Yuamble Blockchain protocol

February 5, 2022

by Ivanov Alexandr (@iaa2005)

yuamble.org

Abstract. This document is devoted to the description of a new type of blockchain — Yuamble. Blockchain is a distributed registry that stores transactions, data on smart contracts (to be disclosed in detail later), as well as other data of users and participants of the blockchain network. This document will talk about algorithms that will reduce the size of fees on the network, as well as make the blockchain post-quantum.

Introduction. The Yuamble blockchain is very similar to the Bitcoin and Ethereum blockchain. It performs the same main functions, such as storing data about users and their transactions. But Ethereum has expanded the possibilities of using blockchain – this is the use of smart contracts.

Smart contracts are a computer program that monitors and ensures the fulfillment of obligations. The parties prescribe in it the terms of the transaction and sanctions for their non-fulfillment, put digital signatures. A smart contract independently determines whether everything has been executed and makes a decision: to complete the transaction and issue the required (money, shares, real estate), impose a fine or penalty on the participants, close access to assets. More about Smart Contracts on ethereum.org.

But often the blockchain network consisting of these smart contracts is very heavily loaded. Network participants who send signed transactions to the pool must pay huge fees to reduce the processing time of this transaction, and so that the transaction gets into the block — the main part of the distributed registry as soon as possible. To solve this problem, we are making some changes to the protocol — the blockchain algorithm.

Proof-of-stake (PoS). This consensus protocol will be used in the Yuamble blockchain. This method of protection in cryptocurrencies, in which the probability of the formation of the next block in the blockchain by the participant is proportional to the share that the account units of this cryptocurrency belong to this participant from their total number. This method is an alternative to the proof of work (PoW) method, in which the probability of creating the next block is higher for the owner of more powerful equipment.

When using this method, the block formation algorithm does not depend on the capacity of the equipment, but the block is more likely to be formed by the account with the largest current balance. For example, a participant who owns 1% of the total amount will, on average, generate 1% of new blocks. More about PoS on en.wikipedia.org.

Using the digital signature of Winternitz. The Winternitz signature (W-OTS, Winternitz One Time Signature) is an improved algorithm for the digital signature of a Lamb port. This algorithm signs transactions quickly. It is post-quantum, i.e., quantum computers and their algorithms will not be able to find a private key to a public one, forge a transaction signature and pass it off as the real account owner. More about W-OTS you can find in this file or this.

Yuascript — smart contract programming language. Yuascript is an object-oriented, high-level language for implementing smart contracts. Smart contracts are programs which govern the behaviour of accounts within the Ethereum state. Yuascript is statically typed, supports inheritance, libraries and complex user-defined types among other features. With Yuascript you can create contracts for uses such as voting, crowdfunding, blind auctions, and multi-signature wallets. The programming language is very similar to Javascript and C++. Therefore, the syntax will be well understood by programmers who know these languages.

Make processing of smart contracts without fees. Most blockchains process transactions only with the payment of a commission. Due to the payment of the fee, the number of participants

in the network who sign transactions and send them to the pool decreases over time, because the size of the fee increases with the demand for transaction processing. We made the main decision — to remove fees on transactions and calls of smart contracts under one condition: if the coefficient k is the probability coefficient of looping, it will be approximately zero.
This coefficient k shows how secure the code written by the creator of the smart contract is for nodes participating in the Yuamble network. Since in the presence of malicious code, Yuamble virtual machines (YVM, an analogue of the Ethereum Virtual Machine EVM) can go into a resource-draining endless cycle. There are several ways to provide a way to terminate the contract from the outside and avoid entering into a resource-draining infinite loop:

1. *Turing incompleteness:* Limited functionality will not allow jumping and/or loops. Therefore, the smart contract will not be able to enter an infinite loop.

2. *Step and Cost Meter:* The program can simply track the number of commands executed, and then shut down after completing a certain count of steps. Another method is a counter. Here contracts are executed with prepayment. A certain amount is required to complete each instruction. If the fee paid exceeds the prepaid fee, the contract is terminated.

3. *Timer:* If the execution of the contract does not meet a certain deadline, then it is terminated forcibly.

We will use *Turing Incompleteness* and a *Timer*, because the *Step and Cost Meter*, as in Ethereum, will not work if we have transaction processing without fees and gas.
If the k coefficient is from 0.5 to 1.0, the Yuamble network participant will need to sign the transaction and pay the commission as in the Ethereum network. To avoid such payments, you need to carefully review the smart contract code and its coefficient k. And smart contract developers should use while, do while and for loops as little as possible.

Decentralized data from Off-chain and centralized Internet. It is a technology for creating a global decentralized network of oracles running on countless computers to provide reliable and real data for smart contracts running on the Yuamble blockchain.
Oracles are real data points that can connect to blockchain-based smart contracts. Each oracle in the Yuamble decentralized network has an incentive to provide accurate data, while each of the oracles has its own reputation (or rating). When oracles follow the rules of the software and provide useful (accurate) data, they receive as a reward YMB — their own Yuamble coin.
An important advantage of the technology is that the system is completely decentralized, so the data is approved by all nodes of the network before it gets to the end user. More about blockchain oracles.

What will the blockchain protocol be written on? The entire protocol will be written in Rust, C++. Rust provides great advantages. It is convenient to write code on it and connect important libraries and modules for working with the network, digital signatures and smart contract processing.

And so, we believe that this project will provide huge opportunities in the field of decentralized finance, banking, programming and cryptography. This project will overestimate the possibilities of the blockchain and make the world of censorship stable and private for the participants of the blockchain network.