Olive
A Decentralized Live Video Streaming Platform

Decentralizing storage, computation and network for live streaming

Project Overview

Live streaming platforms have prospered during the past years, catering a large number of audiences with highly flexible and customized video and audio contents in various domains such as music, talkshow, gaming, social networking and so forth. The rapid boom of such live streaming platforms can be attributed to several technical and socio-economic factors, including increasing network bandwidths with lower costs and massive proliferation of wireless network infrastructures, higher adoption rate of smartphones and mobile devices, wider acceptance of the KOL (Key Opinion Leader) economy, as well as ever-demanding audiences for subscribable, customizable and appealing entertainment activities.

At the same time, there is natural synergy between blockchain technology and live streaming industry due to blockchain's inherent features, such as anonymization, decentralization and cryptocurrency. By utilizing these features, we see an enormous opportunity to build up an ecosystem around a blockchain based live streaming platform, which will eventually disrupt the whole industry. Anonymization and decentralization of blockchain technology will help live streaming platforms avoid being unnecessarily audited or banned by public authorities. It will definitely enrich the diversity of content, and attract more users. Furthermore, the decentralized transaction mechanism of blockchain will significantly reduce operational costs, leading the way to a new business model in the era of a decentralized internet.

To embrace this opportunity, Olive team is launching the world's largest decentralized live streaming service, Olive. In order to completely decentralize the live streaming ecosystem, Olive desirably introduces three new roles (transcoding users, streaming relay users, and channel hosts promoters) for advancing the progress of decentralization. In this progress, they will share a range of 5-10% of Olive's revenue as a reward for their contribution, and substantially decrease the operation cost of Olive platform. Benefiting from the progress, the profit sharing ratio for a channel host may be gradually raised from traditional 50-percent to 90-percent, which make Olive the most attractive live streaming platform for channel hosts.

With full participation of more and more autonomous contributors in the future, Olive team will forge a live streaming ecosystem without centralized operation cost which will highly improve the efficiency of social resource and provide more reliable service. Meanwhile, all contributors in this live streaming ecosystem will receive maximized benefits.

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1. The Booming Live Streaming Market

In the past few years, live streaming business has successfully proven itself to be one of the fastest growing sectors among all major economies. According to a recent study by Deloitte, the global live streaming market will reach $7.4 billion in 2018, representing a 47 percent increase over the previous year.

Millennials are generally more willing to gift channel hosts and performers, in the form of buying digital gifts such as virtual flowers, lollipops or even cars and gifting them to channel hosts and performers. These gifts, as known as tokens can be priced at as low as pennies or as high as hundreds of dollars.

While the live streaming market is still expanding, more restrictive regulation has been laid out and greatly increased the operation costs for service provider. Gradually, live streaming platforms are expecting a slower growth. A few platforms have chosen to shutdown their services, resulting in a bad situation where many performers (or channel hosts) have to look for a more dependable platform to start over. Also, the value income of channel hosts are exploited and delayed by the platform, which affect the mood of channel host, and then influence the live content generated. Last but not the least, user privacy will not be well protected by centralized platform.

However, a decentralized live streaming platform will bring more open, fair and optimized user experience to the live streaming industry.

2. Features of Olive

In this fast growing live streaming market, many problems are still pending to be addressed. A decentralized live streaming platform, Olive is targeted to create a fair and globalized live streaming ecosystem.

2.1 More Income for Channel Hosts

While most live streaming platforms today have set up a profit sharing ratio for channel hosts at a low 50-percent range, Olive vows to boost this ratio up to a 90-percent level. The final ratio may vary based on the actual costs of computational power and/or infrastructures. However, with an undeniable increase in profitability, countless channel hosts are expected to join Olive ecosystem sooner than later.

2.2 Olive Becoming an Ecosystem

Every contributor within Olive ecosystem will be rewarded. The goal is to build an open-sourced live video chat platform, with competitive numbers of channel hosts and audiences. By rewarding audiences who voluntarily share their computational power, Olive can quickly grow and expand its ecosystem. Olive has effectively decentralized functionalities such as marketing/promoting, live streaming and payment settling, expecting a tremendous cut down in operational costs for this project.

2.3 Regulatory Ineffectiveness

Without a proxy or VPN, Olive is able to break through all network restrictions put up by regulatory authorities via the so-called “relay users” in Olive network, and such an approach will definitely improve the quality of service. Likewise, a distributed ecosystem is considered to be absolutely challenging for regulators to audit the streaming contents, thus making forbidding people from accessing Olive service nearly impossible.

2.4 Instant Payments

All payments to the channel hosts will be paid off instantly and directly. There is no a centralized payment system between audiences and channel hosts, and there is no minimum purchase requirement for users to buy Olive tokens.

2.5 Better Video Quality

Along with channel hosts, relay users and transcoding users are also key components in Olive ecosystem. Users can download public released relay and/or transcoding program from Olive, to make Olive video steaming faster and better. In return, these contributions will be rewarded with Olive tokens automatically.

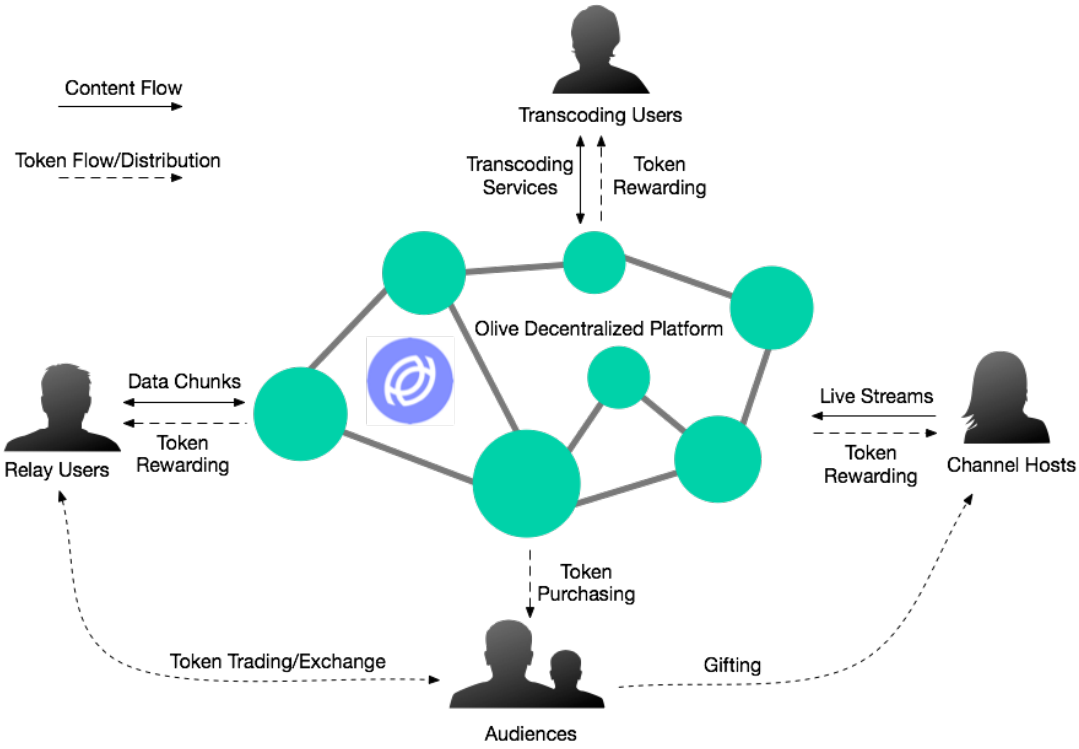
2.6 Privacy

Olive users are completely anonymous. There’s no requirement for users to share their personal and financial data with Olive, and all payment transactions are protected by the blockchain.

3. How Olive Works?

3.1 Users Contributing to Platform Decentralization

To build a vigorous live streaming ecosystem, Olive allows users to be a part of the platform infrastructure and become ecosystem contributors. As contributors, users can exchange their free resources for Olive Token as a reward, which can further be used to exchange and trade with other users, purchase gifts as well as unlock VIP membership functionality and premium services.



Naturally, channel hosts as the main live stream generator and provider will be rewarded and motivated by Olive Tokens as well as gifts for their quality contents and the audience leads attracted by the hosts.

The main source attributed to these content providers is platform audience, who purchases Olive Tokens and gifts from the Olive platform or third-party exchanges indirectly from other users outside the platform. Besides the possibility of becoming a channel host to get rewarded, users can also become relay users or transcoding users.

Relay users contribute their free disk spaces to collectively construct a distributed file storage system. Specifically, these users are asked to store a few data chunks on their devices, so that when requested by their peers, they can relay such chunks to the final destination. These users are rewarded a specific number of Olive Tokens based on the amount of data they have relayed for the ecosystem.

Finally, transcoding users help Olive convert archived video contents from one format into various other formats in order to accustom platform users' devices. Transcoding of video files is a computational expensive task and as a result, Olive can save a portion of the transcoding cost incurred by traditional centralized service architecture. In return, Olive will reward such users for contributing their CPU and GPU resources with Olive Tokens based on the actual efforts needed for each transcoding job.

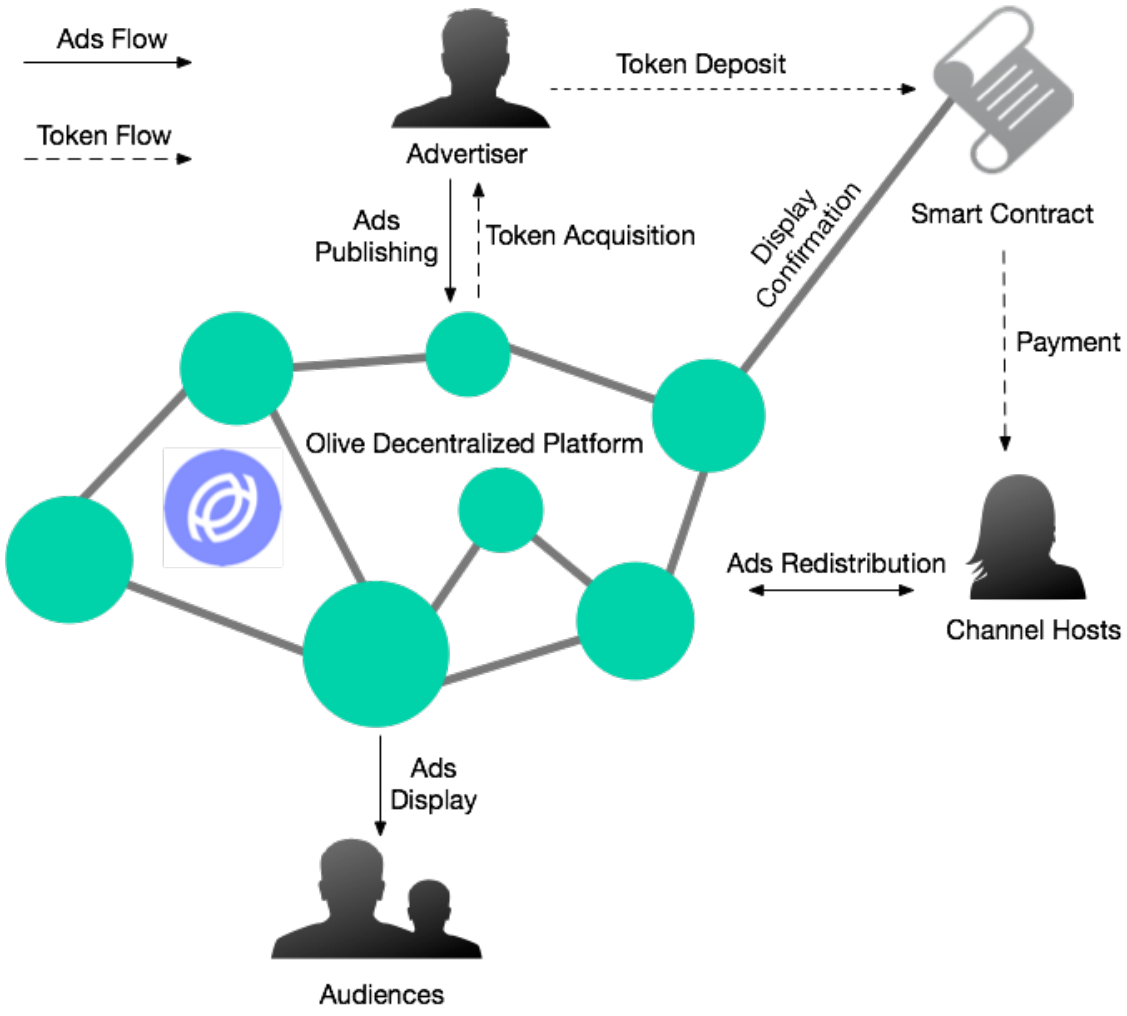
It is worth noting that one user may assume multiple roles at the same time. For instance, performers can be channel hosts at the same time. Besides, relay users can also take advantage of their idle computational resources to conduct transcoding jobs in exchange of more Olive Tokens . In this application scenario, Olive users are not only users by definition, but also the constitutional blocks for the whole ecosystem, and therefore they are rewarded proportionally to contributions.

3.2 Advertising with Smart Contracts

An important line of revenue for live video streaming platforms comes from online advertisements. In this scenario, advertisers acquire Olive Tokens in order to place advertising orders. After an order is placed, the Olive platform establishes a smart contract to oversee the advertisement distribution process and Olive Tokens paid by the advertiser are temporarily deposited into the smart contact.

Channel hosts can retrieve advertisements from the platform and redistribute them to their audiences. The smart contract oversees the redistribution of all advertisements published originally by the advertiser. As a decentralized platform, the redistribution process will be more reliable than centralized systems.

Once the smart contract has verified the redistribution process, corresponding Olive Tokens deposited by the original advertiser will be credited into channel hosts' accounts according to their contributions of redistribution .



3.3 Data Exchange with Smart Contracts

Another important application in Olive platform is data exchange bounded by smart contracts. In the big data era, data is a treasure in every business domain. For the live streaming industry, it is imperative to collect and accumulate virtually everything about the users, including background of channel hosts, viewing habits of audiences, type of advertisements a user is interested in and so forth.

Once these data are collected, they can be resold to other interested parties. In order to protect the privacy of platform users, user identities are naturally anonymized. In addition, smart contracts are used to guarantee successful delivery of such data in encrypted format so that the risk of leakage and redistribution of such data is minimized.

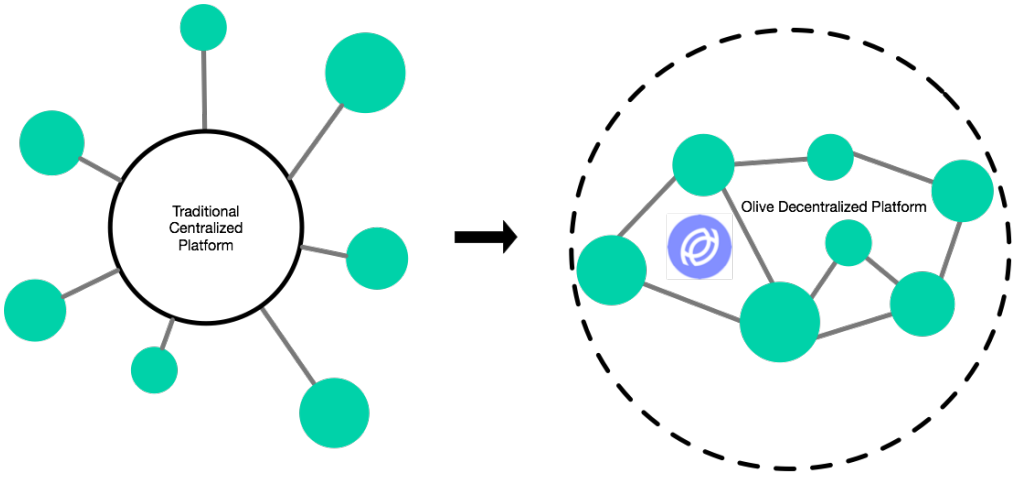
4. Business Model

At present, the traditional live broadcast platform profits from audience's virtual gifts, and the channel host commission basically takes about 50% of the profit. Olive is aimed to make 90% of the audience's pay to reach the channel host through a decentralized approach **in the final stage**.

Olive will use a different mechanism to replace the centralized broadcast platform. Tokens will be sent to the channel host directly by the viewer through smart contracts. Ten percent of these tokens will be allocated to users supporting the decentralized network platform:

3% for relay users
3% for transcoding users
2% to the channel host to promote users
2% for daily operation of the platform

The channel host promotion users will be rewarded with an additional 5% bonus for bringing additional users to the channel. Due to the perceived latency of blockchain transactions, waiting for the transaction confirmation process may result in a poor user experience, especially in the live broadcast area. To do this, Olive will link the transfer transaction to a synchronization database that will validate the transaction before the transfer transaction takes place to resolve the issue. This process will ensure that viewers reach the channel host in real time and add a transaction verification security layer.



In the early stages of providing services, Olive team will play the role of a large number of contributors (streaming media relay users, streaming media transcoding users and channel host promotion users) to the platform. Olive team will adjust the number of related users based with increasing number of users joining the Olive ecosystem, the introduction of the user role played by the Olive team will become less important to the platform. The Olive will become the decentralized platform maintained by the Olive team and users. Our goal is to revolve Olive's decentralized live streaming platform into an ecosystem where everyone can play a key role: channel host, streaming media relay users, streaming media transcoding users and channel host promotion users. These key roles will replace centralized servers and marketing process of traditional live platforms. Thus this ecosystem run on its own. The main responsibility of Olive's operations team is to ensure the daily operation of the entire decentralized live platform and create the best user experience, to help users solve technical problems encountered, to manage the infrastructure management background when our backup server is abnormal.

Streaming media relay users and transcoding users will receive 3% of the audience pay. Trunk users and transcoding users will continue to continuously synchronize the information of the online channel host, the viewer and other available relay and transcoded users to provide the best quality of service

4.1 Channel Host Reward Policy

To ensure that the Olive platform can attract a sufficient number of channel hosts in the initial stages, content resources that quickly initiate the ecology of the entire Olive blockchain are available. Olive will set up a bonus fund for the channel host, 10% of the funds obtained during the token crowdfunding will be used to set up the fund. Channel host awards can be divided into two main types: online duration bonus and quarterly bonus.

4.1.1 Online Bonus

Every day, Olive distributes online rewards to the channel host according to the

online duration of the channel host. The rewards will be paid in Olive tokens. The amount of tokens obtained will be determined by the following formula:

Online Bonus = Online Hours * Total Number of Viewers

The online duration bonus is mainly to ensure that the audience has a stable and sustainable content supply during the project start-up period. In order to stop speculative rewards and encourage channel hosts to be on-line on a regular basis, online time-honored rewards will be based on long-term principles and minimum audience numbers.

The long-term principle that tokens reward distribution will be delayed principle. Fifty percent of the tokens will be settled on the same day via smart contracts while the other 50% will be paid the next day. The definition the second day payment is that on the day of online duration which is no less than 3 hours. The principle of the minimum number of spectators means that each time the token is executed and settled, if the total number of viewers during the online time slot is less than 100, the token issuance conditions are not satisfied. If you do not meet the token issuance conditions, then the remaining issued token reward will be automatically returned to the incentive fund. The award process will be fully executed and confirmed by the smart contract without human participation.

4.1.2 Quarterly Rewards program

In addition to the online duration bonus, in order to promote competition between channel hosts, Olive plans to introduce a year-end reward system to support high quality and sustainable live streaming services. Each quarter, the top ten channel hosts will receive additional rewards that will be proportional to the amount of tokens they receive from the audience.

The top ten channel host selection will be generated by audience votes. In order to increase the loyalty of the audience, a polling mechanism will be established to influence the channel host's ranking. In order to promote consumption, the value of each vote will depend on the token spent by the voting user on that day. The audience can cast a vote on the voting chain for one channel host every day. The same channel host can accept double voting. If the viewer votes in the chain for about 5 days, the channel host's vote chain on the user will be invalid The Therefore, the channel host's ranking depends not only on the number of votes finally acquired, but also on the audience's guardianship of the channel host.

Reward and rewards programs are revalidated quarterly in the Olive community, all Olive token holders are free to participate in the discussion, and finally the token holders use the holding interest vote. The final program is a reward program for community consensus.

4.2 Value-added Service for Audience

Olive Lottery - The winner of Olive Lottery will receive Olive tokens provided by the corresponding channel host as rewards. Olive lottery is fully transparent system, eliminating any third-party involvement in the lottery process and management of funds. The lottery is fully operated by smart contract. Therefore, all tickets sold and results are available to the public and recorded on the Olive public ledger without 3rd party involvement.

OliveSport Lottery - With smart contracts, Olive allows users to participate e-sport lottery online. Channel hosts of e-sport game shall transparently define or select specific rule of lottery according to the live e-sport game including their commission. Users need to mark their choice and transfer Olive Tokens into specific lottery pools in advance. Once e-sport game comes to the end and channel host confirms the game result, lottery pool will automatically release award to the winner/winners.

OliveSport is a revolutionary decentralized service offering an betting experience to the audiences from all over the world. Combining a lottery and sports betting, OliveSport brings new rules into the live streaming world, making the process fair and simple for the audiences, profitable for partners. The determination of the exact results for the sports events based on the participants' knowledge and ability to analyze the situation make the foundation of OliveSport.

During project development, more VAS products will be provided to implement more entertaining activities and improve the practicability of Olive live streaming ecosystem.

4.3 Smart Contract

Access to platform services can only be based on Olive tokens. For the decentralized payment system, ensuring privacy and security is the key, so all payments will be done in the form of smart contracts. There are three main types of smart contracts:

Transactional smart contracts that allow transfer of tokens between users. The smart contract will store the number of tokens held by each user**.**

Channel host rewarding smart contracts that define whether a channel host has the authorization to stream. These contracts will store the relevant data of the rewarding plan, and release the channel host reward automatically.

User payment smart contracts that define whether a specific user is authorized to be a relay user or transcoding user or channel host promotion user. Those users are paid based on their contributions and payment will be automatically processed by smart contracts.

Initially, the Olive team can also play as a relay user or a transcoding user or a channel host promotion user. By this way, we can ensure a stable service for audiences.

5. Technical Architecture

Despite the popularity of live streaming platforms, delivering quality services has proven to be an expensive task. Especially, a major part of the expenditure of live streaming platforms is attributed to operational costs, which can be further divided into content censorship and monitoring, public relationship, payment transaction fees, and technical infrastructure development and maintenance such as computation and bandwidth. In order to reduce operational costs of such platforms, this whitepaper proposes a blockchain-based live streaming platform named Olive, which is set to become the largest decentralized live video streaming platform around the globe. Thanks to the decentralized transaction model adopted in Olive, operational costs can be greatly lower to a fraction of that in centralized platform architectures. In addition, such technological advances will help increasing the commission bonus rates (up to 90-95%) for KOLs, who will be significantly encouraged to provide more quality contents, attract more KOLs as well as larger audiences, and in turn help build a healthy ecosystem. In the meantime, audiences can be a part of the Olive network infrastructure, earning commission through supporting content encoding and delivery.

Olive envisions that a decentralized live streaming platform will fundamentally disrupt the live streaming ecosystem initially introduced by traditional centralized platforms. Specifically, the innovations brought up by Olive are three-fold:

1. Payment transactions between content providers and audiences are conducted through distributed ledger systems and governed by smart contracts. As a consequence, payments no longer rely on centralized payment servers that are prone to single point of failures, which further leads to reduced transaction costs and contributed to lower platform operation costs. In addition, distributed ledgers get rid of centralized intermediaries and thus provide a trustless infrastructure that will be more transparent, secure and resilient to attacks.
2. Audiences may opt to join the Olive streaming infrastructure in terms of content encoding and distribution. As an organic part of the network infrastructure, audiences can contribute their free computation and bandwidth resources to support the streaming network by means of transforming streaming data into a specific format and helping relaying network packets to their peers. This distributed paradigm will significantly increase the performance of the content distribution network by lowering delivery delays, reducing jittering, in addition to providing more resilience to distributed denial-of-service (DDos) attacks. Besides, since participants can significantly reduce operation costs introduced by centralized platforms, being part of the network infrastructure and eliminating Olive's computation and bandwidth bottlenecks will in turn pay back the participants by means of bonus tokens. Consequently, more and more audiences can join the network infrastructure and contribute to a even more vigorous live streaming ecosystem.
3. Eventually, the live streaming platform will become entirely decentralized

with the capability of self-organization, self-governance and self-evolution, leading to a networking protocol and infrastructure that is able to converge to an equilibrium state with various client devices inflowing or outflowing. Such a decentralized network architecture enables zero-management of the infrastructure, greatly reducing operation costs.

In the following sections, we detail the technical platform design in three stages: decentralization of transaction, content delivery and finally the network infrastructure. We also provide a roadmap for implementing such a blueprint, enumerating the respective milestones as well as deliverables.

5.1 Transaction Decentralization

There are a range of issues from traditional centralized transaction systems. Here we enumerate three major points.

1. The primary issue is linked with high transaction cost, especially for payments of trivial amounts. Within usual webcam platforms, all payments from users usually pass through many outside services of payment acceptance. Usage of such a cumbersome system often leads to failures and errors. As a result, payments crediting to an internal account within the streaming platform may be postponed for an indefinite period or even cancelled.
2. Another commonly found challenge is the need of associating names and identities to a transaction. As a result customers are constantly under the risk of identity leakage as well as customer behavior analytics to external parties. As privacy assurance is imperative for live streaming platforms, dealing with traditional transaction systems is both costly and infeasible.
3. The third issue lies in the payout delay and threshold. Typical payment transactions in live streaming platforms are trivial amounts. In order for a performer to receive one payout to his/her account, the balance has to be accumulated until a payout threshold is reached. When combining this accumulation period with the transaction delay caused by centralized payment systems, payout delay in traditional architecture is hard to ignore and can be demotivating to ecosystem contributors.

Confronted with these challenges, we seek to take advantage of mature blockchain technologies to decentralize the transaction system in Olive. Specifically, we rely on a Proof-of-Stake algorithm to establish an efficient and secure decentralized transaction system. When combined with the ring signature technology, Olive's transaction system can guarantee the anonymity of users, thus protecting them from various privacy leakage issues.

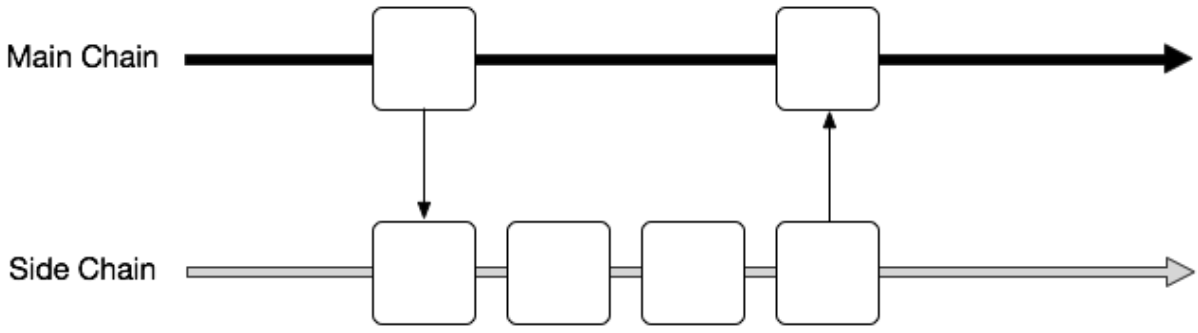
5.1.1 Proof-of-Stake for Fast and Secure Transaction

The first generations of blockchain technologies, represented by BitCoin [Nakamoto 2008] and Ethereum [Wood 2014], primarily take advantage of Proof-of-Work (PoW) function to prevent service abuses and reach consensus amongst participating nodes. PoW algorithms are often bound by a asymmetry feature, that is, the work must be moderately hard (but feasible) to solve but easy to verify for the service provider. Widely adopted PoW-based blockchain systems often rely on various hash functions

such as SHA-256, Scrypt, CryptoNote, Ethash, Equihash and so on. A primary concern regarding the operation of PoW-based blockchain protocols, however, lies in the large amount of energy required for their execution. For instance, it is calculated that generating a single block on the bitcoin blockchain requires more than 2^60 hashing operations, which results in strikingly large energy consumption and the total energy consumption of the bitcoin blockchain is comparable to that of a small country.

Since these hash functions have no other practical benefits within the blockchain system other than guaranteeing the security of blockchain transactions, academic researchers have proposed a new line of practice with Proof-of-Stake (PoS) [Kiayia et al., 2017], which can be significantly more energy efficient than PoW and still achieve distributed consensus in a secure manner. Rather than requesting miners to invest computational resources in order to participate in the leader election process which is performed in a randomized fashion proportionally to the computational power of each miner, PoS instead runs a process that randomly selects one of the participating nodes proportionally to the stake that each node possesses according to the current blockchain ledger.

Aiming at providing an efficient and secure transaction system, we opt for integration with the Ælf blockchain [Ælf 2017], which is a modern blockchain ecosystem with main chain and multi-layer side chains to handle various commercial scenarios. It is also able to communicate with external blockchains via messaging channels. Besides, Ælf supports parallel processing for non-competing transactions and thus enables fast transaction with reduced payout delays. Finally, thanks to the Distributed PoS (DPoS) consensus protocol in Ælf, delegated nodes is to enable transaction relay, transaction confirmation, packaging blocks with high throughput.



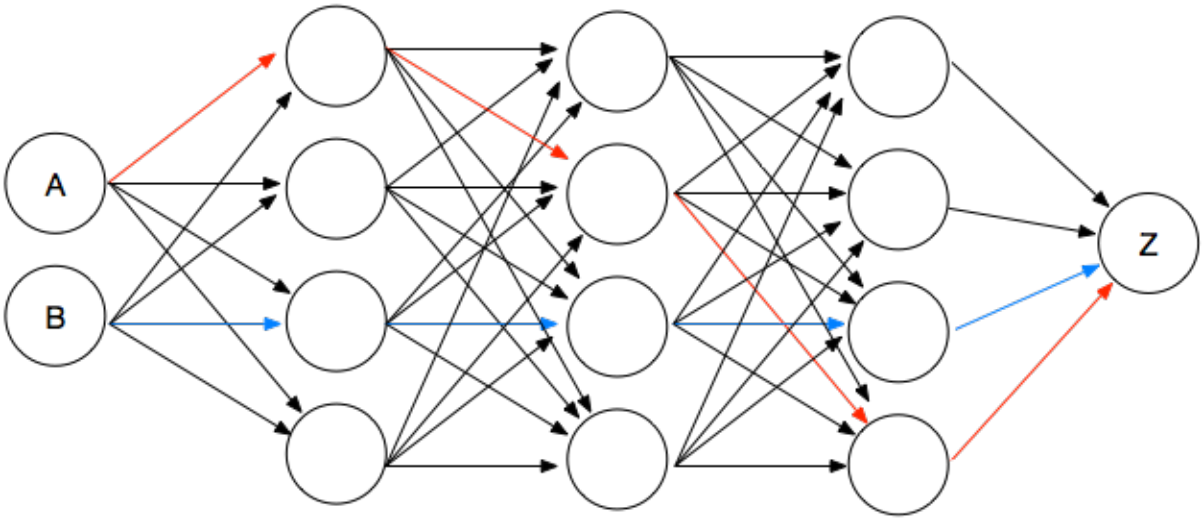
In addition, we take advantage of Ælf's multi-layer side chain structure to facilitate lightening fast micro-transactions in a side chain. In this design, the side chain will have a much smaller epoch interval, enabling close to real-time payment interactions between audiences and performers. These transactions will then be merged back to the main chain after a new epoch arrives.

5.1.2 Privacy by Default with Ring Signatures

Privacy and anonymity are of utter importance for users on live streaming platforms, however, traditional payment transaction systems are not well-positioned in this respect. It is therefore desirable to provide by default a vigorous anonymity and

privacy protection mechanism in Olive's transaction system. To that end we rely on a cryptographic primitive named ring signature [Rivest et al., 2001], which allows a user to sign a message or transaction on behalf of a group. Ring signature is a simplified group signature [Chaum and van Heyst, 1991] scheme which treats users equally without the need of prearranging a group of users or selecting a manager from such groups.

Contrary to traditional public key signature systems, where one user signs a message with his/her own private key and this message is then verified by others using the signer's public key, in the ring signature architecture the actual signer declares an arbitrary set of possible signers that includes himself/herself, and computes the signature entirely by himself using only his secret key and other ring members' public keys. In particular, the other possible signers may be completely unaware that their public keys are used by someone else to produce such a ring signature on a message they have never seen or consent to sign.



After signing the message the user provides not his own single public key, but the keys of all the users of this ring. A verifier is then convinced that the real signer is a member of the ring, but is not able to arbitrarily identify the signer. Such an architecture has been widely adopted in the design of cryptocurrencies, for example, cryptocurrencies based on CryptoNote [Van Saberhagen, 2013] technology, including Bytecoin and Monero.

Such a approach will not only protect user's identity privacy, but also make transactions in Olive platform resilient to blockchain analysis targeting at monitoring and inferring user's activities.

5.2 Decentralization of Content Storage and Transcoding

Previously we have laid out the technical architecture for decentralizing Olive's payment and transaction system by adopting blockchain technologies and specifically PoS census protocol combined with ring signatures. Now we take a step

further to apply meaningful PoW algorithms in order to allow users contributing their idle resources for decentralized content delivery for Olive. To that end we first take advantage of available disk spaces on users' client devices to decentralize the storage system. Then we devise a rewarding mechanism to encourage users to conduct transcoding for Olive's video contents and cutting the platform operation expenditure.

5.2.1 Decentralization of File Storage

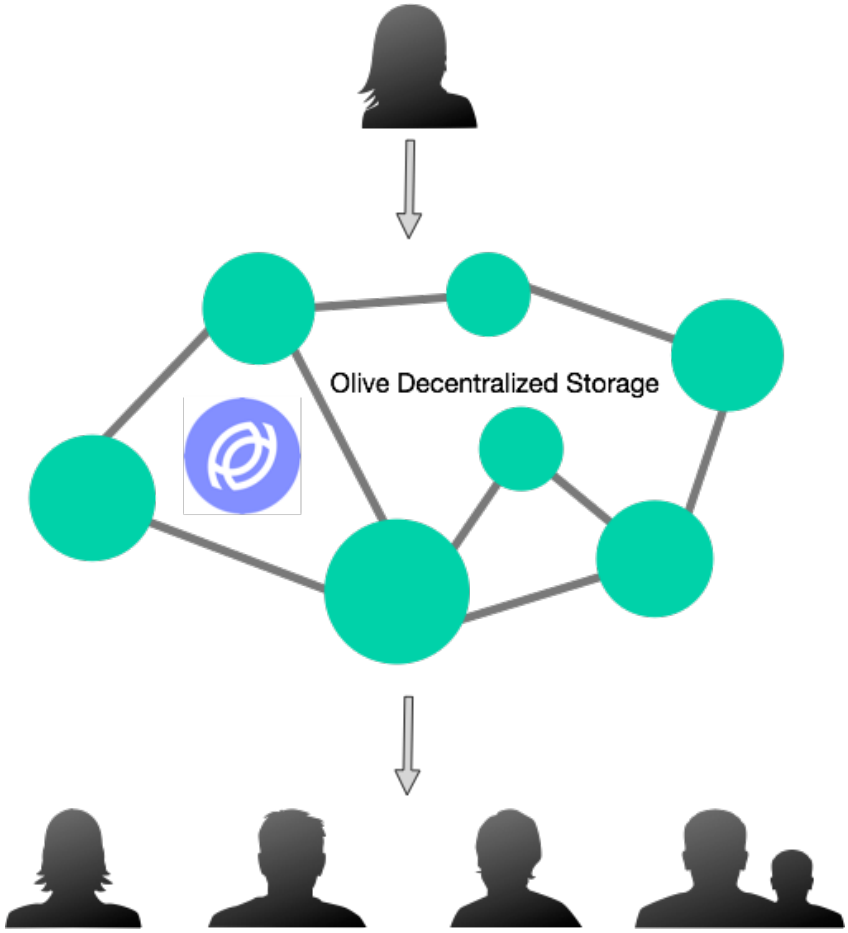
File systems are an essential part of any IT infrastructure. Depending on their specific usage scenarios, various file systems have been proposed with different primary focuses on throughput, reliability, fault-tolerance and availability. File systems can either be centralized or decentralized, although centralized file storage are often easier to implement, they are prone to availability failures and are easy targets of censorship bodies. Besides, centralized file storage are mostly suitable for small files but challenges arise when we enter the era of big data with petabytes of high-definition on-demand and real-time media streams. As cloud computing services become increasingly popular, more and more files systems have been designed to be compatible with distributed network architectures.

Decentralization of file storage can be devised in different perspectives, i.e., file data distribution versus version control. A representative of the former method is Content Delivery Network (CDN), which duplicates files and distribute them to edge networking devices that are physically close to clients accessing such files. As a representative of latter of decentralized storage genre, Git provides facilities to model files' historical changes over time and distribute different versions efficiently. Although it provides a powerful Merkle DAG object model that captures changes to a file system in a way that is friendly to distributed systems, it is most beneficial for tracking text revisions instead of binary formats.

To enable fast access to files and conduct effective file synchronization, Distributed Hash Tables (DHTs) [Maymounkov and Mazieres, 2002][Stoica et al., 2003] are widely used to coordinate and maintain metadata about peer-to-peer (P2P) systems. The success of DHT technologies have led to a great proliferation of other P2P architectures, the most prominent of which is BitTorrent [Cohen, 2008], enabling deploying of large file distribution systems that supports millions of simultaneous users. Today, BitTorrent maintains a massive deployment where tens of millions of nodes churn daily. Despite BitTorrent's success, it was not originally designed as an infrastructure for other systems to build upon and no general file system has emerged that offers global, low-latency, and decentralized distribution.

More recent research tend to combine mature technologies to form a new distributed file system architecture. For instance, the InterPlanetary File System (IPFS) [Benet, 2014] is a peer-to-peer distributed file system that combines the DHT, block exchange mechanism adopted from BitTorrent, a version control system and finally a Self-Certified Filesystem (SFS) to enable distributed trust chains and egalitarian shared global namespaces. IPFS seeks to connect all computing devices with the same system of files in ways resembling to the Web, but it can also be seen as a single BitTorrent swarm that helps exchanging objects within one large version control repository. IPFS aims at providing a high through-put content-addressed block storage model, with content-addressed hyper links. By design, IPFS has no single

point of failure, and nodes within its network do not need to trust each other.



With regard to the live streaming application scenario, files served in such a platform mainly include large media files. For example, historical video streaming media files which are occasionally played back via Video-on-Demand (VoD) services. Besides being large in size, such files can be played back in various encoding format accustoming to different receiver client. For instance, users on broadband with desktop clients may request video contents in high-definition format, whereas users on slower network connections may select lower definition content for the sake of smooth content delivery. In addition, different client devices are in favor of different content delivery network protocols. Such realities demonstrate that BitTorrent with static file sharing does not fully meet the requirements of modern living streaming platforms. Furthermore, BitTorrent's tit-for-tat rewarding strategy which intends to encourage nodes to contribute and punish leeching nodes is vulnerable to exploitative bandwidth sharing behaviors. Finally, BitTorrent peers track the availability of file pieces and prioritize sending rarest pieces first. This is in practical since users of live streaming platforms are generally more interested in popular content rather than contents that are seldom accessed.

Given the fact that not all distributed file system is suitable for the live streaming industry, we propose to remove the version control module from IPFS stack and established a new file system for underlying storage. This file system will have a lower response time compared to vanilla IPFS and is more suitable for live streaming applications. Within this architecture, historical video data files are divided into

smaller chunks and distributed in contributors' devices as a part of the IPFS swarm. To ensure availability of files, each data chunk is duplicated in multiple locations in the IPFS cluster, so that audiences and request the chunks routed from the node with the lowest response time.

In this stage, we propose a notion of Proof-of-Distribution, where users participating in the IPFS swarm are rewarded a number of Olive Tokens proportional to the efforts needed for distributing file chunks to their peer users.

5.2.2 Proof-of-Transcoding

As previously mentioned, live streaming platforms have to cope with various client devices such as smartphones, laptop and desktop computers, TVs and so forth. Consequently, video contents have to be transcoded to accommodate those devices. Technically, transcoding is the process of converting files from one format to another desirable and compatible format. Such a process is both resource- and time-consuming. For example, as a leading cloud transcoding platform, ZenCoder[1] charges 6154$ for 1,001 hours of video transcoding per month. For a large live streaming platform, such cost scheme is unbearable: just to imagine that users upload hundreds of hours of video contents to some live streaming platforms per minute and the transcoding cost skyrockets when more and more users start upstreaming.

In order to increase user engagement, especially for platform audiences, we propose a new Proof-of-Work mechanism for audiences with idle computation resources to help transcoding video contents and as a reward earn credits that can be used for content consuming activities such as paying for performers and content subscriptions.

For the distributed transcoding paradigm to work, a video file has to be divided into smaller chunks, so that they can be easily transferred from one node to another. Together with the file chunks, meta data regarding the transcoding job has to be attached. For example, the hash of a chunk for identification purposes, the timeout threshold and transcoding target format for a job. In order to ensure transmission security, the transcoding job data have to be encrypted and decrypted with the help of asymmetric encryption algorithms, e.g. private and public keys from a Public Key Infrastructure (PKI) such as the RSA crypto-system [Rivest et al., 1983]. Upon receiving a transcoding job, the node can then start transcoding the file chunks.

In a distributed system, nodes participating in a network can not be fully trusted. As a consequence, output from distributed transcoding jobs must be properly verified. On the other hand, due to lack of trustworthy central authority, the verification process should also be distributed. To counter this dilemma, we introduced a few permissioned nodes for system bootstrapping. These nodes take care of the initial verification process and establish the initial credit system.

During the bootstrapping phase, we establish an initial set of verification nodes proportionally to users' stakes inherited from the PoS snapshot. A randomized election process then takes place when a transcoding job is completed by transcoding nodes for verification. To verify the output of a transcoding job, the verification node

[1] https://zencoder.com/en/live-transcoding/pricing

randomly selects a proportion of the frames in the data chunk to transcode according to format specified in the job description. The output of a job is only deemed correct only if the output of all the randomly selected frames match that of the transcoder's output. To further increase the confidence levels, multiple randomly elected verification nodes can verify a job at the same time. After a number of corrected confirmations, the transcoding job may be considered accomplished and both the transcoder node and the verification node will be rewarded to an amount of Olive Tokens proportional to the difficulty of the job.

5.3 Network Infrastructure Decentralization

So far we have proposed solutions for decentralizing payment transactions, file hosting and distribution, however, our infrastructure can be further decentralized in terms of network bandwidth. That is, platform users with idle networking bandwidth may contribute to the Olive platform and help routing all networking traffic, including both VoD traffic and live streaming traffic. The decentralization of the Olive's network infrastructure takes the Proof-of-Distribution to a level higher, since Proof-of-Distribution considers only video file delivery without being bounded by the timeliness. However, when a large number of users join the Olive platform, we envision that we can conduct live video streaming directly on the decentralized network established entirely based on platform users' devices and contribution. At this stage, the Olive platform becomes fully decentralized in terms of transaction, computation, file storage as well as network infrastructure.

5.3.1 Lowering Latency for Live Streaming Network

Currently there are different architectures for live streaming platforms, which can be categorized into two leagues: web-based versus P2P league. Web-based architecture relies on mature and widely adopted HTTP with underlying TCP as transport layer, thus it is easy to implement and supported by major client devices. However, it also comes with a heavy overhead by the underlying networking protocols. Due to significant issues with network delays, web-based streaming architecture are commonly found for VoD services, when adopted for live video streaming platforms, the heavy overhead costs both service providers with large bills and customers with poor user experience.

Although there have been attempts to adopt HTTP for live streaming, for instance, the HTTP Live Streaming (HLS) [HLS] proposal by Apple, there are a few fundamental challenges for the use case of live streaming due to the underlying TCP stack:

1. Many live video-streaming applications are not originally designed with TCP streaming in mind. When using TCP, the underlying environment, i.e., the operating system and network stack, must buffer unacknowledged data chunks for every client. This is undesirable, particularly in the case of live events, where loss of a fraction of the data can be unnoticeable for audiences. VoD requests, on the other hand, do not have as much of a problem with this and therefore TCP is more appropriate for replaying video-on-demand contents.

2. Live video is normally a constant-bandwidth stream recorded off a camera, contrary to pre-recorded video streams which are fetched directly from a file system. The loss-backoff mechanism of TCP makes it difficult to serve live video when the source streams are at a constant bandwidth in a live video streaming event. Furthermore, TCP connections are destroyed after lost of too many packets; on the other hand, UDP offers great flexibility with much more control for this specific application since it does not stress about network transport layer datagram drops.

3. IP multicast significantly reduces video bandwidth requirements for large audiences. Since TCP establishes an end-to-end connection between two endpoints, it is infeasible to use IP multicast in the case of TCP, while UDP is well-suited for IP multicast with a large audience.

Due to the limitations of TCP and HTTP for live video streaming, this whitepaper propose to adopt UDP for the underlying transport protocol and construct a P2P overlay network for content distribution. There are two widely adopted overlay architectures in P2P-based live streaming systems: tree-based paradigms and the mesh-based approaches. Tree-based protocols build a tree overlay on top of the application layer, resembling concepts borrowed from IP multicast. Therefore, in a tree topology, media is pushed from the root to exterior nodes and finally to leaf nodes. The main benefit of these approaches is short latency of data delivery. However, the tree structure is very fragile: failure of nodes close to the root can affect all the traffic that is forwarded by this interior nodes.

As an alternative to tree structured overlays, nodes can be connected in a mesh network. Then the availability of data can be used to organize and maintain the data flow. Peers can receive content data from multiple peers and vice versa, to provide data to multiple peers. Thus the mesh structure is more resilient to node failures, but it is subject to unpredictable latencies due to the frequent exchange data flow routes.

Olive proposes to implement a Hybrid Live P2P Streaming Protocol (HLPSP) [Hammami et al., 2014] that is based on the grouping of several individual nodes into a smaller mesh structure according to their capacity. Then on top of these groups, a multicast tree (tree topology) is organized. In this architecture, each group represents a level of streaming capacity and naturally nodes with the most streaming capacity reside in the highest level. The multimedia contents are delivered from the source being a member of the highest level to lower hierarchies. This topology is thus a hybrid and tries to establish a tradeoff between the tree and the mesh topologies with benefits from both architectures. And academic simulations have shown that this hybrid streaming protocol can indeed result in lower percentage of data loss during transmission as well as lower end-to-end and playback delays.

5.3.2 Step-by-Step Decentralization of Content Delivery Network

Complete decentralization of the content delivery network requires a large amount of resources and thus may be best done step-by-step. During the early phases of this project, Olive can take advantage of third-party CDN services for delivering satisfactory live streaming quality. Then gradually, Olive will start operating adding its own nodes according to Olive users' geographical locations to the CDN in order to

further reduce the delay of live streaming services. When Olive has accumulated a specific number of users and if the technology matures so that consumer devices can also join as a node in the CDN, Olive can allow users with qualified networking nodes to join the CDN. As a reward, such users will receive incentives from Olive for their contributions. At this point, the CDN of Olive becomes fully decentralized and this network is fully functional with low latency, high throughput and great resilience to network congestion or attacks.

6. How to Get Olive Tokens?

In order to further expand platform capabilities, motivate users and successfully launch a decentralized live streaming platform, Olive will generate a total of 10 billion Olive tokens (OVC) through token generation activities (TGE). During the Initial Coin Offering (ICO) or the public sale, 1 ETH equals to 80,000 OVC. Special discount may be applied at different stages. OVC will be the only accepted cryptocurrency, which serves as an internal currency for purchasing services and rewarding contributors within Olive ecosystem.

OVC can be obtained through following ways:

- During the ICO, investors can buy tokens directly from Olive website. Tokens can be purchased in a variety of cryptocurrency forms, for specific information, please see Olive official website.

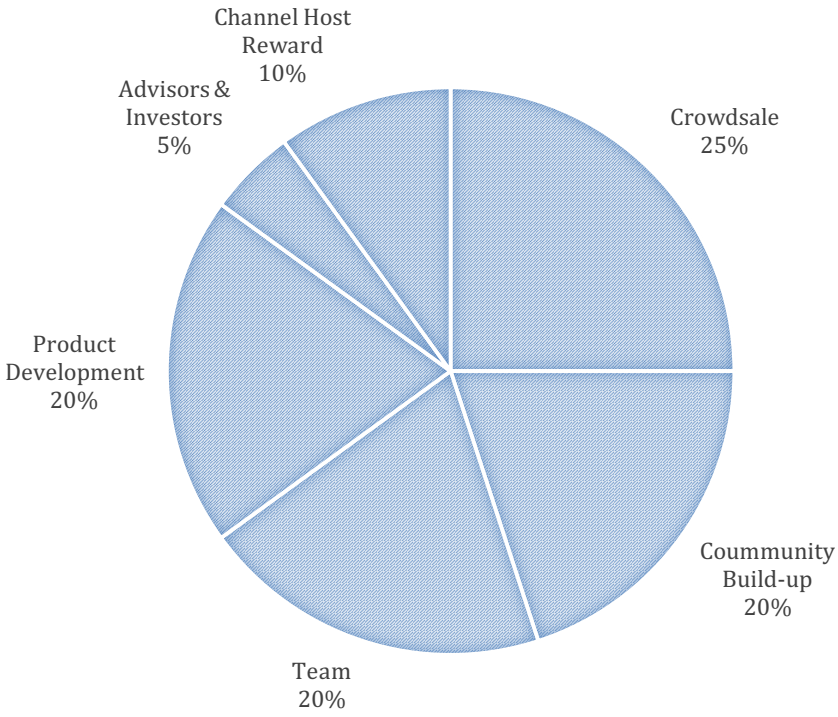
- After the ICO, OVC will be listed on major exchanges for public trading.

- Join into Olive ecosystem, and become an Olive channel host, a streaming relay user, a transcoding user or a channel promoting user. All different types of contribution will be fairly rewarded with Olive tokens.

6.1 Crowdsale

Total OVC Tokens: 10 billion
Total OVC Tokens for crowdsale: 2.5 billion
Token Sale Price: 1ETH＝80,000 OVC
Bonus Program: >=10ETH,Bonus 1%
>=50ETH,Bonus 3%
>=100ETH,Bonus 5%
>=300ETH,Bonus 10%
>=500ETH,Bonus 15%
Minimum Contribution: 0.2 ETH
50% purchased OVC Tokens during crowdsale will be locked until June 2rd , 2018.

6.2 Token Allocation



7. Investor Guarantee Program

Investing in cryptocurrencies takes a great deal of risk. Olive team will try his best to ensure the investors' best interests are protected, not only by offering all Olive users a free tool kit to be used for supporting Olive infrastructures as their wish, but also by introducing a token buyback program, which is intended to stabilize the price of Olive token.

According to the plan, the buyback consists of two phases:

In phase one, Olive will use 30% of its monthly profit to repurchase tokens;
In phase two, Olive will use 10% of its monthly profit to repurchase tokens.

The repurchased tokens will be automatically injected into a reward fund reserved for channel hosts, and their repurposed use and transactions will be overseen through a smart contract.

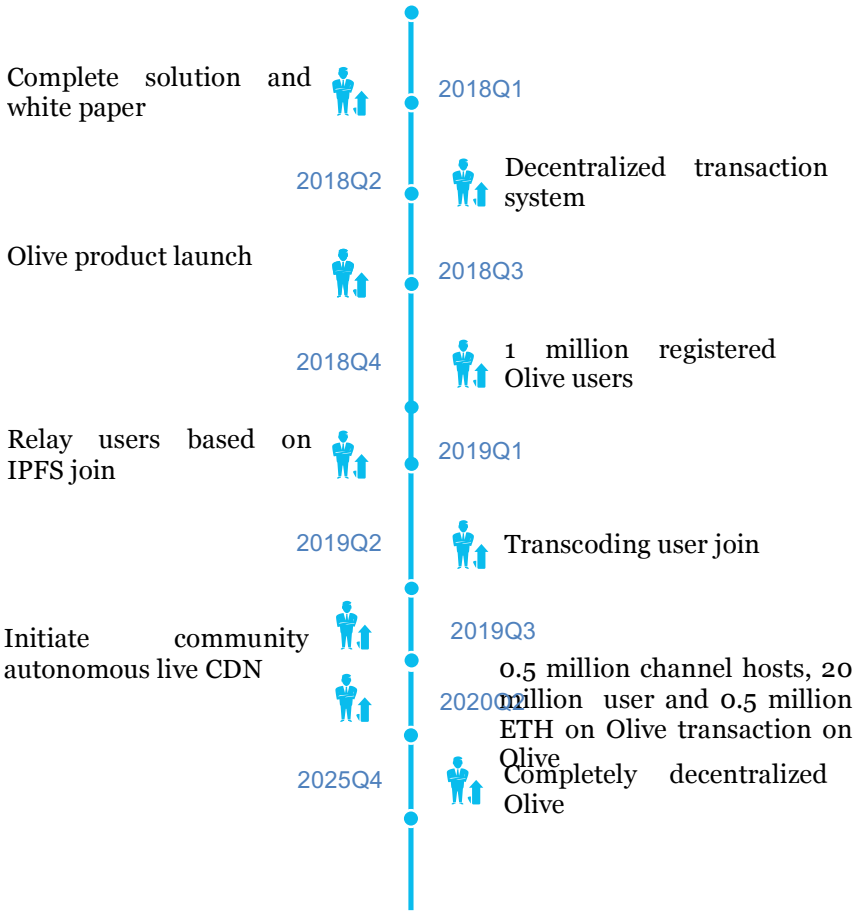
Token plays a key role in this project, and it is the foundation of Olive ecosystem. Our team believes a stable price of Olive token will definitely help the ecosystem grow

faster and healthier. In the long run, we are confident that the value of Olive token is outperformed.

We take investors' concerns very carefully, and we are happy to build a great relationship with our investors.

8. Roadmap

2018Q1 – Design of a decentralized solution and its whitepaper
2018Q2 – A decentralized transaction system with POS and Ring Signature
2018Q3 – Olive platform beta test and launch. Getting rid of centralized transaction systems between channel hosts and audiences.
2018Q4 – Achievement of 1 million Olive registered users.
2018Q4 – Launch of the distributed file system, IPFS, enabling channel promoting users.
2019Q2 – Launch of the distributed transcoding system, enabling transcoding users.
2019Q3 – Initialization of CDN nodes for community autonomy.
2019Q4 – Achievement of 0.5 million channel hosts, 20 million users and a worth of 0.5 million ETH transaction volume.
2020Q2 – A mostly accomplished but self-sustained CDN for community autonomy.
2025Q4 – A completely decentralized Olive live streaming ecosystem.



9. Our Team

Boris Vasin
Founder & CEO
Boris currently serves as the CEO of a worldwide live streaming platform, Chuxin. For the past decade, he has worked closely with many big-name companies in financial sector, and also made some impressive achievements in capital market. His remarkable success in finance and management has ensured him a leading position in e-commerce and entertainment in Europe and Asia. He's now turning his focus on remodeling the imperfect centralized live streaming service with a more future-oriented blockchain technology.

Daniel Teo Chun Ci
Co-founder
Daniel holds a master's degree in Computer Science in Singapore. He has over eight years experience in financial technology industry as a cryptocurrency engineer. His expertise has won him a reputation as a specialist in electronic wallets, blockchains and cryptography.

Shimada Kensuke
Co-founder
Shimada worked in a well-known Japanese company, Livedoor Co., Ltd., and later became former president of a LINE subsidiary. He currently serves as the chief technology officer of public company, Japan MSP Association. He has tremendous experience and knowledge of capital management, communication integration and business operation.

Amber Lam
Co-founder
Amber was the head of Burson-Marsraf Public Relations Department of WPP, a well-known international communications group, and as well as the head of Public Relations Department of Edelman's PR, the world's largest independent communications company. Her expertise lies in corporate communications, PR media and integrated marketing.

10. Partners

KING-ZONEDragonX Club

KING-ZONE DragonX， is a top South Korean e-sport team, who previously known as the Incredible Miracle (IM). Their all-start players include Khan, Cuzz, Bdd, PraY, and GorillA. On October 26th, 2017, KING-ZONE DragonX defeated SKTelecom T1 with score 3-1 at League of Legends Champions Korea (LCK). The championship has shocked every fan in the world.

Maverick Chain

Maverick System is a BAAS(Blockchain As A Service) solution platform which provides multi-chains-supported SDK.Maverick Chain will make your blockchain APP development much easier.With only several steps you can easily transform your traditional APP into a blockchain APP.

11. Legal Disclaimer

This document is intended solely for informational purposes and isn't meant to be a solicitation or an offer to invest in our platform.

11.1 No Ownership and Control Rights

Ownership of Olive tokens does not grant its holders the right of ownership or the right to share in Olive. Olive tokens do not give the right to participate in decision making about direction and development of Olive business. However, the opinions of token holders and platform users are very important and can be taken into account when such decisions are being made. Olive tokens can be used as an internal currency within the project to purchase services and to pay for advertising in Olive ecosystem.

11.2 No Income or Profit Guarantees

All examples of income and profit calculation in this document are presented only to demonstrate the average, empirical indicators of the industry. They do not guarantee

that these results will be achieved according to the marketing plan.

11.3 Regulatory Uncertainty

Blockchain technologies are subject to supervision and control by various regulatory bodies around the world. There is a risk that all digital tokens, as an asset, may fall under heavy regulation and restrictions, which may limit the functionality of Olive token or even make it impossible to use. We see it as a highly improbable course of action, but if it happens, we aren't responsible for its consequences.

11.4 Olive Token Investment Status

The Olive token is not a certified or legally binding investment. Due to unforeseen circumstances, the objectives set forth in this document may be amended. Although we intend to accomplish all the objectives described in this document, all persons and parties involved in the purchase of Olive tokens do so at their own risk.

11.5 Risk of Insufficient Adoption

Although Olive tokens should not be seen as an investment, they will have some value on the cryptocurrencies market. Olive team can't and won't influence the tokens' market price, which depends solely on the proportion of supply and demand, and also on the use frequency. Their value may increase due to high frequency of use and high demand, and decrease when used not often.

11.6 Risk of Funds Loss

Funds collected in the TGE process are not insured. In the case of token loss or decrease of the token value, token holders are not provided with a private or public insurance representative.

11.7 Risk of Failure

Even though the Olive team is highly confident that the project will be successful, working additional shifts and spending countless hours and resources to achieve all goals, these goals may be not achieved due to some reasons beyond the control of the team.

11.8 Risk of Using New Technologies

Crypto-tokens, such as Olive tokens, are a new and unverified technology. In addition to the risks mentioned in this document, there are additional risks which the Olive team cannot foresee. These risks could materialize in other forms not specified in this document.

11.9 No Guarantees

Registration on Olive platform or Olive token purchase is a voluntary action and the

project team doesn't take any responsibility for this action or its consequences. After emission, Olive tokens are sent to users without any guarantees, including guarantees of increase in value. Some jurisdictions do not allow the exclusion of implied guarantees, and the above exceptions to implied guarantees may not apply to you, but we still put it here in order to avoid any monetary claims from investors and users.

12. About Olive

Founded in 2017, Olive's live streaming app 1.0 release was launched in March 2018. At present the main business includes performance shows, live gaming, social netoworking and so on. The company has a large number of well-known channel hosts with millions of fans as well as operating team with years of experience in the field of e-sports and entertainment. In addition, Olive is known for its mature and powerful low-cost operating KOL capabilities, rich access to various low-cost traffic channels, and strong overseas operation experience. Olive's vision is to build a truly decentralized live platform through blockchain technology by serving the channel host and audience. By means of decentralizing the platform, user payouts are expected to be higher and more fair, motivating more users to join the platform and establish a vigorous live streaming ecosystem.

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