelity Streaming Media) and the technical director of Snyppit, the first video contents sharing APP in Southeast Asia. He has served as Senior Technical Director for Southeast Asia in Korea SK Group and has been responsible for developing Southeast Asia version of Dianping in China. He also served as Chief Technical Officer for Asia Pacific at Twilio (NYSE Listed). He is providing technical advice to leading Internet companies in Asia.

- Tim Leon, Architecture Designer

Tim Leond is VP of Cassia Networks and has more than 10 years of experience as a specialist in the Internet of Things and smart hardware area. He also won multiple Best of CES in the US CES Awards. He has been involved

in research and development of social video content at Tencent, and has also worked for Chukong Technologies and MS Asian Engineering Academy.

- Will Sangwon Son, Founder & Business Team Director

Will is currently director of THE E & M and is pursuing various new contents related businesses. He is a contents network specialist as a Co-founder of Ars Praxia – formerly TREUM –, a Big Data & Social Network Analysis Company. He studied industrial engineering, computer engineering, and design and carried out various projects to generate synergy, and has collaborated with Samsung Electronics, Coca-Cola, Naver Corp., etc.

- Jin Lim, Founder & Business Team

Jin is currently the senior manager of THE E & M and is responsible for various content related business strategies. He established global communication strategies at Samsung Electronics Video Display Division and produced a variety of marketing communication promotional materials. He has extensive experience in the software and hardware aspects of global contents.

- Hansin Kim, Co-Founder & Business Team

Hansin is currently in charge of Business in Asia as head of The E & M. He has developed a wide range of business experiences through over 7 years of experience of directing business in China. He specialized insights on contents through game-related business.

- Vladimir Zhitov, Financial Consultant

Vladirmir Zhitov is currently the general manager of Russia's MDM Bank and has extensive experience in banking management and financial knowledge system. He has successfully processed risk management related to bank branch management and gained deep knowledge in national policies and bank characteristics while working in various regions. He has an experience working in Cberbank and ALEMAR Open Co., Ltd. (Kemerovo) of the Russian Federation.

- Kononov Vasilii, Technical Consultant

Kononov Vasilii is currently senior designer at Rock Miner and is a very talented hardware engineer responsible for the development and design of the mining equipment. Since 2013, he has participated in the research and development of the first generation 110nm and second generation 40nm mining machines of early Bitcoin industry, and has rich experience and deep knowledge about cryptography.

- Ralf Klamma, Technical Consultant

Ralf Klamma is currently Chair of the Information Systems Department at Rheinisch Westfaelische Technische Hochschule Aachen University, Germany, and is leading the Senior Community Information Systems Research Group at the University. In addition, he acquired Habilitatio, the highest degree available in Europe, at Rheinisch Westfaelische Technische Hochschule Aachen University in 2010.

- Thomas D' Alonzo, Legal Consultant

Thomas D 'Alonzo is currently director of BioDelivery Sciences International and sALIX Pharmaceuticals. He has a wealth of experience including serving as CEO of MiMedx Group, DARA BioSciences, Pharmaceutical Product

Development (PPD), GENVEC, and Glaxo (GSK Telegraph).

- Dean Xu, Community Operations and Management

Dean Xu is currently vice-chairman of Chinese Culture and Economic Exchange and Development Association and is operating cross-straits exchanges tourism business. He has served as a manager at ZHONGANBAOQUAN. He is in charge of community operation and management of POPCHAIN.

# 8. Partners

## 8.1 Primary Partners

THE E & M

BLOCK INSIDE

CELUV.TV

POPKONTV

roobo

## 8.2 Content Providing Partners of Celuv TV

Urbane Music

fantagio

Jellyfish ENTERTAINMENT

MNH ENTERTAINMENT

rainz

DSP media

KQ ENTERTAINMENT

STARSHIP ENTERTAINMENT

double kick company

PACEMAKER entertainment studio

C9 Entertainment

ENTERTAINMENT





8.3 Global Partners of THE E&M






## 9. Legal Considerations

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