

# **CNN - Content Neutrality Network**

D-Run Foundation Ltd.

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change

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# Abstract

The market size of global digital content industry has reached 224.8 billion USD in 2017 and it's still growing very rapidly. India, as one of the countries with the largest population, has huge potential in its digital content market. It is estimated that India's online content consumers will reach 500 million within the next five years.

Our principle is that **All Contents Are Created Equal**, so the foundation propose a protocol named Content Neutrality Network (CNN Platform) and corresponding ERC20-compliant tokens [1, 2] for the content industry based on the innovative blockchain technology. Our proposal is applicable for all of the content communities who are willing to adopt the CNN Platform protocol.

CNN Platform brings a revolution to India's and global digital content market. To address various issues of internet content communities, CNN Platform introduces several mechanisms/protocols related to content creation, distribution, circulation and revenue share. For example, CNN Platform combines personalized recommendation with the community votes to distribute the most relevant content to each user. CCM (Content Circulation Mechanism) is designed to stimulate seamless circulation of content among different communities. In addition, a neutral and efficient revenue share mechanism is made feasible in the ecosystem of CNN Platform with CBRS (Contribution Based Revenue Share) mechanism. Under CBRS, users who have seldom enjoyed the commercial earnings of content platform will participate in the ads revenue share for their contribution of attention.

CNN Platform has formed a strategic partnership with NewsDog, India's No.1 content platform. NewsDog has more than 40 million users, and supports 10 languages in India. As the first application on CNN Platform, NewsDog will fully utilize the CNN Platform's protocol to build an open, neutral and efficient content community. NewsDog will invite all of its users to hold CNN and enjoy the benefits of CNN protocol. The foundation believes NewsDog will soon become one of the largest content communities on blockchain.

The goal of CNN Platform is to grow to the most popular protocol for content communities globally. The foundation believes CNN Platform can promote more efficient content distribution as well as motivate the commu-

nity members to create better content and engage more on the platform, which would in return bring better benefits to all participants in the ecosystem.



# Chapter 1

## Background

### 1.1 Prospect and Problems in the Digital Content Industry

The development of Internet and mobile devices has provided a new process for information distribution. Instead of receiving information via newspapers, magazines, and books, as was done in the past, people can now access information from websites, mobile apps, and other digital devices in various forms, including articles, pictures, videos, GIFs, and other forms of streaming media.

Statistics show that the market size of the global digital content industry reached 109.1 billion USD in 2016, and this figure increased significantly to 224.8 billion USD in 2017. In the same year, China's online news users reached 579 million and the online content industry generated a revenue of 382 billion RMB. Take Bytedance Inc. for example, its DAU reached over 160 million in 2017, and its annual revenue reached 20 billion RMB.

With over a 1.3 billion population, India is very similar to China whose overwhelming demand for digital content cannot be ignored. It is conservatively estimated that India's online news users will reach 500 million within the next five years. The foundation believes that the content industry will have a promising future in China, India, and other places all over the world.

Despite the rapid growth in the content industry, certain issues cannot be ignored:

- **Flood of low-quality content consuming user attention:** A considerable number of people deliberately add vulgar, violent, and sexual elements to make their articles eye-catching. Some even publish fake news so that people will fall for clickbait. This low-quality content will undoubtedly catch and consume user attention, leading them without the ability to find valuable reading material during their leisure time.
- **Copyright conflicts are costly:** The wide proliferation of Internet

and smart phones have lowered the threshold for people to go online, but the easy-to-copy and easy-to-modify nature of digital content has also led to plagiarism and infringement. Should the problem of there being no proper mechanism to determine copyright ownership remain unresolved, the content community will suffer severe consequences.

- **High quality content among different communities cannot circulate seamlessly:** Due to fierce market competition, content communities are reluctant to share information with each other for two reasons. First, they worry that high-quality content will be “reposted” without receiving proper monetary earnings from the platform that reposts their articles, resulting in a decrease in traffic and loss of users, and ultimately losing their core competitiveness. Second, the influx of different content varieties makes it difficult for the content community to generate their own unique tone to attract users.
- **Users are bombarded with advertisements, but fail to enjoy the commercial earnings embedded in these ads:** These ads are forcefully loaded by the content communities, causing distraction for users while reading the content. This practice will not only waste a user’s time and attention, but it will also make them pay more for internet data and shorten their battery life. The content communities take advantage of the user’s attention to generate income from commercials, but prohibit users from sharing the commercial earnings.
- **Incentive activities take various forms, but cannot be used to build an effective mechanism:** The explosive growth of mobile networks introduces “traffic bonus” into a person’s perspective. Various content communities are offering different incentive programs to attract new users (such as receiving extra services, coupons, cash, etc.). However, given the lack of trust between the two parties, there is no guarantee that participants will receive their promised returns, which in turn will hamper the effectiveness of the programs.

Indeed, there are many problems in the content ecosystem that need to be fixed. Under such circumstances, there is an urgent need for an innovative technology to start a revolution.

## 1.2 Blockchain-Based Content Protocol

Blockchain is designed to solve the trust and decentralization problems. It utilizes the hash algorithm from cryptography, enabling all participants to reach consensus without third-party involvement and allowing them to work together to maintain blockchain data, so as to address trust issues.

Blockchain has undergone several technical upgrades since its birth. If bitcoin [3] is the 1.0 version of blockchain, then Ethereum and smart contracts are the 2.0 version. Smart contract refers to the use of non-tampered, distributed programs to encourage participating parties to build relationships and reach consensus. Once a smart contract is placed on a virtual machine and the trigger conditions are met, it can immediately be executed, thus making it reliable and trustworthy.

Many of the problems described in section 1.1 can be solved by utilizing blockchain technology. Therefore, many teams have proposed new blockchain-based protocols for the content industry, such as Steemit [4], Primas [5] and YOYOW [6]. However, there are two problems in their existing protocols:

- The content distribution depends entirely on the user's upvote, comments, and other actions. This approach might work for a single interest community, but for full-service platforms like Jinri Toutiao and Tian Tian Kuai Bao, content cannot be distributed based only on a user's preference. On one hand, users cannot find the content that they are interested in, and thus are unable to rely on the community. On the other hand, the community content will become severely concentrated on the headlines. For example, Steemit's white paper mentions that if there are one million articles, the most popular 100 account for 1/3 of the total value, the next 10,000 account for another third, while the remaining account for the final third. This kind of proportion is very unhealthy for a community that expects a large number of users to contribute, causing them to lose their passion for creating content. In order to solve this problem, CNN Platform creatively combines personalized recommendations with blockchain technology, and proposes solutions to solve the efficiency problem in blockchain.
- Most of the current protocols address how content quality is measured and rewarded based on the behavior of community users in a single-interest content community. However, there will be many content communities on the blockchain because of the different preferences of users. Therefore, it is of great importance to ensure that premium content can circulate efficiently among different communities. The design of CNN Platform incorporates an incentive mechanism for content creators and those who repost so that they are motivated to repost high-quality content that is suitable for the target audiences and communities, rather than reposting content arbitrarily. This ultimately improves the efficiency of content distribution.

### 1.3 The Mission of CNN Platform

CNN Platform chooses to combine blockchain technology with the content industry based on Ethereum and smart contracts to create a more open, neutral, and efficient ecosystem for all content communities. Through this new ecosystem of content, our mission is as follows:

- To solve the existing issues that content communities are isolated, and content cannot circulate seamlessly, and users and communities have to pay a high cost to access and aggregate high-quality content. For content creators, their content can be circulated more efficiently and in a wider sphere. Premium content and content creators will receive more exposure. For content consumers, our goal is to achieve a personalized recommendation on blockchain, allowing them to find high-quality content that adheres to their interests in a simpler way.
- To solve the unfairness that exists in the revenue sharing system. The key players of a content ecosystem consist of content creators and consumers, because one creates content and the other reacts to the content. However, the value created by the two roles in the current system is not adequately recognized and the benefits distributed are not sufficient. In particular, the latter hardly participates in revenue distribution. Therefore, our second goal is to change the existing revenue sharing mechanism and determine the distribution of income pertinent to the contribution of different roles.
- To solve the existing issues that user acquisition and incentive models are complex and inefficient. The foundation hopes that with the help of blockchain technology and community philosophy, the centralized user acquisition and incentive model in the existing content system will be transformed into a spontaneous and autonomous system, allowing more users to naturally take part in the new ecosystem without the participation and investment of certain centers.

The following sections describe in detail how CNN Platform uses blockchain as a technology to establish a personalized interoperable content eco-protocol. On the basis of this protocol, CNN Platform intends to work with News-Dog, India's largest personalized content APP, as a pilot project to gradually build the world's largest content ecosystem and set off a new chapter in the content industry.

## Chapter 2

# All Contents Are Created Equal

For the problems mentioned in section 1.2, CNN Platform proposes a new blockchain-based content ecosystem protocol and the corresponding token CNN.

The native digital token of CNN Platform ("CNN") is another major component of the ecosystem on the CNN Platform. CNN is a non-refundable functional utility token which will be used as the unit of exchange between participants on the CNN Platform, as well as the economic incentive which will be consumed to encourage participants to contribute and maintain the ecosystem on the CNN Platform. Computational resources are required for running various applications and executing transactions on the CNN Platform, as well as the validation and verification of additional blocks / information on the blockchain, thus providers of these resources and services will require payment for required to be paid for the consumption of these resources and services. CNN will be used as the unit of exchange to quantify and pay the costs of the consumed computational resources. CNN is an integral and indispensable part of the CNN Platform, because in the absence of CNN, there would be no common unit of exchange to pay for these costs or provide the incentive for certain desirable behaviour, thus rendering the ecosystem on the CNN Platform unsustainable.

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On CNN Platform, authors and users form communities based on com-

mon interests, and interact within the community by publishing and reading content. While communities are relatively independent, premium content can still be circulated through a users' reposts.

The primary goal of the entire content community is to create an effective mechanism that establishes an open and free content ecosystem while exerting the original value of each article. In order to ensure the production and circulation of high-quality content, a few principles are put forward and will be reflected in the protocol accordingly:

- **Reliable reputation:** Readers, content creators, and recommendation nodes are working under a unified reputation system. Peer review and token circulation can help to ensure the sustainable development of the whole system, resulting in the proper commercial revenue distribution among all of the participants in the community.
- **Free and pluralistic:** Content has the ability to influence people's thoughts and feelings. Therefore, within the framework of CNN Platform, creators are free to publish their articles on any topic, such as social, economic, political, sports, entertainment, employment, etc. However there will be a fine if they publish articles of poor quality to disrupt the system order.
- **Encourage creating content in consistent with the tone of the community:** CNN Platform encourages the free circulation of articles, but the content created should be consistent with the tone of the community. It would be inappropriate for entertainment gossip to appear in a serious economic community. Therefore, the CNN Platform encourages authors to create content relevant to their communities in order to establish and maintain the tone of the community accordingly.
- **Protect copyright:** Copyright helps protect originality and creativity. To protect copyright is to protect content creators' interests and motivation to continuously create high-quality content.
- **Open and circulation:** The heart of premium content is its subtle influence on a wider audience; CNN Platform encourages the free circulation of high-quality content and maximizing the content's value across communities, while continuing to protect its intellectual property.

There are primarily four types of nodes within the CNN Platform protocol:

- **Authors:** Authors are the producers of content in various communities. The significance of an author is determined by the extent of the users' preference to his or her content. In comparison to other

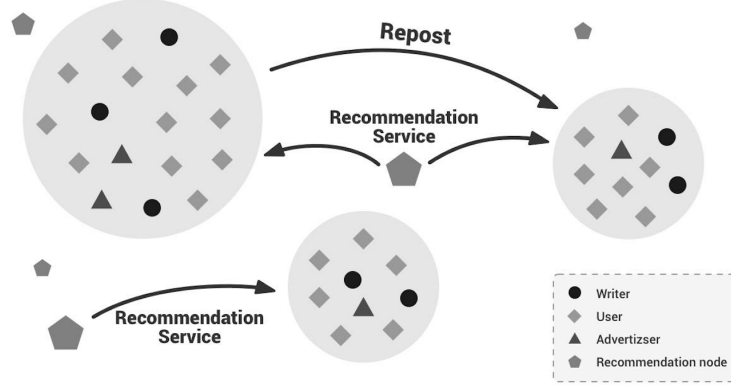


Figure 1: Ecosystem on CNN Platform

contributors, the author shares the largest proportion in advertising revenue.

- **Users:** Users are consumers of content in various communities, expressing their preferences for content through reading, liking, commenting, and other actions, and then sharing advertising revenue due to their response and attention investment.
- **Advertisers:** Advertisers advertise in each community and pay an advertising fee in CNN in order to obtain brand exposure or download / register users.
- **Recommendation nodes:** Recommendation nodes are nodes beyond the content communities. It only shares revenue by providing recommendation services to each community.

CNN Platform protocol mainly includes two aspects: First, a mechanism to incentivise the authors and users to be active in the community. Second, a mechanism that promotes quality content to be circulated amongst different communities.

## 2.1 Content Production

For the content community, content production is undoubtedly the most crucial part of the entire community. The primary goal of the entire content community is to create an effective mechanism that establishes an open and free content ecosystem while exerting the original value of each article. To

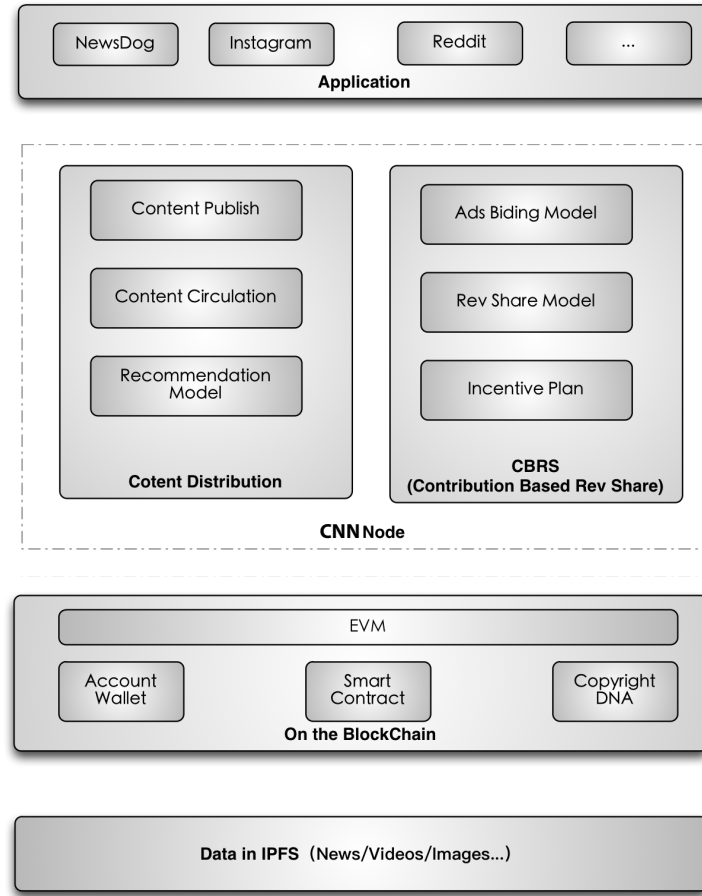


Figure 2: CNN Platform Protocol Architecture

ensure the continuous output of high-quality content, CNN Platform will focus on the following points as its goal:

- Protect creator copyright:** Copyright protection is one of the most important applications of blockchain technology. Data recorded in the blockchain system has strict timing and can not be tampered with. Therefore, once a copyright conflict occurs, the system can determine the final copyright according to the order in which the content is published. If an author releases the infringing content, the system will faithfully record the release time, author and the content, and no one can clear the infringing record by deleting posts. This fundamentally protects the interests of creators and helps stimulate their creative passion.
- Encourage original contents:** Each community has its own tone



and preference, and also has its own circle of permanent authors and the content produced within the community is more in line with the community's tone. Therefore, in each community, content produced within a community is greatly valued, and for recommendation CNN Platform prioritises quality content starting within the community. To this end, the community will support original content with a certain traffic. The specific mechanism will be detailed in 2.3.

- **Refuse the fake content:** In order to prevent the origin of low-quality articles, when creating content, creators need to pay a certain amount of CNN as a deposit, if no one reports the copyright or quality problems within seven days, then the deposit will be returned. If there is any quality problem (such as plagiarism, clickbait, etc.) in the content report, after confirmed by the community-elected committee, the deposit will be deducted, and the relevant advertising proceeds shall be recovered and added to the reward fund of the day (see 2.5.2.2 for details).

For duplicate content, the platform will evaluate it by the Hash value. For patchwork or modified content, CNN Platform uses Locality Sensitive Hash (LSH) [7] to map multiple local low-dimensional features (such as word vector features) through various dimensionality reduction methods and then compare. After extracting some of the features, the content that is pieced together or modified will be detected by the system in keeping with many features of the original content.

When technical means cannot judge the content, CNN Platform will adopt a community committee-based copyright certification solution. With due control, volunteers in the community can all become “referees” and can use the information within the blockchain to trace the proceeds of the infringement. Specific procedure consists of the following:

- When a user questions the content copyright, the challenger needs to submit a certain amount of CNN as a deposit. Then, broadcast on the whole network to form a “committee” to vote for the challenge. Each member of the committee is required to submit a certain amount of CNN as a deposit. The majority of the voting party will win the vote.
- If the final decision is that there is no copyright infringement, the CNN from the minority voting party and the person who raised this issue shall be confiscated and re-distributed to the content creator and majority of the voting party as compensation.
- If it is determined that there is indeed a copyright infringement, the person who raised this issue may obtain the deposit of the infringer and the advertising proceeds are retrieved and added to the reward fund of the day (see 2.5.2.2 for details). The winners of the vote can

get back the amount of deposits, and share the deposit of the minority voting party.

The above scheme is expressed in pseudo-code as:

```
def vote(sponsor, agrees, disagrees, author, reward, depositA,
        depositS, depositC, revenueAd):
    if agrees.count > disagrees.count:
        sponsor.account += depositA
        reward += revenueAd
        for agree in agrees:
            agree.account += depositC / agrees.count
    else:
        author.account += (depositS + depositC) / (disagrees.
            count + 1)
        for disagree in disagrees:
            disagree.account += (depositS + depositC) / (
                disagrees.count+1)
```

## 2.2 Content Repost

High-quality content is fundamental to a community's sustainable development. As noted above, the CNN Platform encourages the circulation of high quality content to maximize its value, so users deserve rewards when they repost high-quality, original articles from the source community to other related communities. Yet, at the same time CNN Platform does not want users to simply repost articles and even junk articles for rewards, for which CNN Platform has developed the Content Circulation Mechanism (CCM).

- A certain amount of CNN need to be paid before one can repost an article. The CNN will be paid to the original author of the article.
- The same article can only be re-posted to a target community once, taking the timestamp first appearing in the target community on the blockchain as the final.
- If the re-posted articles generate revenue in the target community, the user who re-posted them earns a corresponding share based on the reprovisioned revenue share model (see section 2.5.2.3).

Under this mechanism, reposting an article is equivalent to investing in the article, the user pays the cost first in hope of receiving higher rewards. Reposters have the incentive to pay and repost only when the article is indeed of good quality, and in line with the target audience. The reward a reposter will receive and how much he or she receives depends on the extent to which the articles being reposted are preferred by the users in the target community, thus ensuring that only high-quality articles that meet the target community's tone are in circulation.

## 2.3 Distributed Reputation Mechanism

The reputation system is a key component of the content system. An excellent content system requires both high-quality and reliable content evaluation. The results are not trustworthy in the centralized content evaluations system, whether anonymous or not. It is very likely for users to post junk comments because of its low-cost nature in an anonymous world. However, users are unwilling to express their true thoughts in the identity verified system due to privacy concerns. CNN Platform utilizes blockchain technology to ensure the historical actions cannot be tampered with, and Zero Knowledge Proof [8] enables users to express their honest thoughts without compromising their privacy. Therefore, the reputation built upon the CNN Platform is more trustworthy and supportive for the whole ecosystem.

The CNN Platform reputation system consists of the following parts:

- **Content creator reputation:** This term refers to creator's popularity among users. The higher his reputation, the more likely his content will be massively recommended, leading to more commercial earnings. The specific mechanism will be detailed in section 2.4.2.
- **Reader reputation:** This characterizes the contribution the user provides to the community. The user could evaluate the content via comments, upvotes, and downvotes. In this way, the community can pick up the valuable content, thus enriching the whole content community. The distribution system of CNN Platform will reward the user accordingly based upon his reputation. The specific mechanism will be presented in section 2.5.2.2.
- **Recommendation node reputation:** The reputation of a recommendation node reflects its ability to serve the downstream nodes. The more effective a recommendation node is, the more likely it can serve valuable users, thus increase its revenue.

## 2.4 Recommendation

### 2.4.1 Tone control

Different users have very different content needs. There are various communities with different tones on the Internet, such as all-in-one News-Dog/Toutiao, elite-filled Flipboard, literary youth-led Vice, or angry netizens NetEase news. The tone of the community is usually determined by the initial users of that community. Within CNN Platform's ecosystem, the initial 20 users in each content community will form a committee, each of whom pays a certain amount of CNN to vote on whether to be compatible and bundled or to maintain their tone.

Once the community has decided on its tone, the committee will then vote on assigning values of recommendation for different categories. The value of recommendation is converted into different click through rates through smart contracts as a criterion for expanding the recommendation audience.

### 2.4.2 Content's popularity

Content communities need to reward high-quality content creators and their work, but they also need to provide more exposure opportunities for this high-quality content to gain more revenue so that authors have incentive to contribute more content. In the CNN Platform system, using  $\mathbf{R}$  to represent the content's popularity, which is calculated as:

$$\mathbf{R} = \mathbf{R}_w * \theta_0,$$

the following parts will define the **Author Reputation**  $\mathbf{R}_w$  and **Originality Factor**  $\theta_0$  respectively.

#### Author Reputation : $\mathbf{R}_w$

The Content Neutrality Network(CNN Platform) creates strong network effects for the reputation system over the Blockchain. On CNN Platform readers interact with writer's content via reading, commenting, upvoting and gifting, etc. These interactions between readers and writers help to create reputation mechanism.

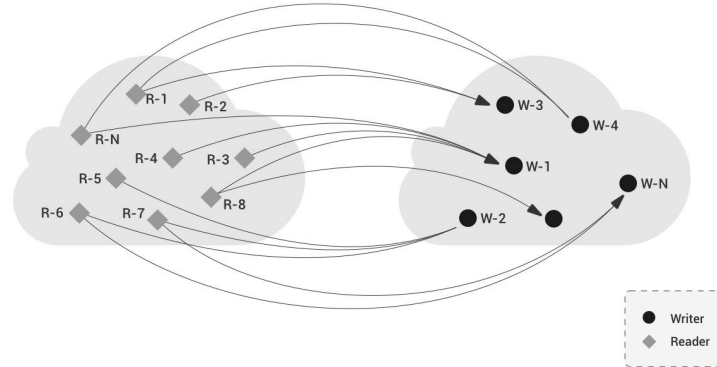


Figure 3: Interaction Network

As described above, let edge  $\mathbf{C}_{ij}$  represent the contribution that reader  $i$  make through reading, commenting, upvoting and gifting the contents of

writer  $j$ . In order to create strong economic incentive for the CNN Platform development (i.e. to overcome the chicken-and-egg problem in the presence of network-effects) CNN Platform proposes ZhangRank© mechanism that serves the following principles:

1. A Writer with many incoming edges from readers should receive high ranking in the reputation system, hence in the token distribution, since many readers benefit from his/her content.
2. A Writer with incoming edges from high-ranked readers should receive high ranking since more high-ranked readers benefit from his/her content.
3. A reader with many outgoing edges to writers should receive high ranking because of their active contribution to the community.
4. A reader with outgoing edges to high-ranked writers should receive high ranking since they contribute in picking up those high-ranked writers.
5. A node(writer or reader) that is added to the CNN Platform early-on should receive high ranking since it helps CNN Platform grow (overcome chicken-and-egg problem).

The ranking mechanism based on above principles determines how token payout is distributed among the writers. Principles #1 to #4 are based on principles that are used in PageRank[9] algorithm for ranking webpages connected through a link graph, while the difference is that the definition of ZhangRank© is used for two separate groups. Principles #5 indicates that early-adopters of the CNN Platform should be rewarded accordingly as they help the ecosystem to grow, especially in the beginning. Thus, the five principles can be satisfied through a “temporal PageRank” ranking mechanism that add “reputation” based on timestamps of each node to rankings generated by the PageRank algorithm. This mechanism is proposed by Prof. Shoucheng Zhang, hence named ZhangRank©.

The ZhangRank© is calculated through the following steps:

1. The rank of each writer is calculated using the iterative algorithm documented in the seminal paper[9] and the according patent[10]. This iterative ranking algorithm satisfies the following two conditions:

**Condition One:**

$$\mathbf{r}_w^p(\mathbf{A}) = \frac{\alpha}{N_w} + (1 - \alpha) \sum_{\mathbf{B}_i \rightarrow \mathbf{A}} \frac{\mathbf{r}_r^p(\mathbf{B}_i) \mathbf{C}_{iA}}{|\mathbf{B}_i|}$$

Where  $r_w^p(A)$  denotes the PageRank for writer  $A$ .  $B_i$ 's are all the readers that contribute to writer  $A$ ,  $C_{iA}$  is the contribution that reader

$B_i$  contributes to writer  $A$ , and  $|B_i|$  is the contribution of all edges that reader  $B_i$  contributes.  $N_w$  is the total number of writers on CNN Platform.  $\alpha$  is a constant number between 0 and 1 (typically 0.1) that ensures the convergence of the iterative algorithm. One can show that the vector of rankings is the eigenvector of the adjacency matrix of the graph.

**Condition Two:**

$$\mathbf{r}_r^p(\mathbf{B}) = \frac{\alpha}{N_r} + (1 - \alpha) \sum_{\mathbf{B} \rightarrow \mathbf{A}_i} \frac{\mathbf{r}_w^p(\mathbf{A}_i) \mathbf{C}_{Bi}}{|\mathbf{A}_i|}$$

Where  $r_r^p(B)$  denotes the PageRank for reader  $B$ .  $A_i$ 's are all the writers that reader  $B$  contributes to,  $C_{Bi}$  is the contribution that reader  $B$  contributes to writer  $A_i$ , and  $|A_i|$  is the contribution of all edges that writer  $A_i$  receives.  $N_r$  is the total number of readers on CNN Platform.

2. A temporal weight function( $W$ ) is defined using the time-stamp  $i$  for each node  $S_i$  as following:

$$\mathbf{W}(\mathbf{S}_i) = \mathbf{f}(i)$$

Where  $f(x)$  is a real function that satisfies the following conditions:

$$\frac{\partial \mathbf{f}(\mathbf{x})}{\partial \mathbf{x}} < \mathbf{x} \quad 0 \leq \mathbf{x} < \infty$$

$$\mathbf{f} : [\mathbf{0}, \infty) \rightarrow (\mathbf{0}, \mathbf{1}]$$

In other words, the function  $f(x)$  is a function that maps non-negative real numbers to weight numbers between 0 and 1. There are many candidates to use as function  $f(x)$ , such as:

$$\mathbf{f}(\mathbf{x}) = \mathbf{e}^{-\mathbf{x}}$$

$$\mathbf{f}(\mathbf{x}) = \frac{\mathbf{1}}{\mathbf{1} + \mathbf{x}}$$

3. The ZhangRank©

$r_w$  of writer  $A_i$  is calculated as following:

$$\mathbf{R}_w = \mathbf{r}_w(\mathbf{S}_i^w) = \frac{\mathbf{r}_w^p(\mathbf{S}_i^w) \mathbf{W}(\mathbf{S}_i^w)}{\mathbf{U}_w}$$

where  $U_w$  is the normalization factor:

$$\mathbf{U}_w = \sum_i \mathbf{r}_w^p(\mathbf{S}_i^w) \mathbf{W}(\mathbf{S}_i^w)$$

This ensures that sum of ZhangRank© for all writers equals to one.

Similarly,  $r_r$  of reader  $B_i$  is calculated as following:

$$\mathbf{R}_r = \mathbf{r}_r(\mathbf{S}_i^r) = \frac{\mathbf{r}_r^p(\mathbf{S}_i^r) \mathbf{W}(\mathbf{S}_i^r)}{\mathbf{U}_r}$$

where  $\mathbf{U}_r$  is the normalization factor that ensures the sum of ZhangRank© for all readers equals to one.

$$\mathbf{U}_r = \sum_i \mathbf{r}_r^p(\mathbf{S}_i^r) \mathbf{W}(\mathbf{S}_i^r)$$

### Originality Factor $\theta_0$

The calculation of content's popularity also involves an originality factor  $\theta_0$ . For original content  $\theta_0 > 1$ ; for non-original content  $\theta_0 = 1$ ; this is for encouraging more original content produced on the communities.

$\mathbf{R}$  will be applied to the recommendation algorithm in the next section.

### 2.4.3 Decentralized update of features and centralized recommendation

Subsequent to determining the community tone, personalized recommendation becomes the second-most important part of content distribution; it is also a standard feature for almost every content community. The user's reading history and personal characteristics are used to match content that will interest them most. In order to simultaneously make full use of the advantages of decentralization of blockchain while improving its efficiency, CNN Platform's solution is to update the user's feature model in a decentralized way, then use strong computing power to provide recommendation services to all users of the platform through the recommendation nodes.

- The recommendation is completed using the Logistic Regression (LR) model within CNN Platform protocol, which predicts the possibility for a user to click based on user and article characteristics and previous click behavior. The CTR prediction can be expressed as  $p = (y = 1 | X, W)$  where  $X$  is various features of articles and users (entity words, categories, article semantic vectors, topic model vector, etc.) and  $W$  is the weight of each feature.
- Every user's feature matrix is stored and updated on that user's nodes in a decentralized way.
- If a node has insufficient computing power, it can broadcast adjacent nodes to complete the calculation for it and pay a certain amount of CNN as a reward.

- Recommendation nodes and servers that provide every user with a recommendation service based on LR models and user characteristics. As a reward, recommendation nodes receive an advertising revenue share. Since the quality of recommendation determines the advertising revenue, and thus ultimately determines how much revenue a recommendation node will receive, the recommendation nodes will try their best to deliver the best recommendation service possible. The recommendation nodes' performance will decide their reputation, which would impact the future work load and revenue.
- After calculating a user's preference for articles based on the recommendation algorithm, the final score of the article can be calculated through the user's preference and the content popularity (see 2.4.2 for details). With pseudocode expressed as:

```
def calc_final_score(user_interest, content_weight):
    return user_interest * (1 + 1 / (1 + math.exp(-1 *
        content_weight)))
```

#### 2.4.4 Community-based feature finding mechanism

Personalized recommendation is based on the richness of a user's features. To improve the performance of recommendation, such as the user's CTR and duration, algorithm developers can obtain the user's behavior data from the decentralized content storage system and subsequently discover new user features through machine learning. This will therefore continue to improve the activity and earnings of all community members. Its operation mode is as follows:

- Developers discover new features based on user data and submit them to the committee, which consists of all recommendation nodes within the community.
- Developers update the user feature model in a decentralized method, and run the model on recommendation nodes that support A / B testing. Developers are required to pay a certain amount of CNN as the cost of the test.
- Run confidence interval of the experimental results. If the improvement of algorithm performance is reliable ( $> 95\%$ ), the new feature model will be adopted and be broadcasted to the entire network.
- Until new features are introduced, the algorithm nodes using the new feature model will share 20% of the subsequent recommendation revenue with the feature developer.

With the operation pseudocode expressed as:



```

def explore_feature(self, feature_set, recommend_server):
    if self.account < explore_fee:
        raise()
    self.account -= explore_fee
    if run_explore(feature_set, recommend_server):
        recommend_server.feature_host = self

```

### 2.4.5 Community-based text annotation

The implementation of personalized recommendation requires a lot of NLP information support. Because the global content industry presents an explosive growth trend, this means that the NLP information also needs to be added and updated regularly. However, the iteration requires a lot of manpower investment. On the blockchain, CNN Platform will provide full support to the enthusiasm of the community on improving the efficiency and accuracy of the annotation. The specific operational procedures are as follows:

- The system will decompose and publish the decomposed task. Each annotation task must be annotated on the network and must have at least three participants.
- If a user claims the task, he or she needs to pay a certain amount of CNN as deposit. The smart contract will be generated after both sides of the transaction confirm the allocation.
- The system automatically compares the results of the three annotators to determine the quality level of each annotator. If someone is underqualified or there is breach of the contract, the deposit will be deducted and will be added to the same day's reward fund. The annotator whose work has been marked satisfying will receive reward from community.

## 2.5 Share of Advertising Revenue

### 2.5.1 Reading revenue calculation

In CNN Platform's system, advertising revenue will be calculated based on the user's attention. Specifically, Assuming that a user's attention to an advertisement is proportional to the amount of time a user spends on the article. That advertiser will specify the user's ideal reading time and the corresponding CPM when they purchase an advertisement by CPM. When the actual reading time is different from  $r_0$ , the price of a single ad display is:

$$p_0 = \frac{\min(r_0, r)}{r_0} * \frac{CPM}{1000}. \quad (1)$$

To prevent users from constantly re-reading and refreshing articles to gain an unreasonable proportion of revenue, CNN Platform reduces the cost of advertising based on the total duration that the user has generated revenue. Therefore, no new revenue will be generated when reading articles once the threshold is reached. This is expressed below:

$$\theta = \begin{cases} 1, & R' < R_1, \\ \frac{R_2 - R'}{R_2 - R_1}, & R_1 < R' \leq R_2, \\ 0 & R_2 < R' \end{cases} \quad (2)$$

$R'$  represents the total duration that the user has generated advertising revenue today.  $R_1$  and  $R_2$  are the two thresholds. The user can receive all of the revenues from the very beginning, but when the total duration exceeds  $R_1$ , the user can only receive part of the revenue. If the total duration exceeds  $R_2$ , the user can no longer receive any advertising revenue. The actual cost the advertisers need to pay is:

$$p = \theta * p_0, \quad (3)$$

This mechanism will prevent users from receiving advertising revenue by suspicious behaviors, such as constantly refreshing and re-reading articles. Formula 3 is used to determine ad revenue from the single reading activity of a user, and it is then divided between the author, user, and recommendation node based on a predetermined percentage as described in 2.5.2.1 or 2.5.2.3

## 2.5.2 Reading revenue distribution

### 2.5.2.1 The revenue share in the community

Traditionally on the Internet, users could not generate revenue by reading news because users' attention was not recognized as a valuable resource and the inefficiency of the traditional payment methods. However, because of the trustworthy blockchain technology and the low-cost point-to-point payment mechanism, it can be guaranteed that users will receive some advertising revenue from every effective reading practice. This will greatly motivate users to migrate from the traditional Internet reading platform to the CNN platform. At the same time, in order to stimulate user's constructive behavior on the platform such as comments, upvotes and dislikes, CNN Platform will draw part of the revenue (10%) as a reward fund in each advertisement display as a reward incentive, such as comments, upvotes, and dislikes. Under normal circumstances, assuming that the distribution ratio of authors, readers, recommendation nodes, and reward fund is 5: 2: 2: 1, the distribution of advertising revenue is as shown in Figure 3:

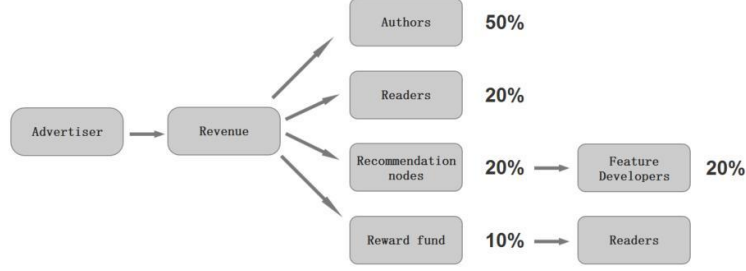


Figure 4: Advertising Revenue Share within Community

### 2.5.2.2 Distribution of reward fund

An active content system requires constant interaction between the reader and content creator. Reader comments, upvotes, and dislikes are all valuable behaviors on the platform. Therefore, in order to maintain the virtuous cycle on the system, CNN Platform needs to encourage readers to be more engaged in the positive interactions through reward fund.

Upvote or dislike actions and comments on a certain article can reward a reader with contribution power. According to the proportion of each reader's contribution to the total system contribution, the reader will receive a proportion of the reward fund generated by the system on a daily basis.

The reader contribution  $P_r$  is calculated as:

$$P_r = R_r * P$$

Where

$$P = \min(x, N_1) + \max\left(0, \sum N_2 + \sum N_3\right) + \sum \log N_4,$$

here  $R_r$  represents the reader's reputation (defined in 2.4.2);  $N_1$  represents this reader's comments, upvotes, and dislikes;  $N_2$  represents the comments and upvotes that this reader's contents or comments receive;  $N_3$  represents other readers' dislikes on the contents or comments that this reader creates;  $N_4$  represents the similar interaction activity that was given by other readers subsequent to this reader giving his or her reaction.

The following explains the meaning of each part:

- $\min(x, N_1)$  : CNN Platform wants each reader to provide their honest opinion and rating accordingly. Therefore, we give a value of 1 for each of the reader's first x comments, upvotes, or dislikes, encouraging readers to actively participate in content reviews.
- $\max(0, \sum N_2 + \sum N_3)$  : a value of 1 is given for a reader's contents or comments being upvoted; and a value of -1 for any dislike on any of

his or her contents or comments. The minimum value of this part is 0.

- $\sum \log N_4$  : In order to encourage a reader to express their true opinions, CNN Platform treats subsequent evaluations of other reviewers as votes on this reader's current review. If a reader upvotes an article, and the following reviewers also give upvotes for this article, then these upvote behaviors are deemed to be endorsement of the reader's upvote. The same procedure also applies to the dislike action. Therefore, CNN Platform converts the subsequent evaluation into the reader's contribution.

```
class Reader:
...
    def effort(self, likes, dislikes, comments,
               be_liked_num, be_disliked_num):
        # engagements
        self.effort_num = min(LIKE_LIMIT, len(likes)
                               + len(dislikes) + len(comments))
        # received engagements
        self.effort_num +=
            max(0, be_liked_num - be_disliked_num)
        # engagements after own engagement
        self.effort_num +=
            sum(math.log(like.after_like_num)
                for like in likes)
        self.effort_num +=
            sum(math.log(like.after_dislike_num)
                for dislike in dislikes)
    def get_effort_profit(self, total_effort,
                          total_profit):
        return total_profit * self.effort_num /
            total_effort
```

### 2.5.2.3 Cross-community revenue share

On the traditional Internet, content licensing is often accompanied by issues such as untrustworthiness, fake data, and non-real-time settlement, hindering the circulation of content among communities. As mentioned in Section 2.2, CNN Platform encourages the circulation of high quality content among communities via our mechanism on the CNN Platform ecosystem. The details are presented as follows:

- If a reader feels that an article posted on community A will also be popular on community B, then he or she can pay a certain amount of CNN to repost this article to community B.
- The system will check the timestamp to verify if the article has been reposted to community B. if the article has been reposted by others,

the system will then automatically reject this action and the repost fee will be refunded.

- If community B does not have this article, then the repost action will be finalized and the repost fee will be transferred to the content creator. The revenue generated from this article in community B will be distributed among the author, the person who reposted, the reader from community B, the recommendation node, and the community B reward fund. The income distribution is presented as shown in Figure 4:

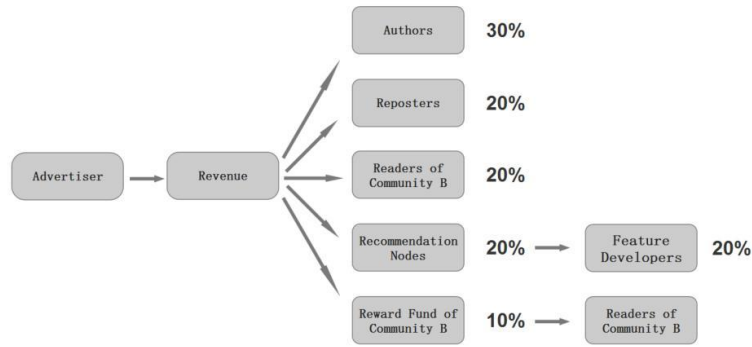


Figure 5: Cross-community Advertising Revenue Share

```

def profit(self, y, writer, reader, recommend,
           reward, reposter=None):
    if self.balance < p:
        raise()
    self.balance -= p
    if reposter is None:
        riter.account += p * PERCENT_WRITER
        reader.account += p * PERCENT_READER
        recommend.account += p * PERCENT_RECOMMEND
        reward.account += p * PERCENT_REWARD
    else:
        writer.account += p * PERCENT_SHARE_WRITER
        reader.account += p * PERCENT_SHARE_READER
        recommend.account += p * PERCENT_SHARE_RECOMMEND
        reward.account += p * PERCENT_SHARE_REWARD
        reposter.account += p * PERCENT_SHARE_REPOSTER
  
```

## 2.6 Incentives

Users and content authors of content communities have an extremely rich set of interactive scenarios on the platform. In addition to the consumption of the content itself, it also includes interaction between users,

content sharing, user invitations, and more. Among them, inviting new users is one of the most important part. The more users, the more active the ecosystem is, and the greater the value is. The content ecosystem, which is based on the CNN Platform protocol, is a natural incentive model for users to participate in revenue sharing as one of the main ecosystem entities.

The rules and procedures of the traditional incentive system are complex and incentive settlement cycles are long, which leads to them being inefficient and error-prone. The invitation incentive mechanism based on CNN Platform protocol can simplify the incentive process and even achieve the multi-level effect, which enlarges the possible benefits brought by inviting new users, enhancing the incentive effect and reducing the cost and difficulty of acquiring new users in the community. This is particularly evident in the Indian market. The specific process is:

- Every day, the platform distributes a certain amount of CNN quota as the incentive reward pool. For the specific amount, please refer to the Chapter 7 Release Plan.
- Calculate each user's contribution to increasing the overall eco-user community, and all users share a daily incentive pool based on their contribution.
- All invitations and invited relationships are recorded on the blockchain, forming an open tree structure that cannot be tampered with. The contribution of each user is calculated from his or her subtree.
- In CNN Platform ecosystem, users can get contribution values from all users in their subtrees. If A invites B, B then invites C, then C is a level 2 invite user of A. If X is an level-n invite user of A, X can contribute  $2^{1-n}$  point value to A. A daily contribution value formula can be calculated as:

$$R = \sum 2^{1-n},$$

- At the end of the day, each user shares the same day's incentive bonus pool based on their contribution.

In this incentive network, it is possible to continually attribute to the value of every new user to his or her parents, which will greatly motivate users, and also enhance the user's viscosity. At the same time, decentralized settlement brings higher efficiency to CNN Platform protocol-based incentives and allows users to quickly obtain incentive rewards. The module's pseudocode can be expressed as:

```
class User:
    # calc all parent contribute when new users sign up
    def cal_invite_contribute(self):
        contribution = 1
```

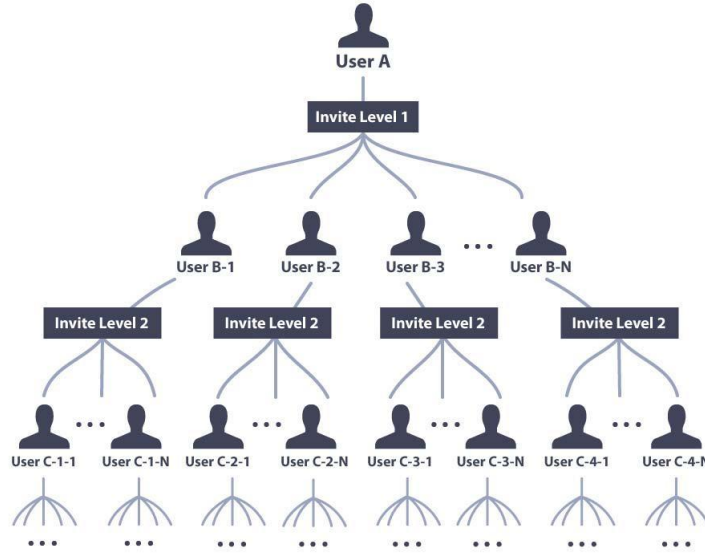


Figure 6: CNN Platform Incentive Pattern.

```

p = self.parent
while(p is not None):
    p.contribution += contribution
    contribution /= 2
    p = p.parent
...
# calc own contribute at end of day
def get_invite_profit(self, total_contribution,
    total_invite_profit):
    self.account += total_invite_profit * self.contribution /
        total_contribution

```

## 2.7 Tipping Mechanism

Tipping is an emerging way of content payment for users to express their appreciation of the author. It is a triumph for decentralization culture, breaking the monopoly position of cultural and entertainment elites. It allows users to express themselves and express their recognition of the author.

Under CNN Platform protocol, a point-to-point rewarding channel can be established. The tip a user gives to an author will go directly into the author's account. And the tip is also regarded as recognition of the author and will help the author and his work receive more exposure. The tipping activity also reflects the user's reading preferences.

In order to prevent the author from cheating through tipping, the platform will draw a percentage (e.g. 20%) from the tip as the reward for recommendation service.



## Chapter 3

# Technical Solutions of CNN Platform

CNN Platform will be developed with solutions that have been used and verified by actual projects in the open source community, combined with the team's original technology stack and codes. The foundation intends to design a suite of technical solutions and system architectures, and integrate these architectures into the blockchain technology.

### 3.1 Capacity Expansion and Speed Improvement

To complete a transaction on the blockchain, all computer nodes in the network either need to validate the transaction or execute a smart contract. If all nodes achieve the same result and come to an agreement, then the transaction is confirmed. This is a very slow and inefficient process. There are some projects that can speed up the transaction of Ethereum, such as Plasma and Raiden, but these projects use either non-chain or sidechain and don't aim at the expansion issue of blockchain.

The foundation has designed several programs as a solution to this problem.

#### 3.1.1 DPoS delegated proof of stake

DPoS (Delegated Proof of Stake) algorithm [11] can solve performance and energy consumption problem caused by decentralized POW. Under DPoS, the nodes using blockchain vote to generate N witnesses, who will then sign the blocks. DPoS is more democratized than the rest of the systems due to the implementation of the decentralized voting mechanism, ensuring that the witnesses behave honestly and without prejudice while maintaining the mechanism. Therefore, each block can prove that the previous block was correctly confirmed by the witness. DPoS reduces the transaction time for

a certain number of blocks to be verified by reducing the required confirmations, therefore significantly increasing the transaction speed. As a result, the cryptocurrency transaction can be conducted as smooth as a centralized transaction system, such as those of Visa and MasterCard.

### 3.1.2 PBFT practical byzantine fault tolerance

Malicious attacks and software errors will continue to increase, resulting in arbitrary behavior of the infected nodes. This behavior may mislead other replica nodes and lead to more harm than just crashing. The early Byzantine fault tolerance algorithm was based on a synchronous system and could not run due to its low performance. In 1999, Miguel Castro and Barbara Liskov proposed a Practical Byzantine Fault Tolerance (PBFT) [12], which solved the problem of Byzantine fault tolerance through copy duplications. It solves the problem of low efficiency of the original Byzantine fault-tolerant algorithm, reduces the complexity of the algorithm from NP to P, and makes the Byzantine fault-tolerant algorithm ready to run. In an asynchronous environment, the response performance significantly increased by optimizing earlier algorithms, and performance tests demonstrated that the system was only 3% slower than standard NFS without copied duplication.

### 3.1.3 Our proposal

After an in-depth study about the existing blockchain expansion solutions, the preliminary conclusion is that the DPoS consensus mechanism and Sharding Scheme will be adopted to solve the bottleneck of the capacity and transaction speed on the blockchain. In the future, CNN Platform will continue to explore new technologies to further enhance system capacity and speed.

The specific solutions are as follows:

Taking computation performance and storage pressure into consideration, CNN Platform divides the database to shardings. Each shard only deals with part of the transaction, so it has a small consensus protocol, and will be able to process transactions in a parallel manner, hence improving system throughputs. In a parallel processing network, each shard can handle hundreds of transactions per second, and the entire network can handle thousands of transactions per second. As more nodes are added, the network will become faster at validating transactions. Once the network is as large as Ethereum, the network can handle transactions faster than banks and possibly at a lower cost. For example, Zilliqa has adopted an efficient and extensible sharding scheme with 600-800 nodes in each shard for computing [13]. This ensures security without sole dependence on the centralized node. As the number of nodes increases, the throughput will grow linearly. Currently, Ethereum also upgrades EVMs and provides basic support at the

smart contract layer. Therefore, implementing the Ethereum-blockchain-based Sharding solution is simple and feasible.

Based on the Sharding scheme, CNN Platform will use the DPoS mechanism to solve the low speed problem for transaction confirmation. The implementation of this mechanism is similar to stock authorization certification. Through voting without friction in real-time while avoiding the participation of untrustworthy parties, it relies on a credit system to generate a group of aggregated “creditors” (“trustees”) who have the right to output block and add it to the blockchain. Each round is randomly signed by a group of creditors to generate blocks; therefore each round has a different block generation order. It is very important that this system does not require a very high level of trust and that the blockchain producers (i.e., the trustee) can only choose to produce or not produce blocks, or either pack or unpack the transaction. They don’t have the capability to change the details of the transaction, such as sender, receiver, or balance. In this model, the trustee has little influence if he or she does something bad. If the trustee drops a block, the next trustee will produce a block twice the size, including the missing transaction in the previous block. The confirmation time changes from 10s to 20s. There are no other influences. The trustee’s behaviors are publicly visible, such as the malicious or procrastinating behaviors, therefore the community has ability to simply vote them out. As a result, the trustee loses their potential income and benefits, and therefore has no incentive to do wrong. The architecture of our proposal solution is as shown in Figure 6.

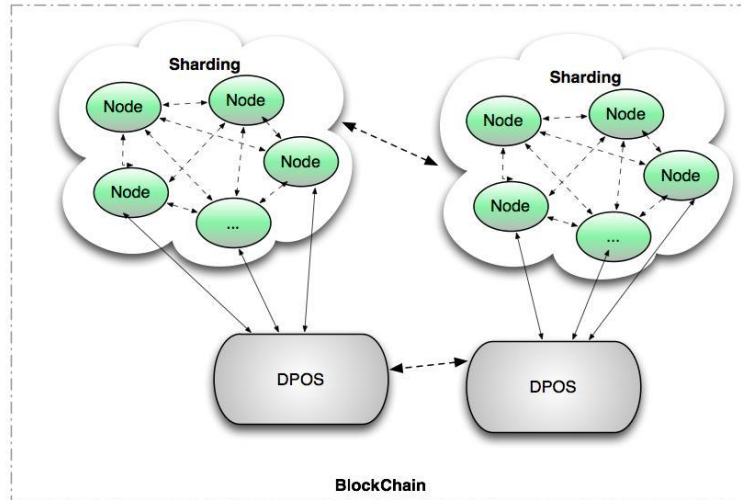


Figure 7: Capacity Expansion Architecture.

## 3.2 Decentralized Content Storage

The size of the data on the web is huge, with structured user profiles and unstructured files (images, videos, documents, etc.). They are usually stored in the server's database or in each site's file system, which is a centralized way to store a large amount of centralization content. This centrally stored data is often subject to institutional scrutiny, like that of the U.S. Security Agency C.I.A., which allows the government to easily access sensitive data as long as they control the server. On the other hand, these servers can easily be hacked, the data privacy is unreliable, and system error, such as error 502, often occurs. Finally, the centrally stored data is under the risk of being modified by the server owner, and operation history can be tampered with as well. These problems can be effectively avoided.

The current decentralized storage solutions are Sia [14], Storj [15], MaidSafe [16], IPFS [17] and so forth, as described below:

Sia provides a decentralized, reward-based cloud storage system that can compete with a centralized, similar system like Amazon S3. It is highly focused on becoming an enterprise product, whose developers are constantly optimizing their product designs to be more flexible in handling the diversity of cloud storage.

Storj is a pay-as-you-go approach where renters frequently pay for a host. Storj's goal is similar to that of Sia, except that Storj does not use the built-in smart contracts of blockchain. The host will not be paid if the user is not online. Storj is currently in the internal testing phase.

MaidSafe is a very ambitious project, with developers moving beyond decentralized storage systems that are not focused on efficiency. MaidSafe uses a new consensus mechanism (different from blockchain), which is not proof of PoW work. MaidSafe has not been proven as practical as Bitcoin's mechanism.

The IPFS (InterPlanetary File System) is implemented by Y Combinator's Protocol Labs and aim to replace the Internet HTTP protocol, which the public has become accustomed to for the past 20 years. IPFS is a point-to-point distributed file system that connects all computing devices to the same file system. It uses content addressing technology to separate content from the source server and stores it permanently. IPFS can be as close to a user as CDN, protecting decentralized storage sites and eliminating potential DDoS attacks. IPFS can archive important public records to avoid loss brought by site's termination of operations. There are already many sites like Neocities that are based on IPFS, and an increasing number of blockchain projects are also running on IPFS. The specific protocol pseudocode is:

```
type EncryptedObject struct {
    // raw object data encrypted
    Object []bytes
```

```

    // optional tag for encryption groups
    Tag []bytes
}
type SignedObject struct {
    // raw object data signed
    Object []bytes
    // hmac signature
    Signature []bytes
    // multihash identifying key
    PublicKey []multihash
}

```

Based on the above analysis and investigation, CNN Platform adopts IPFS to solve the decentralized storage of content. Separating the content data from the blockchain can effectively save the blockchain resources and improve the processing capacity of the entire system.

### 3.3 Probabilistic Micropayments

2017, David L. Salamon introduced probabilistic micropayments [18] as the new micropayment solution. An expandable network of micropayment channels can be provided through probabilistic micropayments, where micropayments can be implemented with high frequency and low cost. Probabilistic micropayments can send an arbitrary number of payments to an arbitrary number of recipients, without any per-recipient initialization or settlement transactions. This will reduce transaction costs and making high-frequency micropayments possible. The procedure is as follows:

- The sender deposits CNN into a smart contract (shared by all senders) which maintains, for each sender, payment balance and penalty escrow.
- The sender creates and signs a ticket locally — a cryptographic data structure that includes payment data, such as recipient and amount.
- The sender sends the ticket directly to the recipient without posting anything on the Ethereum network.
- The recipient verifies the ticket. If the ticket is valid the recipient now has cryptographic proof that they are being paid. Note that even if a ticket is not a “win” the recipient still has absolute proof of being paid, since the randomness used to determine whether a ticket wins or not is derived from both the sender and the recipient. In such a way, neither party can manipulate the outcome.

A valid ticket may be a “win”, in which case it can be claimed by posting an on-chain Ethereum transaction.

## Chapter 4

# NewsDog - CNN Platform's First Application

NewsDog was founded in late 2015. Before starting the app, the founding team noticed the tremendous potential of India's economic growth and digital content market. Therefore, NewsDog decided to put its focus on India's personalized content.

For the past two years, the number of mobile phone users in India has doubled, while the internet data price has significantly decreased to Rs 5 per GB. NewsDog enjoyed rapid growth at the same time. Since its launch in early 2016, NewsDog has accumulated more than 40 million users and are now ranked No. 1 on the Google Play news apps list, making it the smallest, fastest, and most popular news app in India. Aside from that, NewsDog collaborated with thousands of media companies in India to provide users with news information in ten languages, such as English, Hindi, Tamil, Marathi, and others, covering over ten different categories, such as politics, economics, entertainment, sports, health, technology, local, world, and more.

NewsDog has built a powerful recommendation system and has calculated a detailed user profile for all participants. Not only have they provided personalized content for each user, they have also facilitated content and advertisement delivery.

NewsDog team will work closely with CNN Platform team to migrate some of NewsDog's features to CNN Platform protocol by mid-2018.

### 4.1 CNN Platform protocol-based Recommendation System

Recommendation is the core for the content platform, but it's also the most resource consuming job. An advanced recommendation system takes



Figure 8: NewsDog Rank History on Google Play.

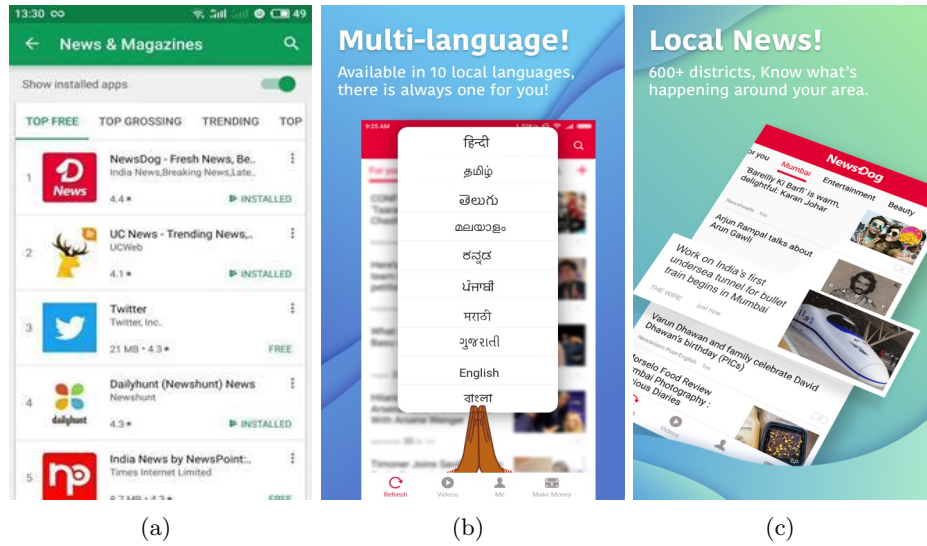


Figure 9: NewsDog Google Play Screenshots

a long time to build. On the other hand, in order to obtain accurate recommendations, privacy has become the price users have to pay to consume content. The recommendation system based on the CNN Platform protocol can solve these two problems.

NewsDog's recommendation system is based on a wide range of user portraits and user data, and the centralized portraits and storage and computation of the data become a time-consuming and burdensome task. With the recommendation system based on the CNN Platform protocol, the user feature model is distributed and stored in each node of the blockchain, which can reduce the pressure of the central recommendation node. Distributed

anonymous storage can also eliminate privacy issues for users.

## 4.2 Advertising Revenue Sharing Model Based on CNN Platform Protocol

Users play a very important role in the current Internet content ecosystem. The content community uses the user's attention to earn the advertising value, but users cannot participate in the commercial profit sharing.

Based on the CNN Platform protocol, the NewsDog community's advertising revenue is distributed to users, reposters, recommendation nodes and referrals beyond content creators.

The content creators of NewsDog are the source of content ecology and therefore they receive the largest share in the revenue sharing model. Authors can receive a corresponding percentage of their articles' ads revenue as they are read, reproduced, and commented on. In the CNN Platform copyright protection mechanism, the author also will be compensated if the copyright is violated.

Under revenue distribution system on CNN Platform, NewsDog users can get rewards by reading articles, commenting, and upvoting; the more active in the community, the more revenue users receive. At the same time, users also undertake the task of transferring content among communities. After reposting the articles, the users can obtain corresponding benefits based on the performance of the articles.

In addition, the recommendation node plays a unique role in the CNN Platform system, and will also receive the corresponding proportion of ads revenue.

## 4.3 Multi-level Incentive System

Because of the centralized setup, the traditional incentive system poses a great challenge to the planning and operation of rules. Each incentive activity requires a high operating cost and the effectiveness of the incentive can't be guaranteed. NewsDog uses CNN-Platform-based multi-level incentive system to effectively solve the input and efficiency problems.

As the invitation records are distributed throughout the blockchain, it is possible to reduce the operator's server and computing costs. Currently, there are two layers in the incentive systems within NewsDog. With CNN Platform, NewsDog can expand two layers into multiple layers, better leverage the user invitation, and optimize the incentive effect. Due to the introduction of CNN, users who participate in the incentive can get incentive rewards sooner, shortening the incentive cycle to one day, and stimulating the enthusiasm for users to participate.



## 4.4 NewsDog MALAMAAL – The Extent of the Incentive Model

NewsDog is the first player to introduce the live-streaming Q&A section (just like HQ Trivia) to India. This model combines a live-streaming platform with an incentive program to acquire new users. However, under the CNN Platform system, this model can evolve from a pure user-acquisition tool to a next-generation all-service-platform. Therefore, CNN Platform introduces the NewsDog MALAMAAL Store into the app. It can provide more value-added services to users settled by CNN.

The game rule is to answer 12 questions correctly to enter in to the shared prize pool. To make the game more entertaining, CNN Platform introduces the privileged right of “extra life” to the game. Participants can get an extra life by inviting a new user, thus increasing their chances of winning. Based on this, CNN Platform introduces the online store to offer more value-added services to users:

- Extra life card: When the user chooses the wrong answer, he or she can use the “extra life” privilege to be back in the game.
- Tips card: Users can use this to receive hints for the correct answer.
- Pass card: When a user does not know the right answer to the question, he can use this card to skip to the next question.

The MALAMAAL itself works as a self-contained economic system. All privileged cards will be settled in CNN. The shared prize is also given in CNN.

## 4.5 Fantasy Cricket League

Cricket is the national sport of India. Statistics show that about 800 million watched the IPL and T20 cricket matches from April to June in 2017. Additionally, Cricket World Cup offers more business opportunities in India. As the largest news app in India, NewsDog will introduce the Fantasy Cricket League to satisfy a user's needs.

Fantasy Cricket League is a cricket game in NewsDog where users can act as the manager of a cricket team and play the tournament to gain earnings. The specific rules are as follows:

1. Users pay an amount of CNN to build a cricket team
2. Each season, there is an auction where all players are ready for the managers to bid

3. Once all players are selected, the game starts. In specific time of a season, managers can exchange players with other teams by CNN to seek better result
4. At the end of each season, managers receive their earnings according to the rank of their team in the league

## 4.6 Other Model

### 4.6.1 Paid horoscope consultancy

Horoscope culture has become increasingly popular around the world. Many media agencies globally, especially in India and China, have built a horoscope on their website or social media, and many freelancers are also entering into this area. For instance, Vogue India has over 1.12 million followers on Twitter, and they post a daily horoscope message for all of the users. China's popular horoscope KOL "Uncle Tondao" has more than 136.2 million followers on Weibo, and many people comment and upvote his posts. Therefore, in order to satisfy users' cultural needs, NewsDog introduced paid horoscope consultancy services. The details are presented as follows:

- Personalized horoscope information: One user can pay an amount of CNN and input his or her personal information like date of birth, place of birth and blood type to receive his or her personalized horoscope information
- Professional KOL answering: One user can pay an amount of CNN to ask a KOL professional on NewsDog to answer his or her horoscope related questions

### 4.6.2 Paid Q&A

In the era of information explosion, there are many mobile apps that help users select and filter useful information such as Quora and Zhihu. The potential of these apps relies on their popularity and practicality. Therefore, Newsdog has developed the same type of Q&A model taking advantage of its vast content to provide users with comprehensive services. The specific form is as follows:

- Crowdfunding Q&A: Users may pay an amount of CNN and ask a KOL to answer some questions. If other users are interested in the questions, they may also pay CNN to join. If the KOL answers the questions, he could get CNN paid by all users. Otherwise, the tokens would be returned to users who raised the question.

- Professional one-on-one Q&A: Users can pick a KOL they trust and pay a number of CNN to ask the KOL questions and get an exclusive answer. The writer can receive the tokens once he or she answers the question.

#### 4.6.3 Charity activities

Not only does the Internet facilitate information communication, it also shortens the distance between people. This provides a good opportunity to promote charity activities to benefit society as a whole. As the largest news app in India, using the platform to promote charity activities is not only News Dog's corporate responsibility, but also to provide a platform for people to help each other. Based upon blockchain's open and tamper-proof nature, NewsDog presents the following proposal:

- People who need help should post their detailed information on the platform, and a professional team will verify his information
- Users can offer their help to them by donating CNN
- The victim/survivor can get all donated CNN after his information is verified
- Both the platform and donee need to regularly update donors regarding the condition, so as to ensure openness and transparency

## Chapter 5

# Development Plan

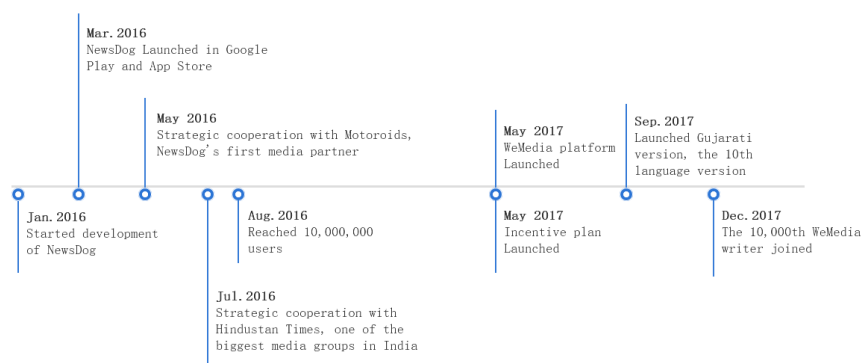


Figure 10: NewsDog Development Path.

### **The first stage: 2017 Q4: research stage**

Study the feasibility of a CNN Platform vision to create a decentralized, user-focused, neutral content ecosystem. While working closely with NewsDog and the consultant team, the philosophy behind CNN Platform was developed.

### **The second stage: 2018 Q1: token offering**

Develop CNN Platform's core smart contract and issue CNN. The foundation will organize a private sale and the use of privately financed funds is detailed in Chapter 7.

### **The third stage: 2018 Q2 - Q4: prototype development**

To develop the first generation of CNN Platform prototype, mainly include CNN Platform's modules, such as copyright certification and dispute resolution systems, content revenue sharing systems, and user-inviting incentives. NewsDog became the first APP on the CNN Platform protocol. This prototype system is primarily for content distribution APPs; it will be completely

open-sourced on Github and will be audited separately.

**The fourth stage: 2019 Q1 - Q3: application and promotion**

At this stage, The foundation will mainly focus on the promotion and operation of the CNN Platform system. The development of the system will be adjusted and improved according to market and user feedback in a timely manner. The focus will be on improving the content revenue sharing mechanism and user invitation incentive mechanism to stimulate the interests of content creators and community active users, as well as to enable the system to support multimedia content, such as pictures and videos, so that more communities and users can enjoy the convenience brought by the CNN Platform mechanism.

**The fifth stage: 2019 Q4 - 2020 Q2: CNN Platform 2.0 research and development**

As more and more users start using CNN Platform systems and contracts, The foundation will upgrade the system architectures by integrating the latest blockchain technologies to further solve the problem of decentralized storage and transaction speed, as well as enhance the expansion and flexibility of software systems. At this stage, CNN Platform may run on a blockchain outside ETH, such as EOS.

## Chapter 6

# D-Run Foundation

D-Run Foundation is designed from the ground-up to facilitate the development, transparent management, and other improvements related to CNN Platform, aiming at creating a healthy and sustainable ecosystem for blockchain node operators, content creators, advertisers, and other end users. All of the participants in the eco-community are entitled to provide and use the network services and exchange CNN. The ultimate goal of D-Run Foundation is to become an independent, and non-profit organization that promotes the democratic, healthy, transparent, and reliable development of the ecosystem. In order to achieve this, D-Run Foundation has set up three major principles:

1. Transparency & openness
  - Independently manage to develop CNN Platform protocol and its applications.
  - Separate legal entity from NewsDog and other entities.
  - Management team acts independently of NewsDog.
2. Non-profit
  - Aimed at developing a healthy and sustainable scalable system responsible for the interests of CNN Platform holders.
  - Work with NewsDog under the mutually beneficial commercial agreements.
  - D-Run Foundation takes responsibility for the issuance and distribution of token.
3. Advanced management system
  - As an independent legal entity, D-Run Foundation develops its own operation and management mechanism.

- Consultancy services are provided by top-tier professionals.
- Technical services for CNN Platform blockchain applications will be provided.

The mission of D-Run Foundation is to create a decentralized content ecosystem for participants, and provide blockchain solutions for the real world and online applications. It also aims at providing a free and neutral platform for service development, enhancement, and delivery to attract users. In order to achieve this goal, the foundation will establish a transparent management process that takes into account the views and suggestions of all participants, and set up transparent pricing and participation rules for token issuance to ensure CNN Platform's revenue transparency.

## Chapter 7

# CNN Issuance

Taken into account the frequency of reading and users' spending habits in developing countries, the value of each CNN will be set relatively low. D-Run foundation proposes to issue 100 billion CNN, 30 billion of which will be allocated for private sales.

The foundation plans to launch CNN through the D-Run Foundation or its wholly owned subsidiaries. Interested parties please visit <http://cnntoken.io//> for latest information on CNN Platform project and token sales.

The allocation plan of CNN Platform's 100 billion tokens is as follows:

	Allocation
Private sales	30%
NewsDog team	20%
Advisors and current investors	15%
Seeding users and ecosystem	15%
D-Run Foundation reserves	20%

1. Financing: Plan to raise 30,000 ETH, 1 ETH = 1,000,000 CNN
2. Token issuance in private sales: 30 billion
3. Percentage of private sales: 30%

The proceeds from the private sales will be used for:

- R&D (developing CNN Platform protocol and migrate NewsDog to CNN Platform) - 60%
- Marketing and developing the content communities - 25%;
- Operating and G&A costs - 15%;



## Chapter 8

# CNN Platform Team

### Forrest Chen

Forrest is a successful serial entrepreneur, expert on deep-learning, product and strategic leadership. He is in charge of strategy, management and business alliance of NewsDog and CNN Platform. Prior to NewsDog, he co-founded Umeng which was acquired by Alibaba for \$70 million in 2013. Forrest is an expert on algorithm, product, R&D, and entrepreneurial leaderships. His papers were published on top-tier academic journals such as ACM Transactions on the Web, and ACM SIGSPATIAL with hundreds of citations. He received his Bachelor of Software Engineering and Master of Computer Science from Tsinghua University.

### Dr. Maggie Ma

Ph.D. in Financial Engineering from Princeton University. Maggie is in charge of data analysis, content platform and operation team at NewsDog and CNN Platform. Prior to NewsDog, Maggie worked for Baidu M&A team and Goldman Sachs IBD as a director/associate, leading major financing and investment. She is an expert on data analysis, international team management and business development. She received her PhD of Financial Engineering from Princeton University and Bachelor of Electrical Engineering from Tsinghua University with papers published on top-tier journals such as SIAM Journal on Financial Mathematics.

### Dr. Linjie Luo

Linjie is responsible for developing CNN Platform's next generation recommendation algorithm. He is a senior research scientist and manager at Snap Inc. focusing on artificial intelligence, computer vision and computer graphics. He has 17 papers published in top-tier academic venues including CVPR and SIGGRAPH with more than 600 citations. He has filed more

than 15 US patents with industry leader licensees such as Weta Digital. Prior to Snap Inc., he worked as a research scientist at Adobe Research. He received his PhD of Computer Science from Princeton University and BS from Tsinghua University with honors.

### **Kevin Wang**

Kevin is the former tech leader at Alimama Mobile Ad Network and Umeng Ads department. He is in charge of building and managing the engineering team at NewsDog and CNN Platform. He has over ten years of experience in SaaS, search, high-concurrency, recommendation, big data, and internet technology. He is the founder of Off-site Mobile Ads System for Alimama, and built its first team and system. He received his Bachelor and Master of Computer Science from Beihang University, and also has various patents and software copyrights.

### **Siddharth Puri**

Sid is the co-founder of Tyroo Media Pvt Ltd and SVG Media Pvt Ltd, and the founder of SMILE Internet Technologies, leading internet groups in India and South East Asia. He is responsible for strategic collaboration, sales and business team management of CNN Platform. He has 15 years of experience in the digital media, advertising, Internet and education industries, and also has extensive experience in strategic collaboration, sales and business negotiation.

### **Dr. Lei Qi**

Lei is a mathematician and an expert on machine learning/statistical learning. He serves as investment portfolio manager at Athena Capital Research, designing and managing cutting-edge quantitative trading strategies. Lei received his Ph.D. of Operations Research and Financial Engineering from Princeton University, and Bachelor of Math/Physics from Tsinghua University.

### **Chris Li**

Chris is responsible for designing NewsDog's programmatic user-acquisition algorithm and recommendation related data analysis. He is an expert on distributed storage architecture, big data processing and content recommendation system. He has ten years of experience in internet development, prior to joining NewsDog, Chris served as a system architect at Naturali and a senior engineering manager at Qunar.com. He received his Bachelor

of Computer Science from Peking University, Computer Science and Technology Department.

### **Carlin Li**

Carlin got her Master's degree from King's College London(KCL) and spent a summer in University of North Carolina at Chapel Hill on an exchange program. Her research interests include big data, location-based services, etc. Prior to NewsDog and CNN Platform, she worked as a user growth expert at Uber China, and a content analyst at ByteDance (Jinri Toutiao).

### **Ray Tian**

Ray is an active explorer of cutting-edge technologies such as social communication model. He has created excellent user acquisition, incentive model and social marketing for NewsDog. Ray is very experienced in KOL promotion, big data, E-commerce and content distribution. He was the founding member of Ji Yu Zhou Tian, an E-commerce start-up. Ray received his master's degree of Foreign Linguistics and Applied Linguistics from Lanzhou University.

### **Tony Zhu**

Tony is NewsDog's back-end engineer leader. He received his Bachelor or Computer Science from Harbin Institute of Technology. He has extensive experience on the design and development of high concurrency and recommendation system architecture. Tony has studied blockchain technology for several years, and previously served as an engineer, architect, and engineer leader in Tencent, Douban, Umeng and Alibaba. Now, he is the major engineer in NewsDog in charge of engineering architecture design and algorithm architecture.

## Chapter 9

# Advisors

### **Prof. Shoucheng Zhang**

Prof. Zhang is the JG Jackson and CJ Wood professor of physics. He is a member of the US National Academy of Science, the American Academy of Arts and Sciences and a foreign member of the Chinese Academy of Sciences. He discovered a new state of matter called topological insulator in which electrons can conduct along the edge without dissipation, enabling a new generation of electronic devices with much lower power consumption. For his ground breaking work in topological insulators, quantum spin Hall effect, spintronics, quantum Hall effect and high temperature superconductivity, he received numerous international awards, including the Buckley Prize, the Dirac Medal and Prize, the Europhysics Prize, the Physics Frontiers Prize and the Benjamin Franklin Medal. Prof. Zhang founded Danhua Capital in 2013 to focus investments in startups from Stanford and Silicon Valley, with a focus on blockchain projects and AI.

### **Prof. Jianqing Fan**

Prof. Fan is Frederick L. Moore Professor of Finance, Director of Committee of Statistical studies, Professor of Dept. of ORFE at Princeton University. He is also the director of Shanghai Center for Big Data Finance and Innovations. He was the former president of the Institute of Mathematical Statistics and International Chinese Statistical Association. Prof. Fan is co-editing Journal of Econometrics and was the co-editor of The Annals of Statistics, Probability Theory and Related Fields and Econometrics Journal. His published work has been recognized by the 2000 COPSS Presidents' Award, the 2007 Morningside Gold Medal of Applied Mathematics, Guggenheim Fellow, P.L. Hsu Prize, Royal Statistical Society Guy medal in silver, and election to Academician of Academia Sinica and fellow of American Associations for Advancement of Science, Society of Financial Econometrics,

American Statistical Association, among others.

### **Michael Arrington**

Michael is a serial entrepreneur and the founder and former Editor In Chief of TechCrunch, a famous news website that covers startups and technology news. Michael was the Founder and General Partner of CrunchFund, a top quartile performing fund which has raised over \$90 million from 3 funds. Michael is the Founder and General Partner of Arrington XRP Capital Fund, LP, a cryptocurrency hedge fund formed in December 2017. In 2008, Michael was selected by TIME Magazine as “one of the world’s most influential people”.

### **Kunal Shah**

Mr. Shah is an Indian entrepreneur, founder and Ex-CEO of FreeCharge which was acquired by Sanpdeal for \$400 million. He co-founded FreeCharge in 2010, seeing the potential of online recharging in a growing market. After FreeCharge was acquired, Shah was appointed as the new CEO of the company. He is also ex-Chairman at IAMAI Forum, a non-profit industry body registered under the Societies Act, 1896 and the only representative body of Internet and Mobile Value Added Services business in India. Shah graduated with Bachelor of Arts degree in Philosophy from Wilson College, Mumbai.

### **Yahui Zhou**

Mr. Zhou is the founder and Chairman of Beijing Kunlun Tech. As a successful entrepreneur, he founded one of the largest comics websites in 2000. After that, he served as Chief Officer of Qianxiang Century Technology Development (Beijing) Co., Ltd. from 2005 to 2007. Mr. Zhou is also an experienced investor who has invested several famous companies including Qufenqi, Inke, Dada etc. and has incubated several unicorn companies. Mr. Zhou received his Master’s degree from Tsinghua university.

### **Kevin Wen**

Mr. Wen is a partner at Ce Yuan Ventures and an experienced investor of blockchain projects. Prior to joining Ce Yuan Ventures, he was the co-founder, director and president of LightInTheBox Holding Co. Ltd., responsible for the company’s marketing, product development and user experience. He is also the founder of blogdrive.com, the earliest blog service platform in China; he served as the vice president of blogchina.com after the

merge in 2005, responsible for the company's overall product and commercial development.

### **Mickey Tian**

Mr. Tian is an early adopter and long time supporter of bitcoin since 2011. He majored in distributed systems and acquired BS/MS degree from dept. CS&T, Tsinghua University. Mickey served as Chief Scientist in the first bitcoin fund in China, bitfundpe.com and was an early supporter of Zerocoin upon its incarnation since 2013, which later became Zcash. He also invested in Bitfinex as a shareholder. Mickey helped a lot of blockchain startups and advised them, including iost.io, data.eco and ddex.io. Mickey is also a serial entrepreneur. As architect, he joined multiple startups which became or was sold to giants later in their field such as Shenma Inc.

### **Prof. Winnie Peng**

Prof. Peng is Associate Director of the Tanoto Center for Asian Family Business and Entrepreneurship Studies at HKUST Business School as well as adjunct associate professor of Department of Finance. Her research and teaching interests include family business, entrepreneurship, private equity and venture capital. Her articles are published in top academic journals as well as local and international media. Prof. Peng has also published various case studies or renowned family businesses and multinational corporations in Asia. She teaches family business courses for MBA and EMBA students and senior executives of global financial institutions.

# Chapter 10

## Risks

You acknowledge and agree that there are numerous risks associated with purchasing CNN, holding CNN, and using CNN for participation in the CNN Platform.

### 1. Uncertain Regulations and Enforcement Actions

The regulatory status of CNN and distributed ledger technology is unclear or unsettled in many jurisdictions. It is impossible to predict how, when or whether regulatory agencies may apply existing regulations or create new regulations with respect to such technology and its applications, including CNN and/or the CNN Platform. Regulatory actions could negatively impact CNN and/or the CNN Platform in various ways. The Foundation (or its affiliates) may cease operations in a jurisdiction in the event that regulatory actions, or changes to law or regulation, make it illegal to operate in such jurisdiction, or commercially undesirable to obtain the necessary regulatory approval(s) to operate in such jurisdiction.

After consulting with a wide range of legal advisors and continuous analysis of the development and legal structure of virtual currencies, the Foundation will apply a cautious approach towards the sale of CNN. Therefore, for the crowdsale, the Foundation may constantly adjust the sale strategy in order to avoid relevant legal risks as much as possible. For the crowdsale, the Foundation is working with Tzedek Law LLC, a boutique corporate law firm in Singapore with a good reputation in the blockchain space.

### 2. Competitors

It is possible that alternative networks could be established that utilise the same or similar code and protocol underlying CNN and/or the CNN Platform and attempt to re-create similar facilities. The CNN Platform may be required to compete with these alternative networks, which could negatively impact CNN and/or the CNN Platform.

### 3. Loss of Talent

The development of the CNN Platform depends on the continued co-operation of the existing technical team and expert consultants, who are

highly knowledgeable and experienced in their respective sectors. The loss of any member may adversely affect the CNN Platform or its future development.

4. Failure to develop

There is the risk that the development of the CNN Platform will not be executed or implemented as planned, for a variety of reasons, including without limitation the event of a decline in the prices of any digital asset, virtual currency or CNN, unforeseen technical difficulties, and shortage of development funds for activities.

5. Security weaknesses

Hackers or other malicious groups or organisations may attempt to interfere with CNN and/or the CNN Platform in a variety of ways, including, but not limited to, malware attacks, denial of service attacks, consensus-based attacks, Sybil attacks, smurfing and spoofing. Furthermore, there is a risk that a third party or a member of the Foundation or its affiliates may intentionally or unintentionally introduce weaknesses into the core infrastructure of CNN and/or the CNN Platform, which could negatively affect CNN and/or the CNN Platform.

6. Other risks

In addition to the aforementioned risks, there are other risks (as more particularly set out in the Terms and Conditions) associated with your purchase, holding and use of CNN, including those that the Foundation cannot anticipate. Such risks may further materialise as unanticipated variations or combinations of the aforementioned risks. You should conduct full due diligence on the Foundation, its affiliates and the CNN team, as well as understand the overall framework and vision for the CNN Platform prior to purchasing CNN.



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