



# Next Generation Decentralised Ethereum Proof of Stake Pool

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## Abstract Overview

Rocket Pool is a first of its kind, next generation decentralised Ethereum proof of stake (PoS) pool currently in alpha and built to be compatible with Casper, the new consensus protocol due in 2018.

Unlike traditional centralised Proof of Work (PoW) pools, Rocket Pool utilises the power of smart contracts to create a self-regulating, decentralised network of smart nodes. These smart nodes can then be engaged by users with any amount of Ether to earn interest on their deposits, all the while helping to secure the Ethereum network.

Rocket Pool is composed of 3 primary elements; **smart contracts**, **smart nodes**, and **minipools**. All three integrate with each other to provide a new type of network that can automatically scale, load balance, and self-monitor across multiple cloud hosting providers in any region of the world.

Rocket Pool also boasts several first to market user features for Casper staking such as Widow Addresses and Rocket Deposit Tokens (RPD).

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## Casper

Casper is a planned future change in the way the Ethereum network forms distributed consensus and is primarily aimed at reducing energy wastage. Casper achieves this goal by using a consensus mechanism called Proof of Stake. Consensus in this regard means that everyone in the network agrees that the current chain being used is the correct one.

The Rocket Pool alpha is currently running with a dummy Casper contract that simulates the inputs and outputs of Casper as currently specified. It is important to note that Casper is not a finished protocol and is still under heavy development. As a result it is entirely possible that Casper may change significantly and the resultant impact on Rocket Pool may vary from insignificant to major. For this reason the Rocket Pool development team keeps a very close eye on the Casper development process, and reacts immediately to any applicable changes.

## Markets

Rocket Pool will not only provide Casper staking opportunities for individuals directly using our website, but can also accommodate businesses such as wallet providers, exchanges, or next generation hedge funds. Rocket Pool includes a 3rd party partner contract application programming interface (API) that allows these entities to offer staking services for their own users, using the Rocket Pool infrastructure in the background. This allows business such as these to focus on their own trade while simultaneously providing their users opportunities to further diversify their own investments.

With this in mind, Rocket Pool can extend its potential market share of staking services substantially by not only providing users direct access to stake with Casper, but allowing the Rocket Pool infrastructure to be used by a large range of 3rd party services. These services could vary from existing exchanges through to next generation decentralised hedge funds.

# Features

## Smart Contracts

Rocket Pool smart contracts contain numerous functions that allow the network to be highly flexible as well as ensuring that all main contracts are upgradable. If an issue manifests itself within any of the main contracts, a new version of a contract can be deployed whilst simultaneously ensuring that other contracts are only able to communicate with the latest version of that contract. The remaining depreciated and bugged version is unable to be accessed within the network at all.

Maintaining smart node uptime is a crucial requirement for being a successful pool in the Casper ecosystem. To help maintain this uptime, Rocket Pool contracts are able to load balance the network when onboarding new users as well as instruct smart nodes to deactivate in the event of partial network failure due to DDoS attacks, simple server failure, or more. This feature ensures that new users are not assigned to any nodes that are misbehaving or are under heavy server load. This will minimise any penalties the network may incur due to any of the above scenarios.

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## Smart Nodes

For Casper to process transactions and reward validators with interest for successful participation, nodes are required. In the Rocket Pool network, a node isn't just any ordinary node, it's a smart node that can listen to everything occurring on in the network, accept commands, and contact other smart nodes directly using special scripts that run as services on each node.

As it currently stands, each smart node must check in with the main contract every 15 minutes to report on its current server load, launch any minipools that are ready for deployment, and more. Smart nodes are also capable of disabling other smart nodes that are not operating to correctly. This can come in particularly handy if a node is suffering a DDOS attack, the server is experiencing hardware issues, or any multitude of other issues that may result in Casper penalising the node for not performing its job correctly. In any of these cases, a smart node will disable the misbehaving node to prevent any new users being assigned to it.

Future versions of Rocket Pool will give smart nodes even more brainpower. Each smart node will be able to monitor the status of the network and attempt to remote reboot another smart node regardless of the cloud provider it's hosted on. Smart nodes will also be able to scale the network by automatically launching new smart nodes themselves if they detect that the network is running near capacity.

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## Minipools

When a user sends their Ether deposit to the main Rocket Pool smart contract, if it does not meet the minimum requirement for staking with Casper (at the time of writing this minimum is 32 Ether), it will create a new minipool contract and assign the user and their deposit to it. More users are added to this minipool until the deposit total exceeds 32 Ether (or any min limit set by Rocket Pool). Once the minimum requirement is met, the minipool is then assigned to a smart node in the network with the least amount of server load and their deposit is sent to Casper with their assigned smart nodes details. Future versions of Rocket Pool will also assign users to alternating geographic regions for increased redundancy and decentralization. Users are also able to join minipools staking for a specified period of time. This allows them to leave their deposit earning interest for the minimum time currently allowed by Casper; 2 months. 6 and 12 month options will also be available.

When a minipool's staking time has completed, a smart node will automatically request the withdrawal process to start with Casper. This withdrawal process takes time and when a withdrawal is ready for execution, a smart node will trigger this process for the minipool. Minipool users are then allowed to withdraw their deposit and rewards from Rocket Pool.



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## Rocket Deposit Tokens

Users are able to set their staking period for lengths of time up to 12 months. While it is nice to be able to set and forget, sometimes life gets in the way. For this reason, Rocket Pool gives users the ability to withdraw their deposit as Rocket Deposit Tokens (RPD). RPD tokens back the Ether the user has deposited and can be sold to other users on the free market, or traded in to the Rocket Pool RPD token contract for immediate payment of Ether provided the RPD token contract contains enough Ether. Tokens purchased on the free market can be redeemed for Ether back at the Rocket Pool Deposit Token contract.

The Rocket Deposit Token contract contains a variable amount of Ether in it at any given time. This Ether is sourced from minipools that have had users withdraw all or part of their deposit as RPD tokens. This Ether is sent to the Rocket Deposit Token contract where it becomes an available source of Ether for those wishing to trade in RPD tokens.

In the Rocket Pool network, 1 RPD token represents 1 Ether. A 5% fee is incurred when the user withdraws their RPD tokens which serves a dual purpose, the first of which is to prevent abuse of the system.

Secondly, the fee is used to help RPD token holders sell their token by incentivizing buyers. If 1 RPD token equaled 1 Ether when buying, people would simply purchase Ether. In the case of RPD tokens, that 5% fee is given as a bonus to users who trade tokens in to the RPD Token contract for Ether. In

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essence users receive an extra 5% Ether when trading tokens. These tokens are also fully enabled on the free market, so if the Rocket Deposit Token contract does not have enough Ether in it for you to trade in your tokens, users can always price them at a discount and sell them quickly on the free market. Patient buyers of these tokens who don't mind waiting for the Rocket Deposit Token contract to fill up with Ether again, are rewarded with a 5% bonus when trading in their bought tokens in for Ether when the time comes.

**Example:** Bob has 200 Ether staking with Rocket Pool. Looking in the mirror on his 40th birthday he finally decides he can't live without that hair piece he's had his eye on since he noticed his hair line marching south at an unusually rapid rate. He decides to withdraw 50% of his deposit as RPD tokens, this leaves his available balance staking at 100 Ether. When withdrawing these tokens, Bob is charged a 5% withdrawal fee, so he ends up with 95 RPD tokens which he can then sell on the free market or if there is available funds in the Rocket Deposit Token contract, he can trade them in there for Ether immediately.

That withdrawal fee prevents Bob cheating the system when his deposit first begins staking as he can't simply withdraw his tokens and trade them into the Rocket Deposit Token contract for Ether immediately, then continuously repeat the process. He could essentially keep this contract drained of Ether without the fee and other token holders wouldn't be able to trade their tokens for Ether.

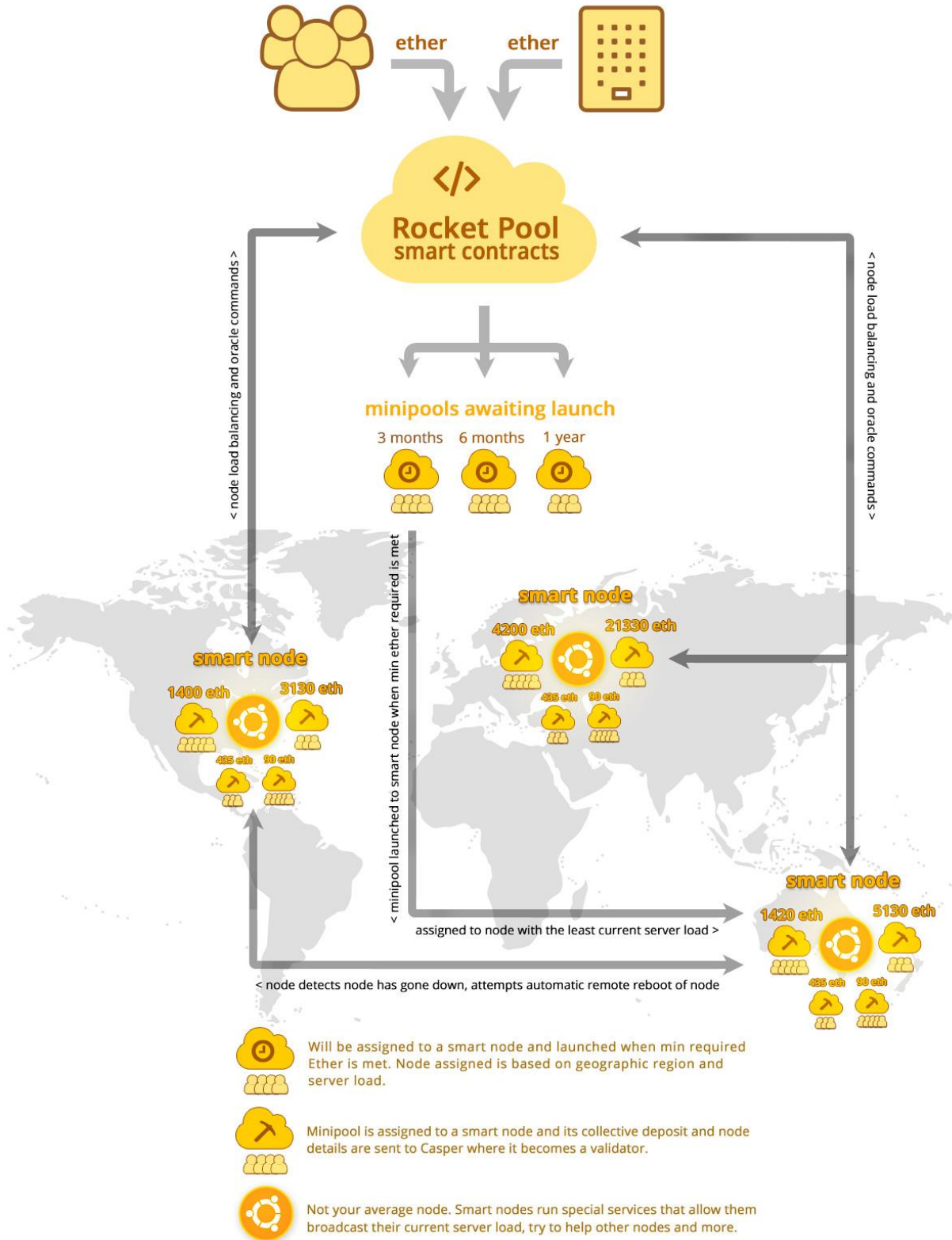
**Bad Bob!**

## Widow Addresses

If users intend on staking with the Rocket Pool network for some time, it is a smart idea to plan ahead. Sometimes life doesn't go the way we planned and unfortunately, bad things can happen. Rocket Pool allows users to specify a widow address after they make a successful deposit for staking. This address will be allowed to collect deposit and interest earned while staking if the primary address used to make the deposit does not collect it within 3 months of the staking period ending.

A good example of how this could be used is to give a family member an empty wallet. This wallet can then be registered as a widow address and should anything happen to the primary user, the family member will be able to use the widow address to retrieve the deposit and interest on the primary user's behalf. Forgetful users might also find this as a useful service for simply creating a backup address. Should anything happen to a users main wallet, a widow address could be used to obtain access to the deposit, albeit after 3 months have passed.

## Network Visual Guide



The Rocket Pool network is a highly flexible and decentralised network which isn't always easy to visualise. For an easier way to see how the Rocket Pool network operates, we've created the above infographic.

To view a full-size version of this infographic at the Rocket Pool website, please follow this link to the [larger infographic](#).

## Audits

In order to ensure the security and safety of customer funds and the smart nodes themselves, Rocket Pool is committing to subjecting its platform to a comprehensive security audit before launching on the Ethereum mainnet.

All Rocket Pool contracts have been open source since alpha; longer than any other Casper compatible pool. As well as allowing the public to examine the contract code, there are several planned code audits, bug bounties on the contracts, and smart node penetration tests planned for Rocket Pool's future beta release. All audit results and applicable post mortem actions will be made publicly available.

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## Initial Coin Offering (ICO)

Rocket Pool has until now been developed entirely by one person. While this has worked well to get to this stage, for Rocket Pool to truly develop into all it can be, increased dedication to the project and more specific specialisations will be required to turn Rocket Pool from a brilliant idea into a dependable, feature rich network. For this reason Rocket Pool will be conducting a small ICO to facilitate the transition into the next phase of the project.

The Rocket Pool Token (RPL) distribution will be in the form of a crowd sale. Rocket Pool will offer up 50 million tokens and anyone wishing to participate will be able to acquire RPL tokens by pledging ETH into a token sale smart contract. The crowd sale will last four weeks from (TBA) --/--/2017 to --/--/2017. These dates are currently an approximation as the actual start and end times will correspond to specified Ethereum block numbers which will be revealed closer to the offer commencing.

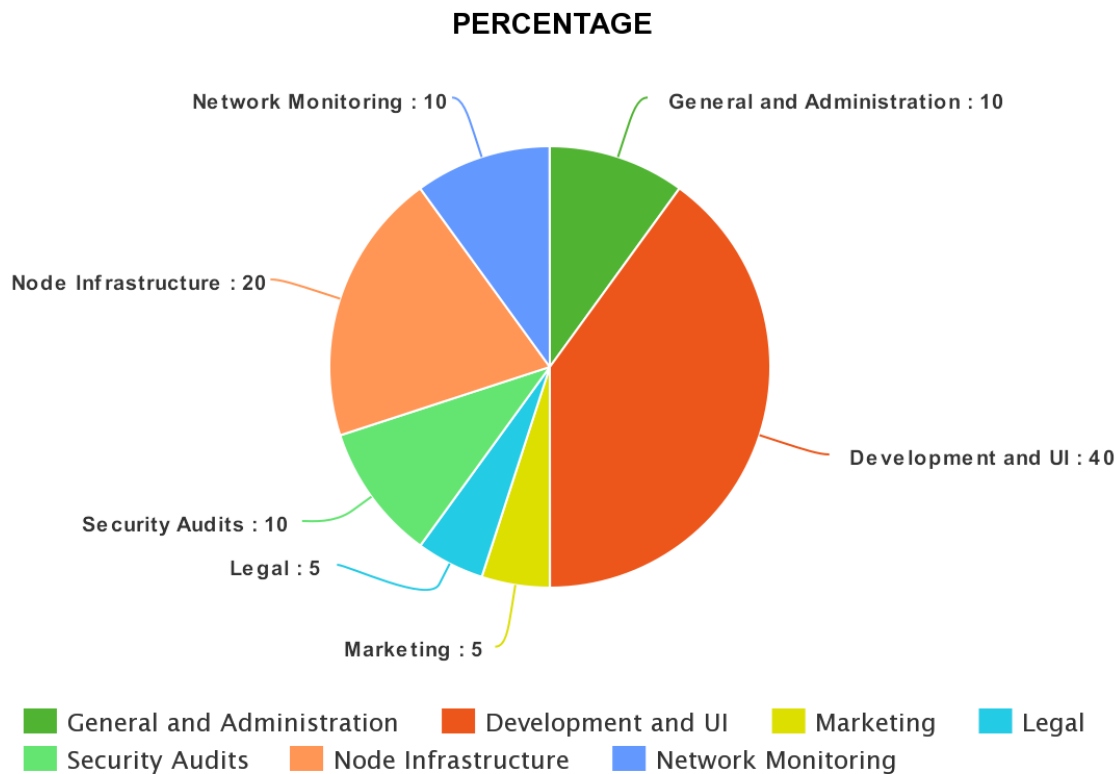
The token sale will be hard capped, meaning that the total amount of Ether able to be contributed will be set before the offer commences. At the point this cap is reached, the token contract will immediately disable additional sales. The cap amount will be set in the token sale smart contract and locked to a value approximately equal to \$3 million USD based on the ETH/USD exchange rate at the commencement of the token sale.

Pledging ETH to the token sale contract will require an amount of gas be used that is no more than double the estimated amount required to complete the pledge. This is to ensure an even distribution of tokens and prevent users assigning abnormally large amounts of gas to pledges in order to move to the front of the queue. Consequently, gas pledges exceeding the enforced limit will be rejected.

Being a crowdfunded project, 85% of tokens will be owned by crowdfunding participants in the form of RPLs, while the remaining 15% of RPLs will be reserved for the original development team, any advisors, further code/node audits, bug bounties, and the earliest adopters/contributors.

## Funding Breakdown

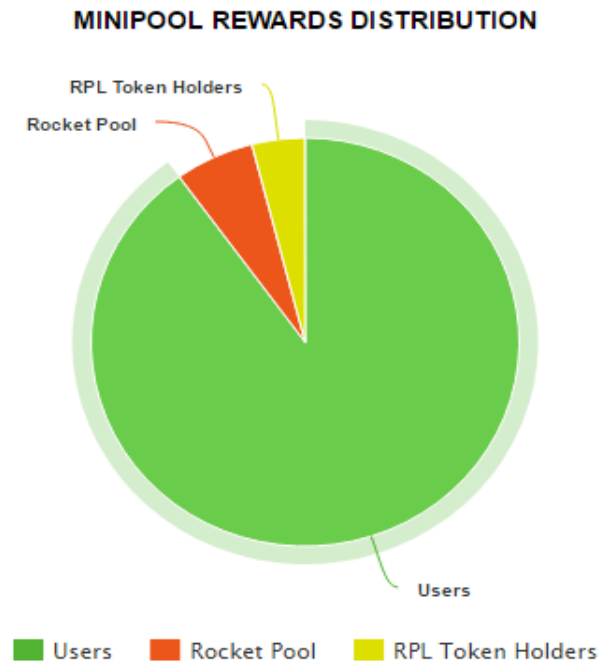
The developers here at Rocket Pool have a plan, and our ICO is designed to enable the execution of that plan in a manner that best utilises any obtained funding. The graph below clearly defines what percentage of funds will be allocated to what area.





## Passive Profit Sharing

Ownership of an RPL token will entitle the user to a share of the fees generated by Rocket Pool. After a staking period ends for a particular minipool, Rocket Pool determines its profit from that minipool based on the percentage of interest earned by users during staking. Rocket Pool assigns a percentage to be paid to RPL token holders and then distributes it evenly on a per token basis to all RPL token holders.



**Example:** There are 50,000 tokens in circulation. After a minipool staking period ended, Rocket Pool earned 10ETH in fees. RPL token holders earn 4 ETH which is then distributed evenly on a per token basis. All token holders receive a regular dividend, regardless of active staking participation.

With this system in place, RPL token holders are given an increased incentive to participate in actively staking with Rocket Pool as they not only receive stake in the overall dividends returned from that minipool, but also the additional dividend from being an RPL token holder. This effectively acts as a discount on overall fees.

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At this point in time we are yet to determine what fee structure is most appropriate for Rocket Pool. Several considerations will be made in order to determine a structure that delivers the best possible service to users, whilst adequately rewarding those that participate in the ICO, and ensuring that Rocket Pool remains serviceable into the future. Details of this structure will be made available prior to the launch of our ICO.

## Team

### David Rugendyke | Project Lead, Senior Developer

David has over 18 years commercial experience developing high end web applications, has been featured twice in Australia Personal Computer (APC) magazine for projects he's built, and is currently committed to working on Rocket Pool full time.

Thriving on a challenge and with a long list of software projects behind him, David has acquired a very proficient knowledge of Cryptocurrency and DevOps as well, a unique combination of skills that lead to the creation of Rocket Pool, a project with scope spread across several of these unique fields.

David also loves to homebrew beer and when not working on Rocket Pool, can be found enjoying a beer or brewing another all grain batch over the course of a day. David's favourite beer style is a good American Wheat Ale, followed closely by an IPA.

## Contributors

### Mathew Wright | Senior Systems Engineer | RPEQ 15507 (IT&E)

Mathew has over 10 years of experience as an Avionics Engineer specialising in Airways Information Technology and Management. With expertise in Systems Engineering practices, Mathew is looking to translate his abilities into the block chain industry with the ultimate goal being to integrate some of this technology back into the world of Air Navigation.

Mathew is a keen video gamer, average football player, hopeless dancer, and loves nothing more than a cold drink over a BBQ with family and friends.