MZKU

// A protocol for decentralized proof-of-stake infrastructure

Abstract

MZKU is a decentralized proof-of-stake (PoS) based infrastructure that creates a global market for computational power and storage. These resources can be combined and
used to carry out any predefined task that requires any capacity (i.e., processing power, storage, and bandwidth). Unfortunately, today such resources are provided by either closed networks or central cloud providers.

By using a peer-2-peer mesh network, the MZKU infrastructure offers a practical, immediately viable alternative that can enable direct payments using MZKU tokens on Ethereum between users (also called “requesters”) and providers of those resources in an efficient, environment friendly, and competitive market.

For the initial release (MVP), the infrastructure will utilize Ethereum 2.0 (e.g., full nodes, wallet providers, exchanges) for staking, but the mission is to expand to all other significant blockchain platforms as well as conventional systems. Using this approach, the infrastructure allows users to earn staking rewards based on their ETH and MZKU holdings without having to maintain an extensive staking infrastructure.

The MZKU infrastructure enables requesters to run nodes for different protocols, without the need to study any technical documentation or requiring any technical knowledge. Just plug and play! Further, this platform has a great potential to create a comprehensive marketplace that fulfills the needs of cloud providers and staking enthusiasts. The infrastructure ensures quality service provision of node hosting via management by the MZKU governance.

Contents

1 Introduction

Interest in proof-of-stake (PoS) technology has been growing quite rapidly (e.g., Ethereum 2.0, Tezos, Dash, Tron, Neo, Cosmos, VeChain, Ontology, Polkadot, Cardano, Kava, Band, Chainlink, Algorand, Storj, Matic). Ethereum will also soon migrate to Ethereum 2.0 and in doing so will replace proof-of-work (PoW) with PoS[1, 2, 3]. Also, there exists some PoS based platforms for outsourced computations via excess computational power of users. We highlight that many computers use less than 5% of their CPU power the most of the time. However, the main drawback of those PoS based systems is that there is no usable staking platform to encourage community to be part of the consensus. In fact, we can further list their crucial drawbacks as follows:

- Existing staking platforms are assumed to be fully trusted today, but unfortunately are vulnerable to single-point-of-failure due to centralization. Namely, a corrupted centralized system can easily wipe out the funds of the users. To prevent such cases, some blockchains have already implemented their own delegation methods without transferring ownership of user tokens (e.g., Tezos). In this scenario, the users only delegate rights to validators while the tokens remain under control in their wallets. However, Ethereum 2.0 does not provide such a delegation process.
- The existing centralization results in security and privacy issues where the servers can observe private data, manage rules, and even manipulate every computation.
- The costs related to centralized servers can force clients to pay higher fees, and this may impede competition in the market.
- Staking rewards and their distribution are not transparent (no one knows how much staking rewards are collected and whether it is distributed fairly.).
- Distribution parameters for staked rewards among the participants are not transparent (no one can verify what percentage is received by each party.)
- There are many people/organizations on the market today that possess large amounts of free-capacity resources and extensive technical expertise to serve while not holding sufficient ETH tokens. On the other hand, there also exist individuals/organizations who hold a large number of ETH tokens (either singly or collectively) while not possessing and/or not capable of managing the infrastructure required to stake effectively.

2 What the MZKU infrastructure solves

The MZKU platform features a feature-rich environment specifically designed to facilitate a system where

resource providers and requesters interact. It allows easy deployment of, and staking in, any node, accessible, affordable, and instantly distributed across the globe. On a very high level, the features of the MZKU infrastructure can be listed as follows:

- MZKU will provide the first robust, decentralized, entirely trustless, blockchain staking platform (i.e., eliminates single-point-of-failure due to existing centralization issues.). On the MZKU infrastructure, users will delegate the utilization of their tokens to the MZKU system and providers through threshold signatures[4, 5]. Namely, the tokens can only be spent if both the MZKU system and providers agree to sign a transaction. This will eliminate the requiring trust of a single entity, and will protect user funds.
- The MZKU infrastructure provides complete transparency of collection of rewards as well as fair distribution of those rewards by means of publicly available smart contracts without relying on a trusted third party.
- MZKU aims to create a marketplace which builds a bridge between providers and requesters, and to allow them to meet on its infrastructure.
- The system will also help individuals to fully utilize their idle CPUs, GPUs, memory and free storage, and to earn money from these assets.
- The system allows payments per use by bringing requesters and providers within a privacy-preserving pseudo-anonymous platform.
- The MZKU infrastructure will also allow the concept of “micropool validators” which are composed of groups of micro investors who have a small amount of ETH (<32 ETH) but collectively hold at least 32 ETH. In this case, the MZKU infrastructure will connect millions of micro-investors in the network to invest and be part of the ecosystem.
- Availability and robustness of nodes are significantly enhanced (guaranteeing low downtime risk).
- The system works in a tokenized manner (through MZKU tokens) to incentivize providers to make business sustainable. That is, it provides a flexible demand and supply mechanism among many independent peer-2-peer network nodes.
- MZKU will begin by supporting ETH nodes, the future goal is to open up to other blockchains.

The system as-a-whole has far wider, great potential, to serve various business models beyond blockchain, as almost any real-life business model requires IT infrastructure and resources.

3 Our architecture

3.1 Entities

The following parties are involved in the MZKU decentralized infrastructure

- MZKU **Node:** an operating system/docker that runs a single MZKU sidecar and a blockchain node (VM/EVM). A provider can have more than one MZKU node.
- MZKU **Sidecar:** software that manages a blockchain node (e.g., availability, capacity, and security). It also randomly chooses other nodes on the MZKU infrastructure, checks their uptime, and reports to the smart contracts. Furthermore, any individual can install and execute this software to stake their MZKU tokens and receive rewards. Furthermore, the stakers on the sidecars are expected to participate in the voting process. For participating in the voting process, the stakers will get rewards in MZKU tokens.
- **Requesters:** users demand for creating a blockchain node for staking (e.g., Ethereum 2.0).

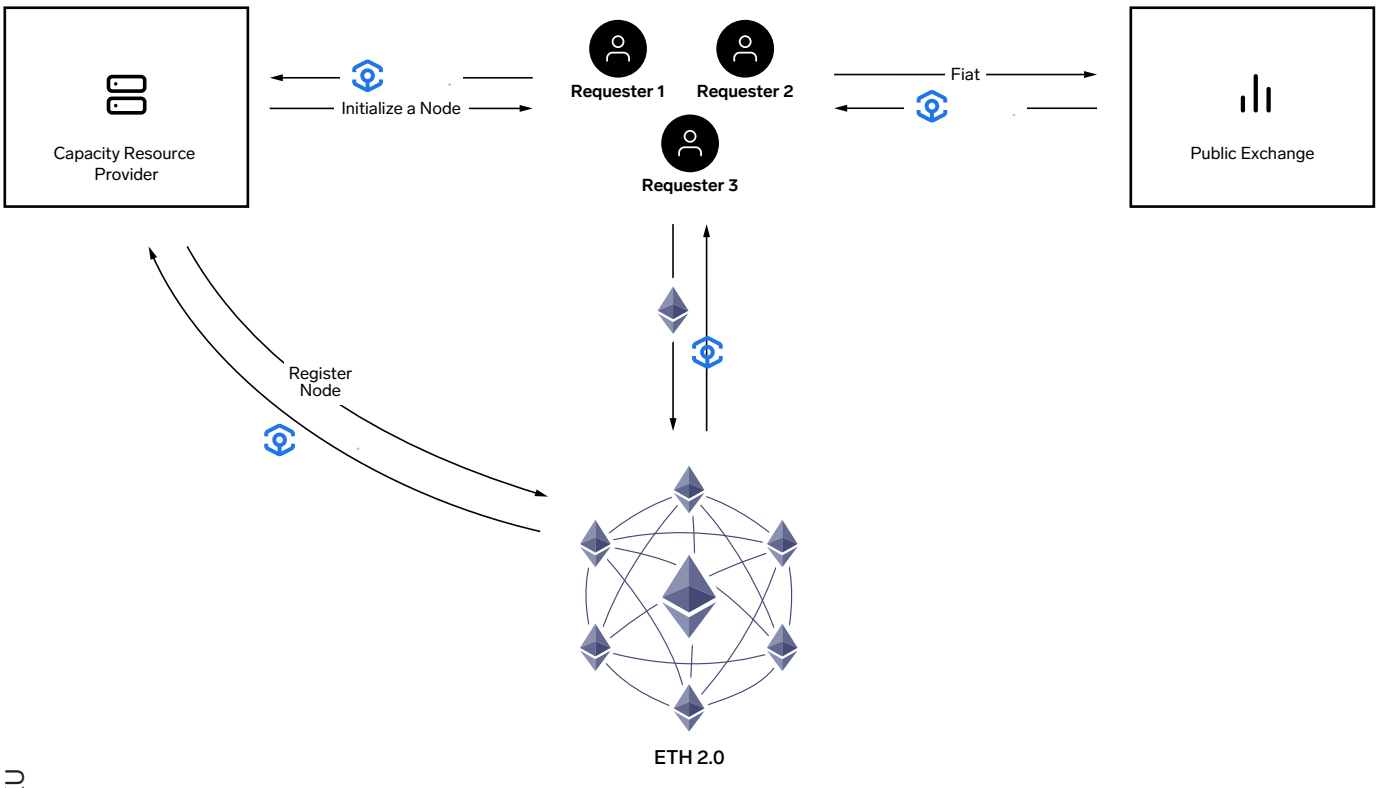

Figure 1: Cash Flow of MZKU *tokens on the* MZKU *Infrastructure*

› **Providers:** independent individuals or entities who invest in resource capacity to connect to the MZKU infrastructure and create new MZKU nodes. Thus, they manage a set of MZKU nodes which are registered on Ethereum smart contracts to be able to run the blockchain nodes.

› **Government:** The MZKU government will consist of `2n + 1` members where `n` is initially set to a certain number but can be further updated.

1. **Initialization Phase:** `n + 1` members (Governors) will initially be invited to participate. These participants will be highly motivated to participate in the project and the platform with a united objective to improve the growing utilization, community and promotion of the platform. These members will be required to stake a certain amount of MZKU tokens to retain membership in this initial government throughout this phase. They can choose to increase their staked amount to increase their rewards.
2. **Transition Phase:** After a certain period of time (which will be defined during the initialization phase), the candidate governors, who stake a minimum number of MZKU tokens, can apply to the MZKU infrastructure to be a governor. An additional `n` governors will be democratically chosen from those candidates through an election process. This process is decided through the number of votes received, where each MZKU token staked by a candidate counts as a single vote, plus then additional votes can be received from community members who have MZKU staked in Sidecars (again, one MZKU provides one vote). According to the total amount of tokens staked by each candidate governor plus votes they received from Sidecars, the first `n` candidates are chosen as new governors.
3. **Automated Phase:** Periodically, the whole list will be updated according to the Transition Phase. Each governor (independently from the amount of stake) has an equal weight in voting for decisions in the platform. In particular, the tasks of the MZKU governors include:
   - › providing recommendations
   - › defining algorithms of reputation (i.e., the algorithms of the underlying smart contracts)
   - › qualifying providers
   - › collecting statistics

   Whenever a governor does not follow the governance policies, they will be punished. For example, if governors fail to participate in three consecutive voting processes, their staking will be slashed.

› MZKU **Staking Users:** Users who do not want to stake their ETH, can still stake their MZKU tokens to the platform. These users can see the list of installed sidecars on the MZKU marketplace, choose the most profitable one, and stake their MZKU tokens to it. The following rules will be applied for these users:

- › Users can stake any amount of MZKU tokens to a sidecar which is executed and managed on the provider side.
- › Users can withdraw their MZKU tokens at any time before a project is completed, however, in that case they will not get any rewards.
- › Periodically, stakers get rewards from the Reward Pool proportional to their staking amount.

Hence, the entire system is transparent, reliable, and robust. From the view of users, requesters, and providers, the platform is indeed decentralized. However, the government mechanism will initially be semi-decentralized because a set of governments will be chosen during the initialization phase. In the long term, once the rules and policies are matured enough the system will evolve into a fully decentralized network.

3.1.1 Calculation of a reputation score

Calculation of reputation scores will depend on the following parameters:

- Staked amount.
- Bid price.
- Average running time of a MZKU node.
- Average percentage of total uptime of a MZKU node (e.g, 99 %).

3.1.2 Onboarding process of a provider

A provider will have the following features:

- Must run a MZKU sidecar for each Ethereum node and stake a certain amount of
- MZKU .Set a price (as they wish with a max value).
- Provide a brand name.
- Provide on-demand services.

Note that an Ethereum 2.0 node requires to stake at least 32 ETH in order to be a validator. However, the rewards will not be affected even if more than 32 ETH is staked. In the MZKU infrastructure, each provider has a reputation score which represents the reliability level of a provider. In this case, we may have the
following cases for staking ETH:

- **Provider is fully trusted:** If the provider is fully reliable and trusted, then the provider does not need to stake any ETH, but in this case, the requesters are required to stake at least 32 ETH. If there are losses during this staking period, then the requester loss will be compensated by the insurance pool.
- **Provider is not trusted:** If the provider is not trusted, then it should at least stake 16 ETH and the remaining 16 ETH will be staked by the requester. This prevents the requester's loss completely since all the loss can be compensated by the provider's stake.
- **Provider is semi-trusted:** If the trust level of a provider is between the first and second case, then the provider must stake at least `k` ETH where `k` is defined by the government while the requester is required to stake `32 - k` (`k` can be different for each provider).

Why shouldn't a provider stake only MZKU **?** In the MZKU system, the penalty can only be performed by Ethereum and the loss will be paid in ETH. If a provider stakes only MZKU and the ETH price
increases sharply then the loss may not be compensated by the staked MZKU . Hence, the MZKU infrastructure will be robust even in case ETH or MZKU prices fluctuate heavily.

3.2 Smart contracts in the MZKU infrastructure

The smart contracts of the MZKU Infrastructure include, but are not limited to:

- MZKU **Nodes:**
  - Registered nodes with a unique identifier.
  - Current staked ETH and collected rewards.
  - Provider ID and its capacity resource details.
  - How much ETH/MZKU is staked by the providers and the
  - users.Start and finish time of a node.
- **Marketplace:**
  - Matching of requesters and nodes.
  - Assigning a user to be a qualified provider.
  - Managing an auction mechanism for requesters to decide the best offer given by the providers (e.g., Vickrey auction[6]).
- **Government:**
  - List of governors.
  - Collecting statistics (to monitor the system).
  - Updating policies.
  - Redistributing tokens to requesters.
  - Managing total collected rewards for a user.
  - Managing the distribution of collected rewards in the pools.
- **Providers:**
  - List of providers and their details.
  - Qualifying providers.
  - The reputation score of a provider.
- **Sidecars:**
  - Status of installation of a MZKU node.
  - A sidecar can control only one single blockchain node.
  - A list of blockchain nodes to be checked for uptime.
  - Check the uptime score of other blockchain nodes.
  - The block ID of the latest check for a node.
- **Requesters:**
  - List of users and their details.
  - Total ETH/MZKU staked amount.
- **Micro-pool:**
  - Any provider sends ETH as collateral and executes the micro-pool smart contract to initiate a new Ethereum node.
  - The provider can specify the end time of staking period.

- The provider can add more ETH staking.
- The provider cannot withdraw staked collateral until the completion of the node.
- Any user can stake ETH to the smart contract.
- As soon as the total amount of ETH reaches or exceeds 32 ETH, the provider will start its validator node immediately.
- Once the node initiates processing requesters cannot withdraw their stake until completion of the project.
- If a provider wants to stop the service for its node (or the service is stopped due to unexpected reasons) then the government migrates the requesters of that node to another pool.

3.3 The role of MZKU tokens

The platform adds the following utilities to the MZKU token:

- All payments on the platform are done with MZKU tokens.
- Requesters require MZKU tokens to pay to the infrastructure in order to initiate the process.
- Providers are required to stake MZKU tokens as a collateral to become a qualified provider. They earn rewards (as MZKU tokens) due to staking. If providers become unresponsive, the underlying smart contract will immediately detect this and they will get slashed from their deposit.
- A MZKU governor needs to maintain a minimum staked amount of MZKU tokens to retain membership in the government. Independently from the amount of stake, each governor will have an equal weight in voting for decisions in the platform.

3.4 The main functionalities of the MZKU infrastructure

At the first stage, the MZKU infrastructure will work on Ethereum 2.0 where the smart contracts are only limited to ERC20. Before we go into the details, we will briefly describe how the MZKU infrastructure works. Note that it is a decentralized hosting solution through Ethereum. Any provider can register their capacity of resources using MZKU tokens and install the MZKU sidecar on each node under their control. These nodes are evaluated by the government in their approval process as qualified providers. They are then called "MZKU nodes" of the MZKU infrastructure. Any requester can submit a project proposal to the MZKU infrastructure by paying some certain amount of MZKU tokens. The MZKU infrastructure evaluates the proposal, and approves it, if the underlying criteria are met. If an Ethereum 2.0 node is installed as a validator, both the provider and the requester (or micro investors altogether) must stake at least 32 ETH in total.

At the end of a project, the collected profit from that requester node is deposited into a smart contract, and is distributed to the participants.

3.4.1 Initialization

1. The MZKU infrastructure is launched by a governor who will publish a policy to qualify a provider (e g., Ethereum slash history, average uptime, reputation score) for giving services to different types of projects (any project which requires bandwidth, CPU, RAM, and storage capacity).
2. Providers and Requesters launch the MZKU software through the user interface of the MZKU platform.All requesters and providers are registered on Ethereum through the MZKU infrastructure .Privacy of users will be provided through the pseudo-anonymity of the underlying Ethereum cryptocurrency addresses.

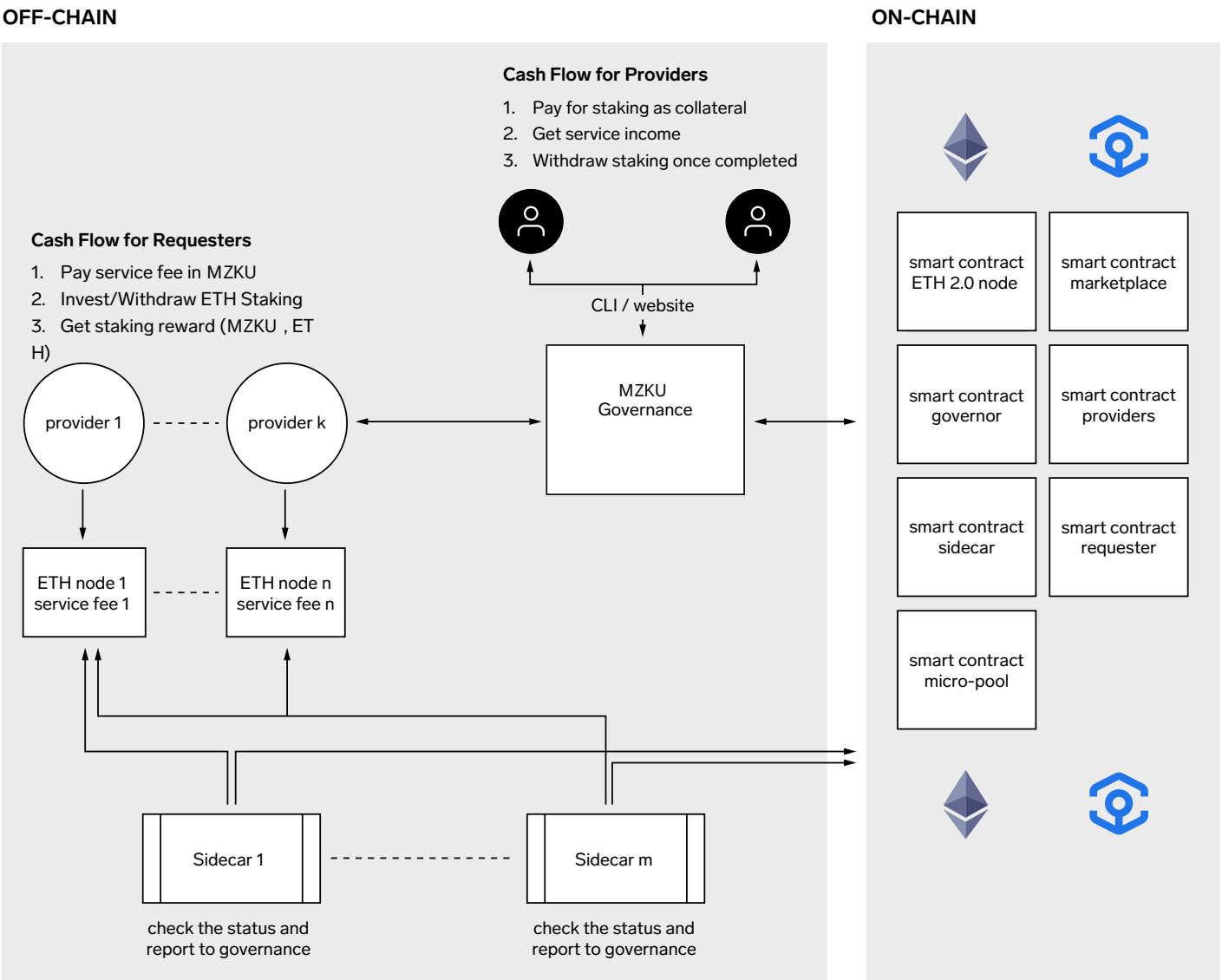

Figure 2: The MZKU Infrastructure

3.4.2 Creating a node on a provider

When a requester initiates the process for an Ethereum node, the requester should first pay for the service fee in MZKU tokens and stake at least 32 - k ETH tokens to become a validator where the provider must stake at least k ETH. The k value is defined by the government and can be updated later. The k value can also be different for each provider. For requesters who have less than 32 - k ETH, the platform will also provide a "micro-pool" system to bring multiple investors to satisfy the requirements.

1. Any provider (with a proper resources of capacity) can apply to be approved as a qualified provider at any time. Notice that each provider is uniquely identified on the MZKU infrastructure.
2. The MZKU platform encourages any provider to have more than one node by sharing more profits. Therefore, each provider has a max number of nodes that can be installed based upon their available capacity.

3.4.3 Assigning as a qualified provider

1. The government checks the application of potential providers according to the MZKU policy and approves listing as a qualified provider. For reliability and transparency reasons, the qualified list will be broadcasted on Ethereum.
2. When the application is approved, the provider must stake at least P_{min} amount of MZKU tokens, which will be used as the compensation in case of any loss of the requester due to a failure of the service. All of these processes will also be executed on Ethereum.

In case a provider is qualified for more than one node, the collateral will be the maximal required amount for the compensation. Any qualified provider P can bid a price Bid_P to provide a service for a node. A qualified provider can stake at most $P_{max} - P_{min}$ number of MZKU tokens as an investment in the platform where P_{max} is the upper bound for the collateral by a qualified provider. All staking collateral will receive dividend periodically, which comes from the profit generated by all business in the infrastructure.

3.4.4 Submitting a project proposal by a requester

1. A requester asks a price for his/her project proposal from the MZKU infrastructure. For example this project can be a blockchain full node (e.g., Ethereum 2.0) to be on the MZKU infrastructure using its underlying functionalities.
2. The MZKU infrastructure determines how much CPU power, RAM, and storage capacity is required and then responds with a fixed price FP in terms of fiat currencies as well as the expected profit of the project.
3. The MZKU infrastructure also provides information about the qualified providers such as capacity, cost, expected return rate, its performance score and reputation score.

4. The requester needs to pay FP in terms of cryptocurrencies or fiat currencies to initiate the evaluation.
5. The MZKU platform initiates an auction process for the project proposal to get the lowest price from the qualified providers.
6. The requester does not need to provide any staking for the project, but after its completion, the requester can stake any amount of the profit as an investment.

Any requester, independently from the project, can stake any amount of MZKU tokens. The governance will record the performance of each provider and give/update their score according to the history of its performance.

3.4.5 Evaluation of a project by the government

1. As soon as the requester pays the fixed price, the government will
   - filter out all providers who do not meet the pre-defined requirements of the MZKU infrastructure in the project.
   - choose those with the lowest bid price.
   - randomly pick up a provider from the resulting list, with probabilities proportional to their scores. The randomness will be computed in a decentralized manner to be transparent and verifiable.
2. The MZKU infrastructure assigns the project to the picked provider, who immediately initiates the project.

3.4.6 The MZKU pools

Insurance Pool: The MZKU infrastructure utilizes an Insurance Pool to reduce the risk of users' loss that might be occurred during the staking. For instance, assume that the total 32 ETH deposit of a node is slashed completely due to an attempt to cheat the ETH 2.0 consensus. In this case, the victim users on that particular node will be refunded with the entire k ETH from the provider deposit and the remaining loss of 32 - k ETH will be compensated by the Insurance Pool. Hence, the users who were on this unfortunate node will not lose their entire deposit as the whole network absorbs this loss equally. Periodically, the collected rewards in the Insurance Pool will be checked by the MZKU Governance. When the balance exceeds a pre-defined threshold value, they can be used for other purposes like transferring to the Reward Pool or burning MZKU tokens.

Reward Pool: The rewards on this pool can be collected as ETH and MZKU .
The following policy will be implemented on the MZKU infrastructure.

- Each project on the MZKU node has a processing fee to be paid by the requesters and 10% of this fee will be collected by the Reward Pool.
- Once a project is completed, 10% of the total profit will be collected by this pool.
- Periodically, 30% of this pool will be distributed to governors proportional to their staked amount.

- Periodically, 40% of this pool will be distributed to providers and requesters proportional to their staked amount.
- 20% of this pool will be distributed to MZKU Staking Users (who staked their MZKU tokens on the sidecar until the project is completed) proportional to their staked amount.
- The remaining 10% will be used for development and marketing of the MZKU infrastructure.

3.4.7 Computation of profit and distribution

There are basically two conditions to start off a project: 1) A single requester 2) Micro-investors.

In case of a single requester: Suppose a project is demanded by a requester R and the service is given by a provider P with a bid price $\texttt{Bid}_P$ which generates a profit X. The distribution of cost and profit will be as follows:

- $P_{\text{profit}} = \texttt{Bid}_P$ will be kept by the provider P.
- $\texttt{RP}_{\text{profit}} = \texttt{(X + FP) x 10\%}$ will be saved in the Reward Pool.
- $\texttt{IP}_{\text{profit}} = \texttt{(X + FP) x 10\%}$ will be saved in the Insurance Pool.
- $\texttt{X + FP - } P_{\text{profit}} \texttt{ - RP}_{\text{profit}} \texttt{ - IP}_{\text{profit}}$ will be sent back to the requester R.

Here the 10% rate can be adjusted by the governance (on Ethereum for transparency reasons).

In case of micro-investors: In this case, a fixed price FP for processing a node will be publicly announced. The micro-investors will pay proportional to their stake. For example, if a micro-investor stakes 4 ETH then he needs to pay 4/32 x FP MZKU tokens. 10% of this fixed price will be transferred to the Reward Pool. The remaining part will be transferred to the provider (which initiated this particular node). Once the project is completed, the following policy will be implemented:

- 10% of the total rewards will be sent to the Insurance Pool that will be responsible for the compensation of any participants' loss incurred during the staking.
- 10% of the total rewards will be sent to the Reward Pool that will be distributed to the community members that staked MZKU tokens.
- 80% of the total rewards will be distributed to the requester and the providers who staked ETH.

3.4.8 Profit distribution from the Reward Pool

The MZKU infrastructure periodically distributes collected MZKU tokens from the Reward Pool among the MZKU stake holders according to their staked amount and period.

3.5 A simple example of profit distribution

Assume that a requester asks for a two-months project which requires 4Ghz + 128GB storage + 16GB RAM. According to the MZKU pricing, it costs ~$50 per month, and therefore, FP = $100 in total. The requester needs to pay FP to start the process. The MZKU Foundation, on the other hand, will initiate
an auction to fairly determine the qualified provider for this project. Assume that we have only three qualified providers: P_1, P_2, P_3. Assume also that:

- P_1 submits its bid price of $60,
- P_2 submits its bid price of $70, and
- P_3 submits its bid price of $75.

Note that P_1 wins this auction as his bid is the lowest, and therefore will run the project for two months. Suppose that the collected profit of this project is X = $300 once the project is successfully finished. Hence, the MZKU platform will automatically (through smart contracts) send:

- P_{profit} = $60 to P_1,
- RP_{profit} = ($300 + $100) x 10% = $40 to the Reward Pool,
- IP_{profit} = ($300 + $100) x 10% = $40 to the Insurance Pool, and
- $260 = $300 + $100 - $60 - $40 - $40 to the requester.

Once the project is completed, the Reward Pool will also distribute some additional profits to requesters proportional to their MZKU stake. Hence, the requester pays $100 and receives at least $260 (i.e., $160 is the profit).

3.6 Penalty conditions

- If a provider fails to successfully deliver a project, then the provider should immediately pay the incurred loss to the requester through the governance. The failure will be recorded on the Ethereum blockchain to provide transparency so that the score of the provider will be affected accordingly.
- The collateral will be used to compensate the loss.
- If there is any stake left, it will be returned to the provider according to the MZKU policy.
- After starting off a project, the requester can not withdraw it (until it is completed).
- If the reputation score of a provider is less than a pre-defined threshold then the MZKU infrastructure will disqualify the provider for a certain period of time.

The MZKU government enforces a set of rules that govern both organizational and operational, and is in

charge of any dispute between requesters and providers. The government implements the MZKU policy

such as qualification of providers, rewarding sharing, and task allocations. For non-standard issues, the government will make decisions through a public and transparent voting mechanism. Each governor will have an equal weight in voting power irrespective from the amount of stake.

3.7 Conversion of the value generated on PoS for Ethereum 2.0

Until the second phase of Ethereum 2.0 goes live, users will receive an alias-token of ETH (called aETH) which is equal to the amount of ETH they have deposited. In the second phase, all aliases will be swapped on the BETH network, and this aliasing will not be used anymore. Users whom deposit ETH to be staked by the node (hosted on the provider) will instantly receive the aETH token which represents a tokenized staking deposit. This token:

- can be held, traded, or sold.
- does not need to be locked with the MZKU infrastructure to gain staking rewards over time.
- will be able to be traded for Beacon ETH (BETH) when Phase 2 of the Ethereum 2.0 roll out occurs and smart contracts on Ethereum 2.0 are enabled.

4 Dynamic scoring for P2P credit checking

A group of sidecars randomly choose other nodes and remotely audit their functionalities and availability to prevent any kinds of suspicious operations. Each node will be checked by k number of sidecars while each sidecar will check k number of other nodes during a fixed period of time. The lists will be randomly updated for each period to make the MZKU infrastructure more robust and reliable. This way, the change of the credit over time will be provided.

5 Cost and benefit analysis of participants

The platform helps requesters to efficiently find the best provider and enables providers to get projects by utilizing their service. While the platform is organized in a decentralized manner, the MZKU free-market
guarantees efficient trading. In the following sections, we show how all the participants are better off with this platform.

5.1 For requesters

5.1.1 Benefits

1. Monetary benefit from getting staking rewards from staking on projects (not necessarily an MZKU
   project. For example, it can be Eth 2.0). The benefit is calculated by (project staking reward)
   Example: A user staked 3,000 ETH. After 3 days, he gets rewards, including staking and delegation rewards, about 3 ETH. Meanwhile, he needed to pay the provider 1,500 MZKU *tokens. So his overall*
   benefit is (3 ETH - 1,500 MZKU *).*
2. Time saved by running staking nodes instead of setting up an own machine.

5.1.2 Cost

1. Cost of using the MZKU platform to get a provider to stake tokens.
2. Risk of getting slashed and not generating staking rewards.

5.2 For providers

5.2.1 Benefits

1. Payment from requesters for provision of services.
2. Use of spare capacity, otherwise would be wasted.

5.2.2 Costs

1. **Fixed costs:** This includes hardware servers, server racks, secondary power supply.
2. **Variable costs:** This includes electricity, ISP monthly fee, AC or cooling devices, potential maintenance personnel.

3. **Entry staking cost:** The MZKU tokens purchased for entering the market. (This entry cost is the minimum insurance coverage from the provider side).
4. **Insurance cost:** Providers need to purchase additional tokens to increase the insurance coverage for their target users, so that they can be more competitive than other providers.
5. **Additional staking:** Providers may choose to stake additional tokens to increase their probability of being chosen.
6. Opportunity cost of shifting to other platforms or provide other services.

5.3 Governance

5.3.1 Benefits

› Earn ETH rewards from the Reward Pool.

› Earn MZKU staking rewards from the Reward Pool.

5.3.2 Responsibilities

1. Define the entrance bar for providers.
2. Recommend providers with respect to the given criteria of each requester (through the Ethereum blockchain for transparency purposes).
3. Initiate potential future market expansion.
4. Development and maintenance of the MZKU platform and software.

5.3.3 Costs

1. Hardware monitoring (done by the governance software).
2. Provides must report to the smart contracts to validate the existence and healthiness.
3. Cost of maintenance of the MZKU platform and software.

5.4 Participants in the investment staking pool

5.4.1 Benefits

1. Staking rewards of MZKU tokens.

5.4.2 Costs

1. Opportunity cost of getting benefits from alternative investment methods.

6 Future potential projects on the MZKU infrastructure

The MZKU Infrastructure is not only built for staking purposes, it can also handle computational tasks. The MZKU infrastructure can expand to other industries in the future, including but not limited to:

- **Blockchain-as-a-service Workloads:** The MZKU Infrastructure is not limited to Ethereum 2.0, but will allow anyone to launch a blockchain in minutes while maintaining privacy, scalability, simple and fast automatic deployment.
- **Efficient and Secure Deployment of Apps:** Security breaches are the most crucial issue for many operational companies today. They need to make substantial investment to physically secure their environments by building fences which will never make it safe enough due to control management issues.
- **IoT or 5G Workloads:** With the rapid development of IoT and 5G networks, the traditional central cloud computing model will evolve into an incentivized and decentralized system. Decentralized computing provides mobile computation, network control, and storage to network edges to help reduce latency in critical and computationally intensive applications.
- **Beyond Blockchain (DB/Archive):** It can provide the most efficient and cost effective large scale archive solution which operates without any downsides.
- **High Security IT Workloads:** It also prevents adversaries to attack critical infrastructures such as banking.
- **Decentralized Applications (DApps):** Alternative to digital applications such as Facebook, Airbnb, Twitter, and TikTok.

References

1 Ethereum 2.0 specifications. https://github.com/ethereum/eth2.0-specs. Accessed: 2020-07-26.

2 Evangelos Deirmentzoglou, Georgios Papakyriakopoulos, and Constantinos Patsakis. A survey on long-range attacks for proof of stake protocols. *IEEE Access*, PP, 02 2019.

3 Rixard Dillak, Devie Suchendra, Robbi Hendriyanto, and Anak Agung Gde Agung. Proof of work: Energy inefficiency and profitability. *Journal of Theoretical and Applied Information Technology*, 97, 03 2019.

4 Rosario Gennaro and Steven Goldfeder. Fast multiparty threshold ecdsa with fast trustless setup. In *Proceedings of the 2018 ACM SIGSAC Conference on Computer and Communications Security*, CCS '18, page 1179-1194, New York, NY, USA, 2018. Association for Computing Machinery.

5 Rosario Gennaro, Steven Goldfeder, and Arvind Narayanan. Threshold-optimal dsa/ecdsa signatures and an application to bitcoin wallet security. In *Applied Cryptography and Network Security*, pages 156-174, Cham, 2016. Springer International Publishing.

6 Wikipedia. Vickrey auction, https://en.wikipedia.org/wiki/vickrey_auction. Accessed: 2020-07-26.