



UMBALA NETWORK

A Blockchain-based
Eye Vision Computing Economy

Consensus Algorithm Proposal V1.0

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A. PREFACE

Umbala Network's vision

Umbala Network is a performance-focus & highly scalable Blockchain to connect billions of camera devices all over the world and accelerate decentralized eye-vision-computing applications, a new term referring to all types of business models optimizing camera-based applications.

We believe in the connection of camera data, so we create a Blockchain to help build a decentralized network of camera data from billions of cameras all over the world. The main mission of the network is to take advantage of the camera-tech service and camera-data utilization by using a cryptocurrency-based payment & token-incentivized system.

Umbala Network will provide the specific tools and platform features leveraging the power of the community, thus reducing costs and allowing the community to focus more on the core business of their applications built on the eye-vision-computing economy.

The core technology powering all the Umbala Network ecosystem is the Umbala Chain with the consensus algorithm named 108 Delegated Proof-of-Reputation (108 DPoR) developed by Umbala Foundation. With the aforementioned design, Umbala Chain allows for zero transaction fee transactions and high TPS and empowers Dapps to be the Block Producers of the decentralized network.

Last but not least, we also try to solve the painful problem that many Blockchain are running into. This is 'how a Blockchain could get mass adoption'. To solve that problem, we propose sophisticated go-to-market plans for our Blockchain products based on our fifteen-year experience of developing online mobile social platforms. Umbala.Tv - the first member of Umbala Chain targeting at KOL-livestreaming-based e-commerce market, will be released by the time the mainnet is launched.

Scope

This document describes Umbala Network's design for our newly-invented 108 DPoR. The consensus algorithm helps Umbala Chain to allow for zero transaction fee transactions and high TPS and empowers Dapps to be the Block Producers of the decentralized network.

B. CURRENT PROBLEMS OF POS-BASED BLOCKCHAINS

In the Blockchain world, EOS, with the Delegated Proof-of-Stake (DPoS) consensus algorithm allowing for 21 Block Producers to produce blocks, is known as one of the pioneering blockchain solutions for the problem of scalability. However, the blockchain is dealing with some problems threatening the possibility of getting mass adoption.

Not many Standby Block Producers are always ready for playing the roles of official Block Producers when needed. When a block is added to the Blockchain, a block reward will be given to Block Producers involved in the process of transaction confirming. Now, the problem of DPoS consensus algorithm is exposed: Standby Block Producers do not receive or receive very few from Block Reward while they still have to pay full infrastructure costs to satisfy the Block Producer Candidate criteria.

For the network, the problem arisen is often called 'the partial centralization problem'. With a Blockchain allowing for only a handle of token holders to produce blocks, power in the network is totally concentrated in the hands of a few richest ones which is unofficially called 'sharks and whales'. They are accounts staking the largest number of tokens, but not contributing the most to the performance of the business ecosystem. As a result of this fact, current blockchains with DPoS consensus algorithm have not built on themselves a true ecosystem of real

applications creating real value but a group of monopolies controlling the network and making money from block rewards.

C. 108 DELEGATED PROOF OF REPUTATION GENERAL DESCRIPTION

Reputation Scoring Engine (RSE)

Umbala Network Blockchain has proposed a Reputation Scoring Engine that is a Reputation Scoring system for all accounts in Blockchain. All wallet addresses in UN Blockchain are scored and the scores will be updated constantly as a way of measuring their reputation in the system.

Reputation Scores of all accounts are re-calculated every 270 seconds with the inputs measured averagely in the last 30 days. The Reputation Score formula is composed of three variables:

Reputation Score = f (Power Score, Token Traffic Flow, Evaluation on The Usage of Allocated Resources)

Power Score

Assume that an account has at least 1 million tokens being staked into the system. The Power Score calculating mechanism is as following:

On the first day, 10% of the number of staked tokens will be converted to Power Score. For every subsequent day, 10% of the number of staked tokens that have not been converted to Power Score will be converted into Power Score and added to the cumulative Power Score.

For instance, an account U ***** in UN Blockchain stakes 1,000,000 tokens into the system. On the first day of calculating process, Power Score of such account is $1,000,000 * 10\% = 100,000$. The number of tokens that have not been converted to Power Score is $1,000,000 - 100,000 = 900,000$.

On the second day, the Power Score is $900,000 * 10\% = 90,000$ and added into the Power Score the account got yesterday (which is 100,000). Now the cumulative

Power Score is $100,000 + 90,000 = 190,000$. The amount of tokens that have not yet been converted to Power Score is $900,000 - 90,000 = 810,000$.

It can be seen that the cumulative Power Score of the account is described as the following sequence:

$$P_1 = 1.000.000 * (1 - 0.9^1)$$

$$P_2 = 1.000.000 * (1 - 0.9^2)$$

$$P_3 = 1.000.000 * (1 - 0.9^3)$$

.....

$$P_n = 1.000.000 * (1 - 0.9^n)$$

The Power Score will increase gradually and reach 1,000,000 if the number of staked tokens remains unchanged and the staking time is long enough. It can be deemed as a challenge for the account to demonstrate its level of contributing to the system's stability. As long as the contribute time is long enough, the number of staked tokens will be converted totally to Power Score, meaning the account gets the maximum possible Power Score.

As for accounts have less than 1 million token staked, their Power Scores are all zero. It can be noticed that the larger the Power Score is, the higher the Reputation Score an account can get.

Token Traffic Flow

The principle used to create this variable is that the score of an account has 'positive' token flows (traffic volume of inflow tokens is greater than traffic volume of outflow tokens) is greater than that of an account has 'negative' token flows (traffic volume of inflow tokens is less than traffic volume of outflow tokens).

The logic behind the design of 'Token Traffic Flow' variable is that the account which has 'positive' token flow is the one that receives many tokens from other accounts in the system, which means its reputation in the system is higher compared to others. Unlike normal accounts whose sending and receiving tokens

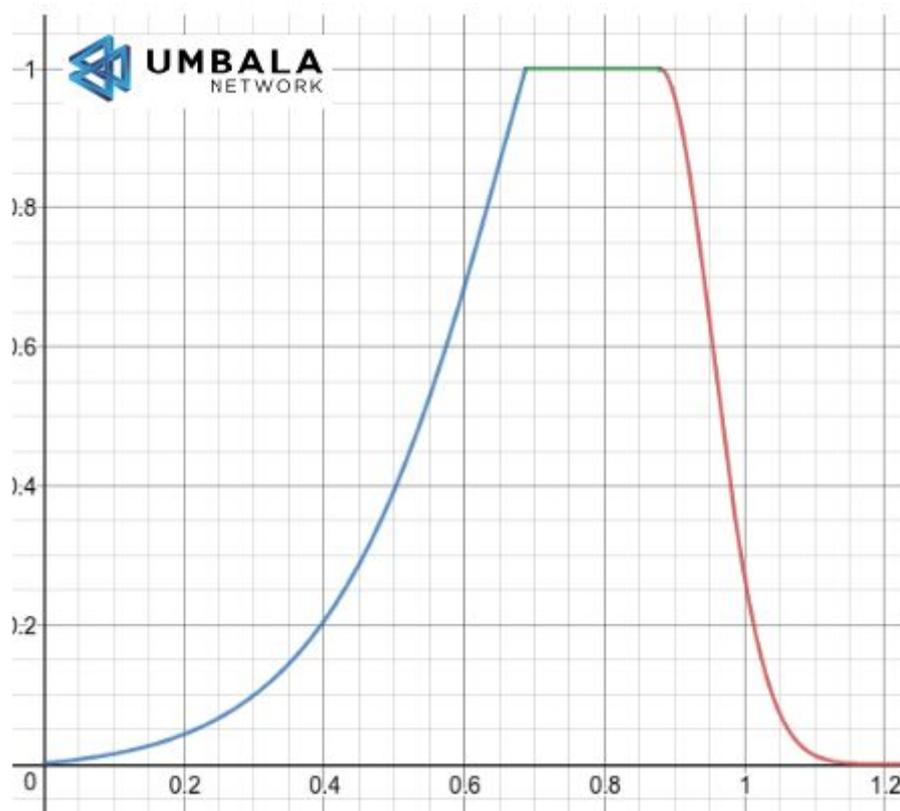
are the only activities in the system, this account is able to run a real business on UN Blockchain.

It can be noticed that the larger the Token Traffic Flow is, the higher the Reputation Score an account can get.

Evaluation on The Usage of Allocated Resources

Staking tokens into the system, an account will be given a specific amount of system resources ('Allocated Resources'). These resources include RAM, Net Bandwith and CPU. The larger the number of staked token is, the richer system resources an account can be allocated.

The relationship between the score for 'Evaluation on The Usage of Allocated Resources' and the actual usage of allocated resources of an account is described as the following curve:



For any accounts, utilizing 70–90% of the allocated resources is considered to be ideal. At this level, accounts can not just prove that they are active folks in the system. They also have to ensure that they always have available backup resources that can be used when needed as well. This proper usage also helps the system be

able to have backup resources to use in emergencies, for example, the system is congested by the dramatic increase in the number of transactions.

Utilizing less than 70% of the allocated resources, accounts are not considered to be active participants in the system. Utilizing more than 90% of the allocated resources, the account is exhausting their given resources and utilizing up close to or more than 100% of the allocated resources, the account is wasting resources of the whole system.

The larger the score of ‘Evaluation on The Usage of Allocated Resources’ is, the higher the Reputation Score an account can get. Notice that among the three variables, the variable being mentioned has the strongest influence on the Reputation Score of an account.

Reputation Voting

UN Blockchain proposed a new mechanism of voting named Reputation Voting to replace the Stake Voting. From this point on, we will use the terms ‘account’ instead of ‘token holders’ as written in many papers on current DPoS consensus algorithms.

Only accounts have positive Reputation Score can participate in the Reputation Voting. It is for the quality of the voting because these accounts are most concerned about Blockchain’s operations (as it will affect their own operations), thereby having the real motivation to vote out.

Like Stake Voting, accounts use their votes to select the Block Producers in Reputation Voting. However, votes’ strength are determined by the Reputation Score, not by the number of staked tokens.

In other words, if in Stake Voting the ‘rich guys’ can manipulate the vote results, then in Reputation Voting only those with high reputation— accounts that are actively contribute to the system and create real value in the business ecosystem—are the ones, if desired, can influence the system.

Voting Procedure

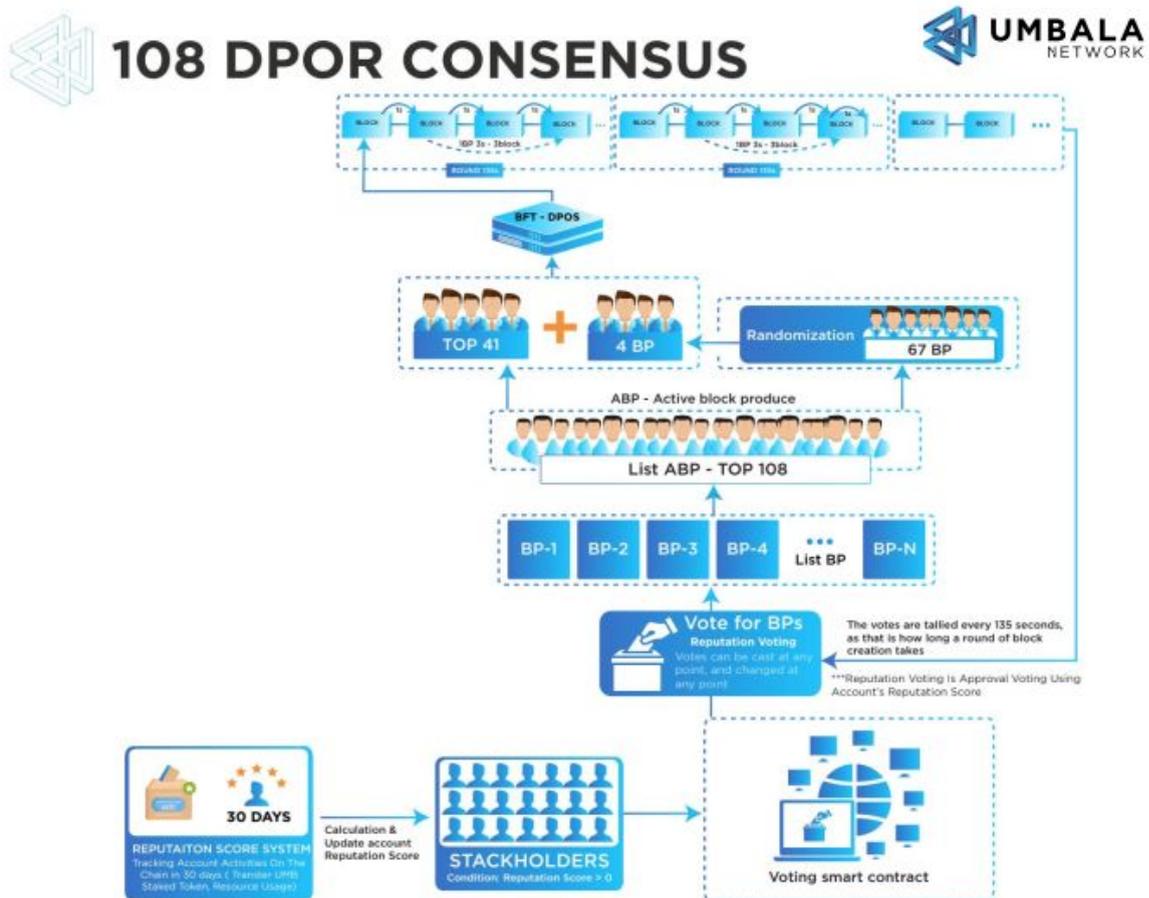
The 108 DPoR consensus algorithm operates as following steps:

Step 1: Accounts vote out to the list of Block Producers (BPs) in a Reputation Voting round.

Step 2: Select 108 accounts who are most voted. This 108 accounts become 108 Block Producers (108 BPs)

Step 3: Select Top 45 Active Block Producers (Top 45 ABPs) from 108 BPs

41 ABPs in the Top 45 ABPs are the ones who are most voted in 108 BPs. The rest 4 ABPs are randomly selected from 67 BPs who do not make it in the top 41,



Step 4. Top 45 ABPs in turn produce blocks, 12 blocks per each and 1 block to be produced in exactly 0.5 seconds

Step 5. After an epoch of 270 seconds, accounts' vote and Reputation Scores are updated, leading to the change in the list of 108 BPs in Step 1. After that, step 2, 3 and 4 are implemented as the way described above.

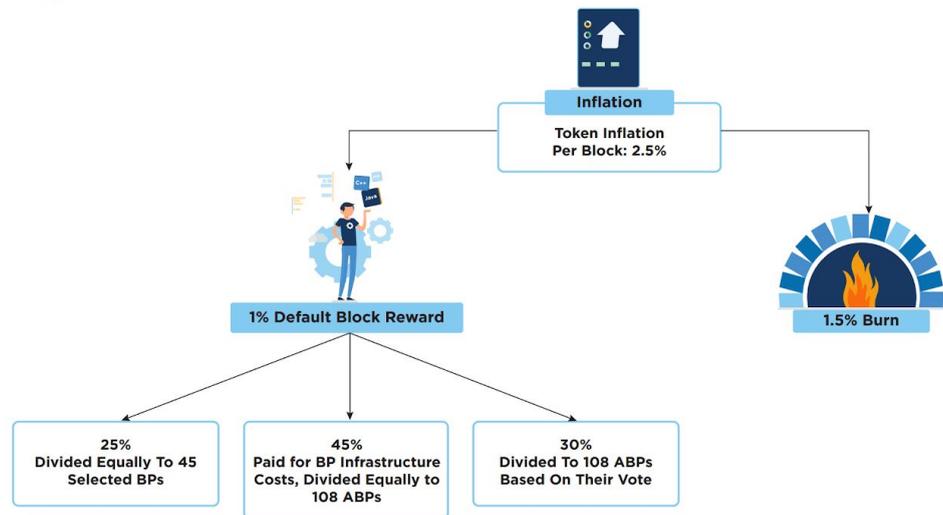
Incentive mechanism

Block Reward for each confirmed transaction is the inflation of the initial total amount of UMB token. This allows transactions in the Umbala Network's Blockchain to have a zero transaction fee.

The overall system inflation rate will be 2.5% per year at the maximum and divided into 2 portions: 1.5% for burning and 1% for Default Block Reward.

Block Reward is divided into portions for all parties involved in the process of transaction confirming. This dividing mechanism is to ensure all parties have financial incentives to participate in the process of transaction confirming. Block Reward is divided as follows:

- 25% are divided equally to Top 45 ABPs
- 75% are given to 108 ABPs. This portion is divided as follows:
 - 30% are given to 108 ABPs in proportion to the vote of each ABP in Reputation Voting
 - 45% are divided equally to 108 ABPs, helping each BP Candidate to pay for the infrastructure costs. This incentive mechanism will solve the aforementioned problem of the cost of infrastructure which Standby BPs have to pay to satisfy Standby BP criteria.



D. IN-DEPTH MATHEMATICAL DISCUSSION

To carry out in-depth research on mathematics aspects of 108 DPoR, we have published a report named [*Delegated Proof of Reputation: Ranking for Blockchain consensus*](#), written by Mr Thao Nguyen (Umbala Network’s CEO), Mr Hung Pham (Umbala Network’s CTO) and Mr Thuat Do (Umbala Network’s Blockchain Researcher). The report was featured as one of the most innovative research at ‘2019 Blockchain and Internet of Things Conference’ (BIOTC 2019) in Japan. Read more about this document and further discussion here <http://gg.gg/dngow>

E. DAPPS AND THEIR ROLES IN UMBALA CHAIN

Technology experts and recent updates of leading Blockchains have proven that Blockchains with consensus algorithm, which is developed towards PoS, is the key for scalability problem. This has also been mentioned in CAP theorem: A Blockchain has to sacrifice either the decentralization or the speed (given that the security factor is fixed).

However, over trusting in PoS-based Blockchains could also be a big problem. In October 2018, EOS Blockchain was involved in Houbi's serious scandal in which the exchange was alleged to engage in EOS voting manipulation. Not only did Huobi buy votes from small token holders by issuing HPT token but the exchange also colluded with 20 other Block Producers to vote for each other. Before then, with the design consisting of only 21 Block Producers, EOS Blockchain was rumoured to be manipulated by sharks and whales for many times.

Therefore, the question of whether we should choose the richest ones to control the decentralized network (as most of the PoS-based Blockchains are doing) or not is worth being put forward. From Umbala Network's perspective, a Blockchain should be managed and controlled by people who actually create values to it, instead of wealthy people who don't build up a true business ecosystem but join to make profit by controlling the system.

Umbala Chain with the 108 DPoR solves this painful problem. UN Blockchain evaluates participants in the system under their reputation, not how wealthy they are. In most cases, accounts have high Reputation Score in UN Blockchain are decentralized applications — the ones who operate actively in the system.

Therefore, it is not the rich, but the accounts operating actively in the system are the most significant characters in the Blockchain movie. They can be decentralized applications or decentralized business models built on top of and based on Blockchain. They create real value and enrich Umbala Network Blockchain's ecosystem, thereby helping to bring Blockchain closer to the real life. The aforementioned scoring mechanism is also designed to make decentralized applications to be superior in terms of Reputation Score:

- Applications operating healthily and effectively will receive a large number of tokens transferred from other accounts. This state will also be maintained for a long time, making the 'Power Score' of applications higher.
- Applications operating healthily and effectively are the ones providing real services in the system and attracting many users. In most cases, they receive many deposited token from users, meaning their scores of 'Token Traffic Flow' are not just positive but even tend to grow gradually.

- Applications operating healthily and effectively normally reach the efficient usage of allocated resources, making their scores of 'Evaluation on The Usage of Allocated Resources' higher.