Authors: Dennis Chu, Harry Liu, Open Archive Foundation

OPEN ARCHIVE

ABSTRACT

Centralization of content distribution has immense implications such as underpaid creators, authoritative censorship, difficulty in content discovery and single point of failure.

Open Archive is a censorship-free, middleman-free distributed network designed for creators such as artists, musicians, developers, designers, songwriters, documentary makers, photographers, writers, videographers, film makers etc to store, share, market and sell their contents directly to consumers without paying middlemen's fee.

Different from centralized Appstore and Google Play Store, Open Archive has no servers, no administrators, instead, it relies on millions of nodes that synchronize content data and store content files in redundancy, which makes censorship impossible, piracy out-competed, monopoly middlemen bypassed and single point of failure eliminated

Open Archive will not charge the 30% fee that Apple does. Open Archive is built with blockchain technology with the mission to incentivize an egalitarian community on which an altruistic content economy thrives.

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1. FOREWORD

Underpaid Creators Problem

Seeing superstars on YouTube, TV channels, newspaper headlines and stages, you may assume that artists are all wealthy. But the reality is most artists are poorer than people with "regular jobs" such as supermarket cashiers, bus conductors, plumbers, real estate agents and office workers.

For centuries, artists and creatives have been notoriously under-paid and under-appreciated. Even the most talented genius such as Vincent Van Gogh got his recognition too late, years after his death. Vincent only sold one painting during his lifetime La Vigne Rouge for 400 Francs. He spent his entire life in poverty and died 37. Vincent was not the only one that met such a tragic end; artists such as Franz Kafka, Emily Dickinson, Paul Gauguin and Franz Schubert are all unsuccessful before they die. It is heart-wrenching to see the greatest minds who contribute so much to the world died alone in destitution. They not only make our world more beautiful, have generations enlightened and inspired, but also created derivative businesses of billions dollars, provide jobs to millions who give their families food, education and medical care.

Today, 128 years after Vincent's death, financial situation of artists hasn't change that much. Artists are still at the bottom of the food chain in the creative industry, which would not have existed without their talents, dedication and sacrifices. They are often asked to work for free, even when they get paid occasionally, they are handed over bread crumbs, when music labels, auction houses, advertising companies, social networks and mega content hubs devour the feast.

A Finnish pop singer Anssi Kela has a hit called *Restless Girl*, which got one million plays over four months on Spotify. That is a remarkable feat given the total population of Finland is only 5 million in the world. Anssi was paid only US$3,200 before tax. You knew that artists are paid in peanut, but you wouldn't expect that peanut could come this tiny. Yet most songwriters have never got a song streamed for 1 million times.

According to the Guardian, nearly 75% of artists are getting just 37% of the average UK salary from their practice. At £10,000 a year, these artists receive only 66% of the living wage. Things are not better off in other countries, in Canada, an artist makes only 74% of national average income; in Finland, grants are main source of income for 10% of artists; in Sweden, 60% of artists who had showed their work in the smaller state museums either failed to get paid or received less than the agreement terms. In Australia, the average annual income of an Australian artist – $10,000 – is a fraction of the median average earnings of the country's workforce.

Content Discovery Problem

In his best-selling book Sapiens: A Brief History of Humankind, Yuval Noah Harari argued that the most important quality that human has is the ability to tell stories. We can work together with strangers because we believe in things like gods, nations, money, companies and human rights, none of which exists outside the stories that we invent and tell one another.

> *You can never convince a chimpanzee to give you a banana by promising him that after he dies, he will get limitless bananas in chimpanzee Heaven. Only Sapiens can believe such stories. This is why we rule the world, and chimpanzees are locked up in zoos and research laboratories.*
>
> *- Yuval Noah Harari*

Today, arts, stories and contents are contained in digital files in forms of e-books, photos, soundtracks, apps, games, videos, documentaries, and movies, stored on billions of computers known as smartphones, tablets, laptops, and servers connected by the internet.

According to a Google Advance Algorithm, there are 129,864,880 books ever published; there are 97,000,000 songs ever recorded and still counting. As of 2017, there are 2,800,000 and 2,200,000 apps respectively on Android and iPhone; On Steam, there are 781,000,000 registered games; these digital contents have already topped up to a staggering 1,012,864,880 titles.

How to discover a particular content in this byte cosmos?

You may suggest that we search. Unfortunately, the "virtual database" exists nowhere except in our imaginations. Most content data are siloed in disparate databases of often rivalrous companies such as Google, Apple, Amazon and thousands of publishing houses from all over the world.

2. OUR VISION

We envision a community, in which creators like Vincent Van Gogh will act as independent entrepreneurs and stakeholders of the network, rather than employees of art dealers and publishers. Creators, discoverers and consumers are paid not only for work sold, but also for reviews they have made, or even simple existence in the network would share a fraction value of the network itself by the tokens they hold. There are no authorities but the community who decides what content is worthy or not.

On this network and marketplace, all content, no matter in what form they may come by, a digitized book, a video, a game, a piece of software, a film, a documentary, a design, a photo, a short video, a note, are contributed by creators.

Users download and purchase content directly from its creators without involvement of middlemen such as Apple and Google, so they get content cheaper, authentic, and advertisement free. Users post reviews of contents so other consumers would find out good contents by reading reviews of peers.

This library is accessible to everyone, owned by every token holder, and value to be shared by community instead of monopoly big companies or capitalists. We call it community capitalism, which might be closer to the ideal that communism had proclaimed but never fulfilled.

We envision it as a public digital library for humankind; built for all, owned by many, designed to withstand censorship, single point of failure and monopolies.

3. OPEN ARCHIVE: A DECENTRALIZED CONTENT NETWORK

We propose Open Archive, a blockchain-and-crypto based content economy that creators of all kinds not only can market and sell their works, but even post project ideas to raise fund like token sales of blockchain startups. The contents are reviewed, traded, archived and funded.

This design eliminates the issues of underpaid creators and discovery problem. Because creators are owners of this network and independent entrepreneurs, and payment is processed by smart contracts defined by creators. The middlemen are eliminated. There will be a Discovery Incentive Plan to reward people who review and help discover the contents. We believe it is a solution that both efficiency and social justice are taken into consideration.

4. OPEN ARCHIVE: A USE CASE

4.1 Open Archive Participants

There are four roles on Open Archive: creators, witnesses, discoverers and consumers.

1. Creators are content authors who upload their contents to Open Archive; When a creator has a content published, she can choose either 1) join the Discovery Incentive Plan to share profit with discoverers who post reviews; 2) not to join the Plan to share profits with discoverers;

2. Witnesses are nodes to build Main Chain which will be explained in technical part.

3. Discoverers are people who write reviews of contents on Open Archive; this allows contents to be discovered; hence reviewers are called discoverers on Open Archive Network.

4. Consumers are people who download and purchase paid ones;

4.2 How to Post Content Up to Open Archive?

Digital content metadata stored in Open Archive includes the following alphanumeric strings:

1. A content title; The content title is a human readable "name" of the content such as *A Beautiful Song*;

2. A description of the content with a length restriction of less or equal to 280 characters. The content description explains what the content is all about; The length restriction is applied because of two reasons: 1) people hate reading lengthy passages; 2) developers might want to synchronize the reviews up to Twitter;

3. A 32-bit content hash; the content hash provides with an access link should readers choose to get a copy downloaded;

4. A price set by creator when she/he submits the content entry; the price tells the consumers how much Open Archive Token they will pay if they choose to download;

5. Discoverer Incentive Plan, by which content discoverers/reviewers can share a fraction of content sales with creators, so they are incentivized to recommend quality content;

Assume that you are a creator, a songwriter.

1. You register an Open Archive account;

2. Your content *A Beautiful Song* is uploaded onto Open Archive nodes and a cryptographic hash is generated;

3. You send *A Beautiful Song* publishing transaction up to Open Archive Network, checking the box of "Discovery Incentive Plan", which means you agree to join the plan;

4. The *A Beautiful Song* transaction is verified by new transaction and it is published on Open Archive Network, which looks like this:

> *Title: A Beautiful Song*
>
> *Description: This is one of the most beautiful songs that I have heard when I was travelling in the countryside of Provence, South France. I fell in love with it and the girl who sings it at a nice café.*
>
> *Content Hash: a39a3ee5e6b4b0d3255bfef95601890afd80709*
>
> *Price: 50*
>
> *Discovery Incentive Plan: Yes*

5. A consumer Alice downloads a copy of *A Beautiful Song* and 50 tokens is transferred from Alice' wallet to your wallet;

6. Alice likes *A Beautiful Song* and decides to post a review, which costs her 1 tokens;

7. Fred discovered *A Beautiful Song* from Alice's review, and he buys one copy. Alice receives 25 tokens and the remaining 25 tokens are transferred from wallet of Fred to your wallet.

4.3 How Contents Are Streamed?

Open Archive Dapp enables content publishing, content review and content purchase/download. It is built on Open Archive Network, which utilizes Delegated Proof of Stake consensus.

On Open Archive Dapp, content reviews are streamed by Pub/Sub model like that of Twitter. Consumer can follow creators and discoverers so everyone has an entirely personalized content review stream.

The following models are used to personalize stream of each users on Open Archive Dapp:

Publication/Subscription Model

It works like a Twitter of Content:

- Users can follow creators;

- Users can follow discoverers;

Like Model

- Unlike the *Like* on Facebook, it costs user 1 token to like a review;

- Like on Facebook, the action *Like* is streamed on DApp as an "update";

4.4 Discovery Incentive Plan

Discovery Incentive Plan is a content profit sharing smart contract between creators and discoverers. The purpose is to help new contents to be discovered by consumers with help of community, aka, discoverers.

To make things simpler, the Discoverer's Incentive Plan sharing ratio between creators and discoverers are predetermined, Creators can choose to participate or not to participate.

If the creator chooses to participate in the Plan, she agrees to share sales revenue with discoverers who wrote reviews that generate downloads/purchase of their contents. The proceeds are automatically sent to wallets of creators and discoverers. The proceeds will be automatically redistributed as follows:

1. Week 1: Discoverers receive 50%;

2. Week 2: Discoverers receive 30%;

3. Week 3: Discoverers receive 20%;

4. Week 4: Discoverers receive 10%;

5. The Plan expires on 1 month; the creator can choose to end or renew.

5. ADVANTAGES FOR PARTICIPANTS

To Creators:

If you are a creator, you

- Own your customer relationship(You are boss of your own, employee of none)

- You own the Open Archive network; The cryptocurrency Open Archive Token is both a community currency and a crypto equity, by which holders can use to make transactions or sell for fiat;

- No middlemen fee;

To Consumers

If you are a user:

- Every penny you spend goes to creators; (except the part that is paid to discoverers)

- You get paid when you help to promote content;

- The opportunity to directly interact with the creators;

- Authentic and affordable content;

- You can use it on cross platform, Android, Windows and iOS;

- Opportunity to socialize with like-minded fans;

To Discoverers

- Your opinions are valued, actually, paid

- Open Archive don't censor your posts, Yay, freedom of speech;

To Contributors

- It is a good investment

- You make the world a better place to live

6. TECHNICAL DESCRIPTION

Disclaimer: The technical solutions described in this document are what we think the best solution available at present to build the software that solves the problem that we mention in the first part of the document. As technologies continue to progress, the Open Archive Foundation may choose technologies that are considered best in implementation.

Introduction

The underlying data structure of Open Archive Network is Directed Acyclic Graph (DAG), compare to the traditional blockchain such as Bitcoin there is no block in the network, every transaction in a DAG is like a block in a bitcoin or Ethereum blockchain. Every node can publish transactions to Open Archive Network. Each transaction refers to and verifies earlier (parent) transactions. New transactions verify parent transactions directly and grandparent transactions indirectly.

Multi transactions can proceed simultaneously; the transactions grow and finally form a stable DAG.

Since there are no blocks, miners and block reward in the DAG network. There is no need to waste awful load of electric power to sustain the network.

Open Archive Network is asynchronous; this means the nodes in the network does not have to hold the same set of transactions. Diverging in the network is normal, with growing transactions, the branches converge and the DAG stabilizes.

The transactions in Open Archive Network tend to be minuscule; low fee would facilitate transitions and induce a booming marketplace. In the meanwhile, a low transaction fee would have to be expensive enough to keep spammers away.

We have decided to build Open Archive with JavaScript, which is the most popular programming language in the world with largest pool of developers. Plus JavaScript is a cross-platform language so Open Archive will be accessible in all mainstream platforms. The development communities evolve very fast and are willing to adapt to new innovations.
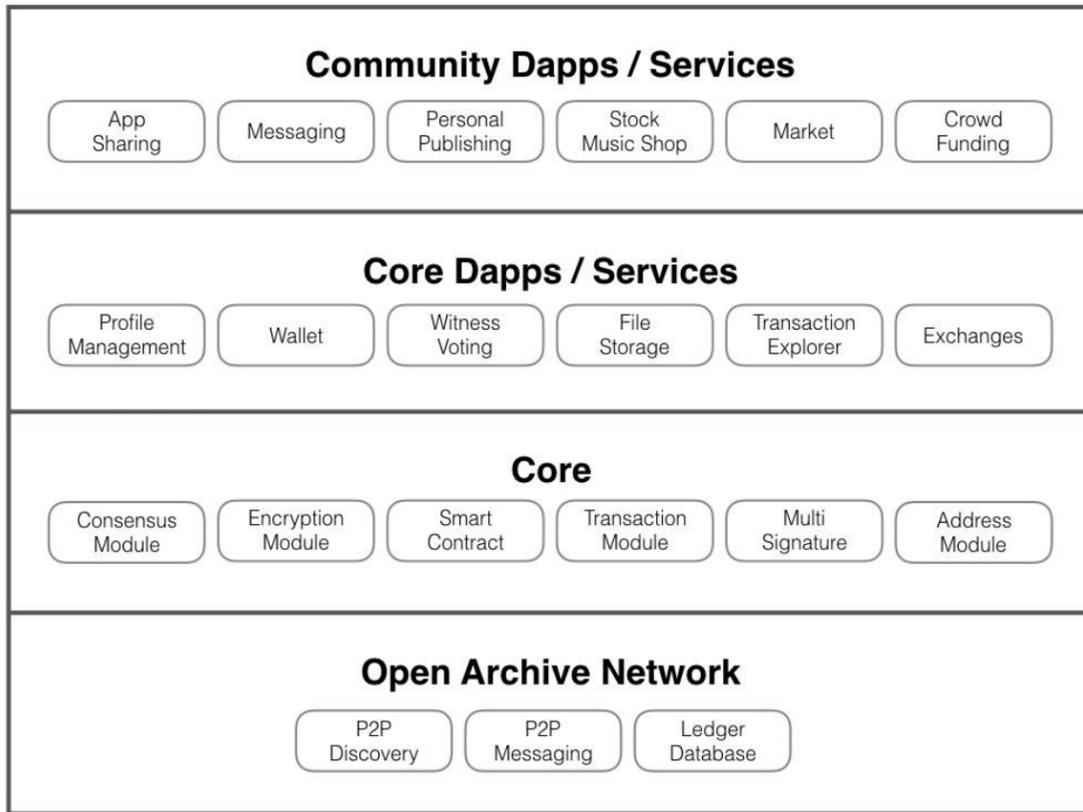

6.1 DAG

In mathematics and computer science, a directed acyclic graph (DAG ˈdæg), is a finite directed graph with no directed cycles. That is, it consists of finitely many vertices and edges, with each edge directed from one vertex to another, such that there is no way to start at any vertex v and follow a consistently-directed sequence of edges that eventually loops back to v again. Equivalently, a DAG is a directed graph that has a topological ordering, a sequence of the vertices such that every edge is directed from earlier to later in the sequence. [1]

There are two types of DAG in Open Archive Network: Main DAG and Side DAG. Main DAG is the backbone of Open Archive Network; Side DAG servers as a service or Dapp for a specific scenario.

6.1.1 Main DAG
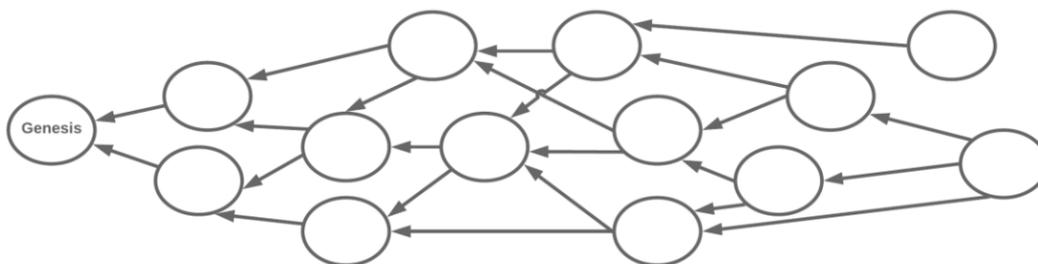
Terminologies:

- Nodes: The Open Archive Network is composed of nodes, they are entities that create and validate transactions.

- Transaction: Each dot in the graph is a transaction.

Every node can publish transactions to Open Archive Network. Each transaction will refer to and verifies earlier (parent) transactions. New transaction verifies parent transactions directly and grandparent transactions indirectly.

Other than Main DAG, there is another DAG which we call Side DAG. It will be explained in more details in later section.
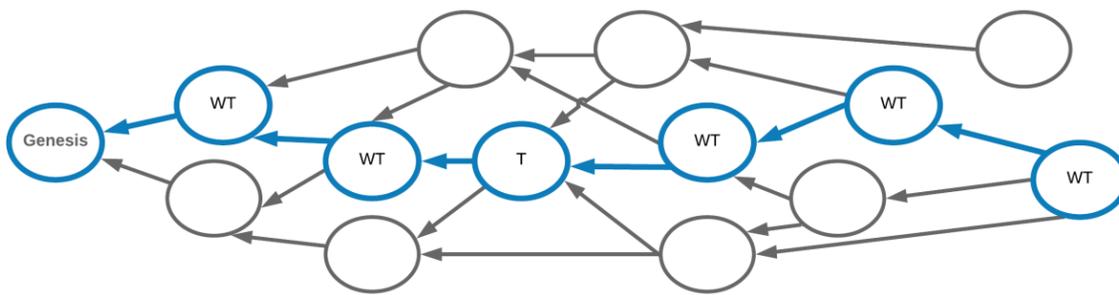
6.1.2 Main Chain

Terminologies:

- Witnesses: There are N delegates called Witnesses in DPoS consensus;

- Witness Transaction: Transactions created by witness
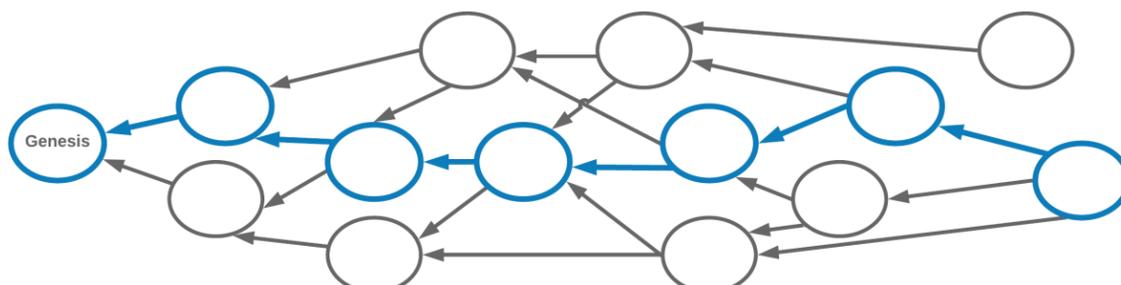
If we start from any transaction, there will be multi paths to trace back to the Genesis. From any transaction, we can find at least one path to refer to all the other transactions directly or indirectly. If we add the index for the Main Chain, assign 0 to Genesis, then increase by 1 moving forward along the Main Chain, finally we get the index of Main Chain.

Abbreviations:

- T: Transactions

- WT: Witness Transactions

Witness Main Chain has the most Witness Transactions, from one of which you may move backward to any other normal transaction on the graph, these normal transactions then have the same index.

6.1.3 Side DAGs

Some decentralized network store all data in one place and this often causes bloated data that makes it slow. In Open Archive Network, we provide the capability to isolate data to different DAGs by different purpose.

This makes the system more modular, the main DAG only contains core data from core Dapps/Services, which is kept leaner.

A Side DAG is like a service provider such as Avatar Management Service, which helps you to manage your avatar, including uploading, updating, etc. You can upload your avatar to AMS DAG after you register your address; the avatar file is stored in the AMS Side DAG instead of in the Open Archive DAG.

Main Chain in Side DAG uses the same algorithm as in Main Chain.
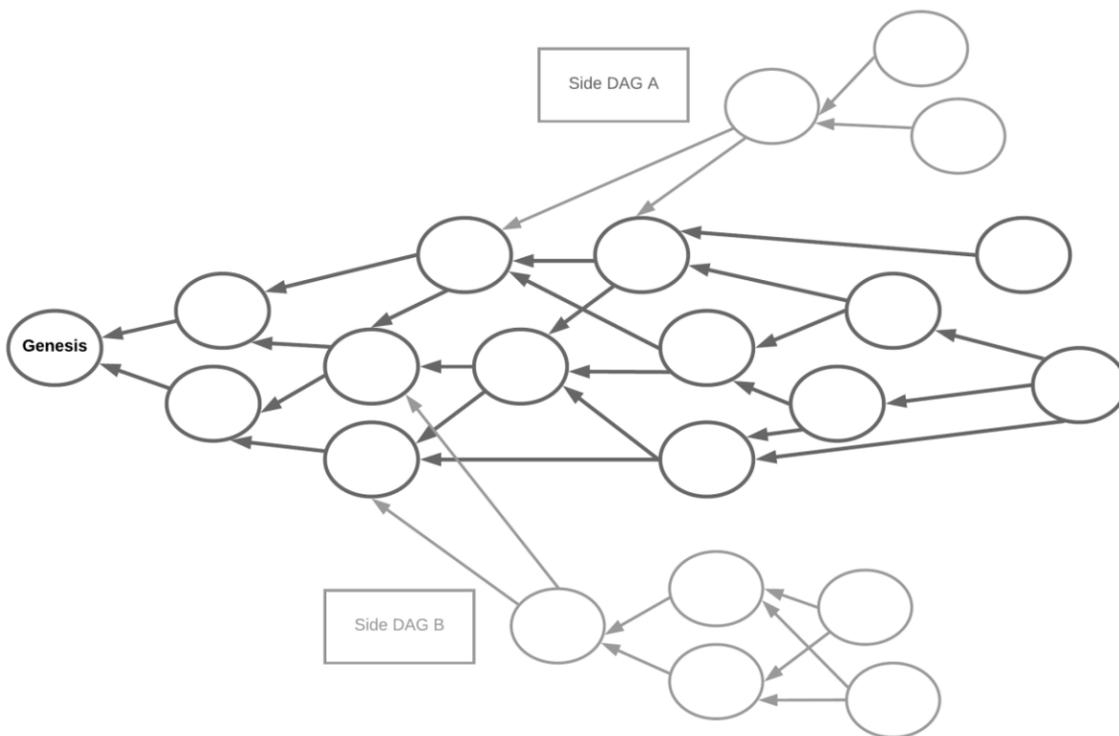
6.2 Transactions

To create a transaction, a node needs to do the following:

- The node randomly chooses two other transactions to refer to according to an algorithm. In general, these two transactions should be relatively new.

- The node checks if the two transactions are valid:

    - Check if the signature is valid

    - Check if they contradict with each other

- If they are both valid, the user adds the hash values of these two transactions into its own transaction

6.3 Consensus

Consensus is vital for every decentralized network as it secures integrity of data across all nodes, so the network could sustain and scale.

To cope with possible high growth and secure final data integrity, Open Archive combines two kind of consensus:

- Directed Acyclic Graph (DAG) consensus

- Delegated Proof of Stake (DPoS) consensus

6.3.1 Witnesses

A witness is a special type of account that is registered with a witness registration transaction; these accounts have a special purpose within Open Archive as they are allowed to generate Witness Transactions for the network.

Any account can be a witness, but only accounts with the required stake are allowed to create Witness Transactions.

6.3.2 Witness Round

During one round, each witness will create Witness Transaction. If a witness cannot create transaction during a round, another witness will take his place and create instead.

At the beginning of each round, each witness is assigned a slot indicating their position in the transaction generation process. Once a node with an enabled active witness has created a transaction, the node associated with the witness signs and broadcasts that transaction to the network.

Once the transaction is broadcasted to the network, the next witness will proceed in the slot assigned to them.

6.3.3 Transactions Confirmation Process

There is a special kind of transactions, published by witnesses, is treated as Witness Transaction and will be a node of Main Chain in the future.

Before a transaction is confirmed, the Main Chain for every node is different because there are new transactions added constantly, and the Main Chain is different for every node, every node has its own Main Chain depending on its transaction data set. When number of transactions increases and there are witnesses involving in transaction confirmations, we will have an identical and final Main Chain to everyone.

Witnesses publish Witness Transactions within the network; these witnesses are selected by a voting protocol that lists all the parameters, configurations and history performance for each witness candidate. Each stake holder can cast less then N votes, and the votes are weighted by the amount of tokens that the stake holders possess.

Transactions are not valid until they are verified by newer transactions that refer to them. If the transaction can be traced back from transactions created by witnesses, the transaction is deemed verified.

6.4 Security

6.4.1 Double spending

If 2 transactions are identical, the second transaction will be declined.

If 2 transactions are not continuous and buried deep in the network and there seem to be no relation exist between them, we can use the Main Chain index to identify which is valid. The transaction with smaller index will be deemed valid.

6.4.2 Tamper

In DAG, if a malicious user tries to tamper transaction data, it would invalidate all its child transactions due to the hash changes introduced by the tampered transaction. It's almost impossible to change all the following child transactions since the network grows very fast. Additionally the final state of the transactions is verified by all witnesses, it is highly impossible for one user to control all the witness nodes.

6.5 Rewards

There are 2 kinds of rewards in Open Archive Network:

- Reference fee: a child transaction gets the fee after it refers to its parent transactions;

- Witness fee: Witness gets the witness fee after all Witness Transactions are verified in one witness round. The fees from all transactions that have the same index with the Witness Transaction will be aggregated and divided evenly and reward to all the witnesses in that witness round.

7. MORE USE CASE: INITIAL CREATIVITY OFFERING

7.1 What is Initial Creativity Offering?

Artists are entrepreneurs. They conceptualize, design, develop and deliver a product of creativity. Like startup founders, creators are often constrained of budget. That is how Initial Creativity Offering comes in handy.

To help creators, we borrow the idea of Initial Coin Offering from the Ethereum blockchain that many blockchain entrepreneurs use to fund their moonshot projects. We call this Initial Creativity Offering, by which creators use to raise fund in OAT to finance their creative projects such as a novel, a song, a movie, a documentary, a game or software.

The initiator of an Initial Creativity Offering will post her project onto Open Archive Network by the following format:

Project Name

One line to describe your project or work

A Video Teaser

Video link

Project Demo

Project demo link

Description

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Aenean commodo ligula eget dolor. Aenean massa. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Donec

quam felis, ultricies nec, pellentesque eu, pretium quis, sem. Nulla consequat massa quis enim. Donec pede justo, fringilla vel, aliquet nec, vulputate eget, arcu.

Open Archive Wallet Address

*0x32be343********124dc4fee27****bd38c102d88*

Amount to Raise in OAT

2000 OAT

7.2 How Initial Creativity Offering Work?

The Initial Creative Offering is programmable so creators can customize conditions of contributions from supporters.

When the project is published on Open Archive, it is open for contributions from supporters. When the required sum is completed, the raised amount to be transferred to account of the project, but the contributor can propose to place a tap on the smart contract so there is a speed limit on how much OAT can be retrieved from the account to the creator's wallet.

1. The contribution to the Creative Offering can be used to buy the content the creator proposes to create when it is delivered at a "Supporters Discount" of public price as a reward.

2. Revenue Sharing: Supporters also share an agreed percentage of the total revenue of the project. This percentage is coded in smart contract.

8. ROADMAP
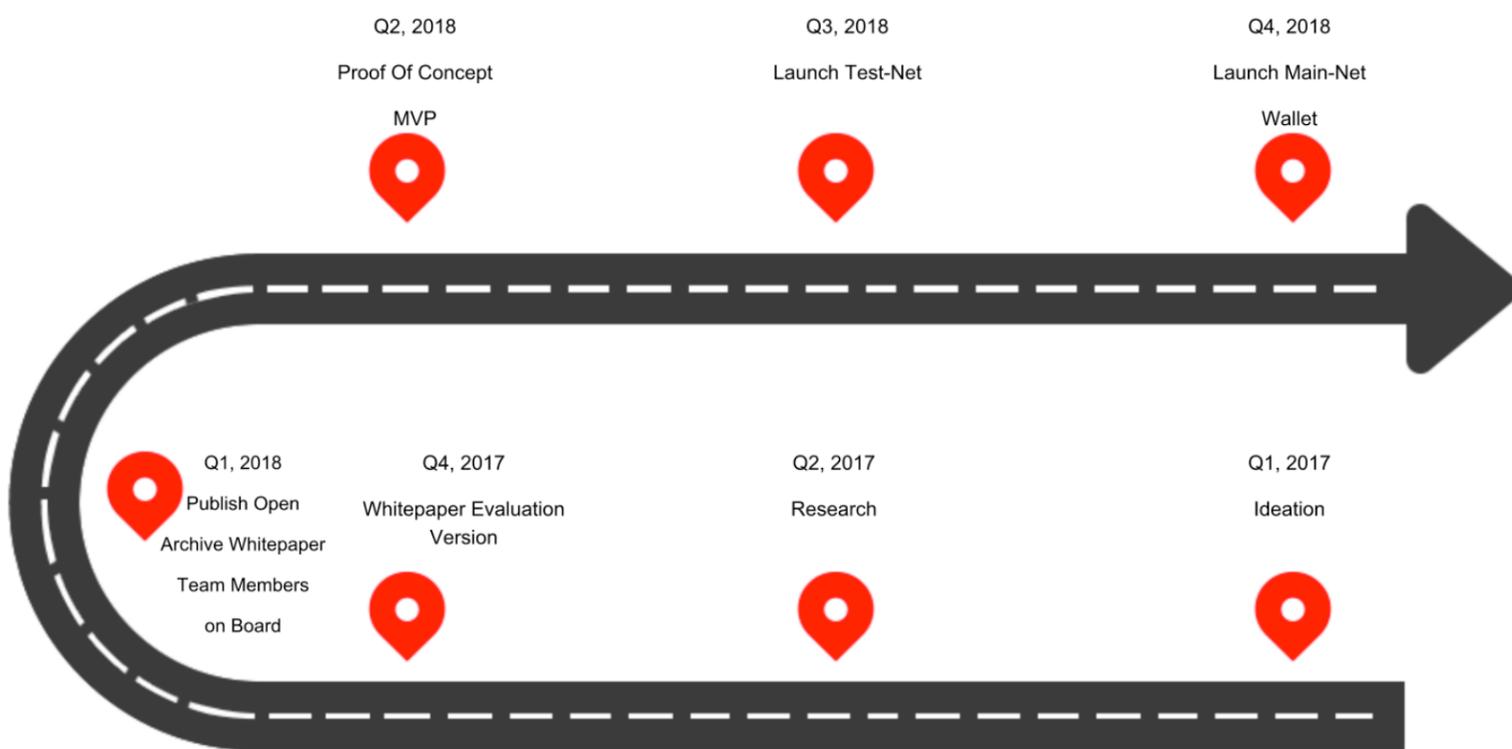
Q1, 2017

- Ideation

Q2, 2017

- Research

Q3, 2017

- Whitepaper Evaluation Version

Q1, 2018

- Publish Official Whitepaper
- Team on board

Q2, 2018

- Proof of Concept
- MVP

Q3, 2018

- Launch Test-Net

Q4, 2018

- Launch Main-Net
- Wallet

9. COMMUNITY DEVELOPMENT

Q3 2018

- Publish online documentation for developers and users to quick start
- Adopt agile methodology for development, publish the progress of development and get more involvement from community
- Hiring global talents include developer, designer, marketing, etc.

Q4 2018

- Publish more documents for community users to easily get involved
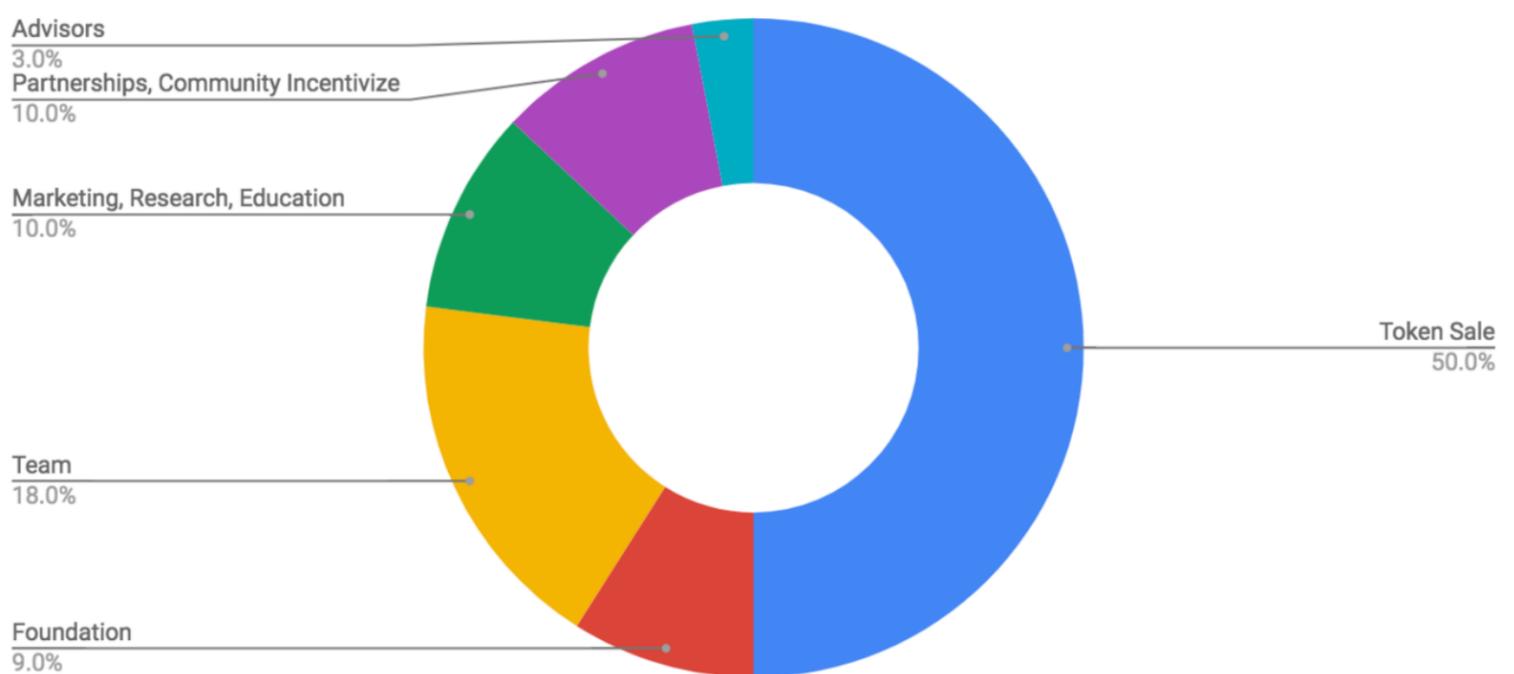- Keeping hiring global talents

10. TOKEN DISTRIBUTION

Token Sale

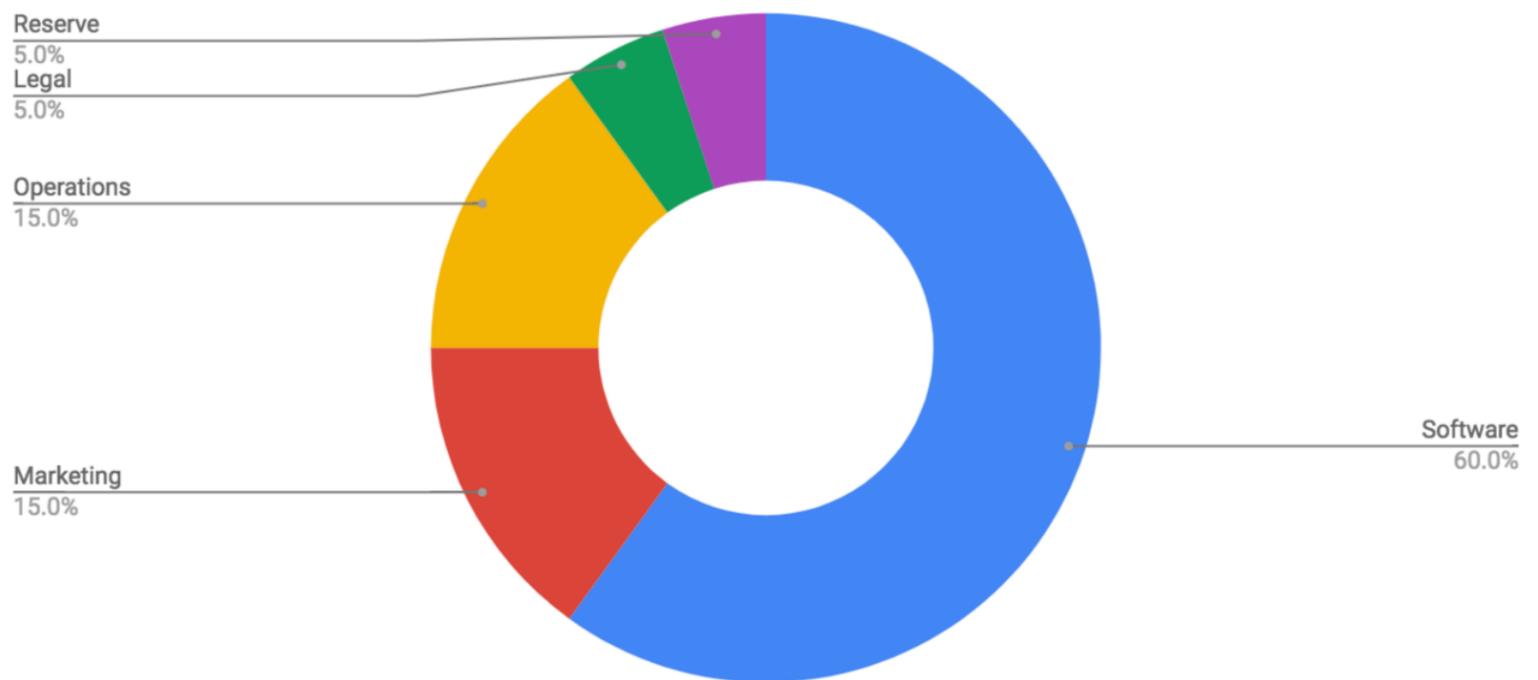| Period	3 Months	
Ticker	OAT	
Token type	ERC20	
ICO Token Price	0.000002	ETH
Total Supply	18,530,330,000	OAT
Available for Token Sale	9,265,165,000	OAT
Minimum Purchase	0.1	ETH
Maximum Purchase	300	ETH
Soft Cap	5,000	ETH
Hard Cap	18530.33	ETH
Unsold tokens	Burned	
Whitelist	Yes	
Accepts	ETH	

Vesting Schedule

Team	Vested for 4 years with a 6-month release program after the 1st year
Advisor	Advisers can release 25% of their tokens every 3 months.

Token Allocation

Advisors 3.0%
Partnerships, Community Incentivize 10.0%
Marketing, Research, Education 10.0%
Team 18.0%
Foundation 9.0%
Token Sale 50.0%

Funds Allocation

Reserve
5.0%
Legal
5.0%
Operations
15.0%
Marketing
15.0%
Software
60.0%

11. OUR VALUES

Tolerance and Diversity

Difference is embraced or even celebrated.

Altruism

The network is designed to incentivize altruism.

Freedom of Speech

Positive impact of freedom of speech outweighs its negative influences.

12. REFERENCES

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Byteball White paper - https://byteball.org/Byteball.pdf

IPFS white paper - https://ipfs.io/ipfs/QmR7GSQM93Cx5eAg6a6yRzNde1FQv7uL6X1o4k7zrJa3LX/ipfs.draft3.pdf