IOHK | SHELLEY INCENTIVIZED TESTNET

GUIDE FOR STAKE POOL OPERATORS

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Contents

In addition to this overview guide a complete [How to guide for stake pool operators](#) is also available to help you set up and configure your stake pool.

What is a stake pool?

A stake pool is a reliable server node that focuses on maintenance and holds the combined stake of various stakeholders in a single entity. Stake pools are responsible for processing transactions and producing new blocks and are at the core of Ouroboros, the Cardano proof-of-stake protocol.

To be secure, Ouroboros requires a good number of ada holders to be online and maintaining sufficiently good network connectivity at any given time. This is why Ouroboros relies on stake pools, entities committed to run the protocol 24/7, on behalf of the contributing ada holders.

While Ouroboros is cheaper to run than a proof of work protocol, running Ouroboros still incurs some costs. Therefore, stake pool operators are rewarded for running the protocol in the form of incentives that come from the transaction fees and from inflation of the circulating supply of ada.

Who can run a stake pool?

Anyone can register a stake pool, although it requires an individual or team with system administration skills to be able to operate and maintain a pool. The only cost associated with creating a pool is the stake pool registration fee, which is a configurable value defined in the genesis configuration file and varies depending on the associated network. For a pool to be competitive, it needs to have a significant amount of stake delegated to it, otherwise the node will run idle and never, or very seldom, create blocks.

Why operate a stakepool?

The foundational concept of cryptocurrencies is decentralization. When you set up a stake pool or choose to run a node on your own, you are helping to improve the Cardano network's strength and security. The more independent nodes in the ecosystem, the more copies of the blockchain that exist, therefore the more resilient the Cardano network becomes.

Registering a stake pool

When you are creating a stake pool, you need to generate a *registration certificate* and embed it in a special transaction that creates the stake pool. The certificate contains the *staking-key* of the pool leader. People wishing to delegate to a pool will then create a delegation certificate, which transfers their staking rights to the staking-key of the stake pool.

Recommended skills for stake pool operators

As a stake pool operator for Cardano, you will typically have the following abilities:

- operational knowledge of how to run and maintain a Cardano node continuously, 24/7/365.
- system operation skills.
- experience of development and operations (DevOps) would be very useful.
- server administration skills (operational and maintenance).
- familiarity with Prometheus or Grafana for alerts and monitoring, or some other monitoring framework of your choice.

Basic Nix skills are beneficial, but not required. We provide Nix scripts for ease of use, but you should be able to start a node and connect to the testnet without using these scripts.

Minimal requirements for running a stake pool

In terms of hardware, you should have the following available:

- 4 GB of RAM
- a good network connection and about 1 GB of bandwidth / hour
- a public IP4 address

Note that processor speed is not a significant factor for running a stake pool.

In order to set up a minimal stake pool, you need a small server that fulfills the hardware requirements and a Jörmungandr node started with the --secret parameter. Although this will work, a stake pool should have close to 100% availability. That means that the node must be online with good internet connection 24/7.

Operating systems

The Cardano incentivized testnet supports Linux, Berkeley Software Distribution (BSD), Mac, and Windows platforms. The following versions are required:

- Linux (2.6.18 or later)
- NixOS (19.03 or later)
- BSD (NetBSD 8.x and FreeBSD 12.x)
- macOS (10.7 Lion or later)
- Windows 10

How to set up the networking node

You can choose to download pre-compiled binaries directly from the Jörmungandr releases page where the list of assets we provide for each release is outlined.

To install the Jörmungandr networking node, follow these steps for Linux and Mac or these steps for Windows. As an alternative, you can use Nix to install Jörmungandr, please refer to the Nix installation instructions.

Also, you can use Chocolatey and Snappy installers to make the installation process easier.

If you are using Chocolatey for Windows, run this command:

```
choco install jormungandr --upgrade
```

If you are using Snappy for Linux, run this command:

```
snap install jormungandr
```

Costs associated with running a stake pool

While Ouroboros is cheaper to run than a proof of work protocol, running Ouroboros still incurs some costs, namely electricity, network connectivity, equipment depreciation, and so on.

Therefore, stake pools are rewarded for running the protocol in the form of incentives, that come from the transaction fees and from inflation of the circulating supply of ada.

Learn about incentives

In blockchain technology, the goal is to incentivize participants to "do the right thing". In Cardano that means achieving a certain distribution of stake. This distribution can be achieved with an appropriate number of stake pools, not too many or too few. Most stake is expected to be concentrated in stake pools and stake pools are incentivised to be online and actively participate in the protocol. Incentives are designed in such a way that if everyone follows their own rational financial interest, the outcome should be an even distribution of stake amongst stake pools.

In the context of a cryptocurrency, incentives is a way of encouraging stake pools to participate in the protocol and to support it faithfully. In Cardano, that means that the stake pool is online and creates a block when it has been elected as slot leader.

As stake pools make an investment in the form of hardware, time, and so on, it is fair that they receive incentives for their costs and effort. Incentives in our case refer to monetary incentives in the form of ada.

What do we want to incentivize?

In our incentives model we want to incentivise stake pools to be online and participation in the protocol creating blocks whenever they are elected slot leaders.

On the other hand, there may be people who are not interested or do not have the technical know-how to set up the required software or the time to be online, but they can still participate by delegating their stake to a stake pool.

About the incentives mechanism

A lot of work has gone into creating an incentivization mechanism that will ensure the long term health of the network, but the game theory which underpins the incentivization only works if real rewards are available for real users. The Incentivized Testnet enables us to test the theory in a sandbox environment to make sure it works as intended. The ada rewards earned for delegating stake or running a stake pool are real and, once the testnet is complete, those rewards will be redeemable and available to spend. We are using real rewards to gauge real responses, and to assess how the incentivization mechanism works in a real world setting.

Understanding the delegation mechanism

As Cardano is a proof-of-stake system, holding stake, or owning ada, means that you can buy goods or services with your purchase and payment power. In addition, you also have the right and obligation to participate in the protocol and create blocks.

These two uses can be separated by the delegation mechanism, meaning someone who owns ada can keep the spending power, while delegating the power to participate in the protocol to someone else, a stake pool. It is important to note that funds can be spent normally at any time, regardless of how they are delegated.

What is a delegation certificate?

A delegation certificate is a cryptographically-signed piece of metadata in the blockchain that transfers staking rights from one staking key to another.

A delegation certificate is published on the blockchain, therefore, transaction fees apply. If there are conflicting certificates, as in you delegate to someone and then to somebody else, two delegation certificates will exist. There is a rule to break the tie, and this is whichever is later in the blockchain wins.

Stake Pool Architecture

Here we explain the architecture of stake pools and the Cardano ecosystem.

Context of a stake pool

A stake pool does not exist in isolation, instead it interacts with the entire Cardano ecosystem.

First, the stake pool operator sets up a stake pool node, which is a Jörmungandr server that has been configured to validate blocks from the Cardano blockchain. Once the setup is complete, the stake pool operator registers on the stake pool registry.

The stake pool registry is a list of metadata about stake pool owners that is maintained by the [Cardano Foundation](). This list will appear in the Daedalus interface. However, it is important to note that anyone with enough ada to pay the transaction fee can set up a stake pool, even if they are not listed in Daedalus.

An ada holder can go to Daedalus, and in the Delegation tab, select the stake pool to which they want to delegate their stake. That delegation action is recorded on the Cardano blockchain and will influence the slot leader selection process in the next epoch.

This diagram outlines a process flow for stake pools:
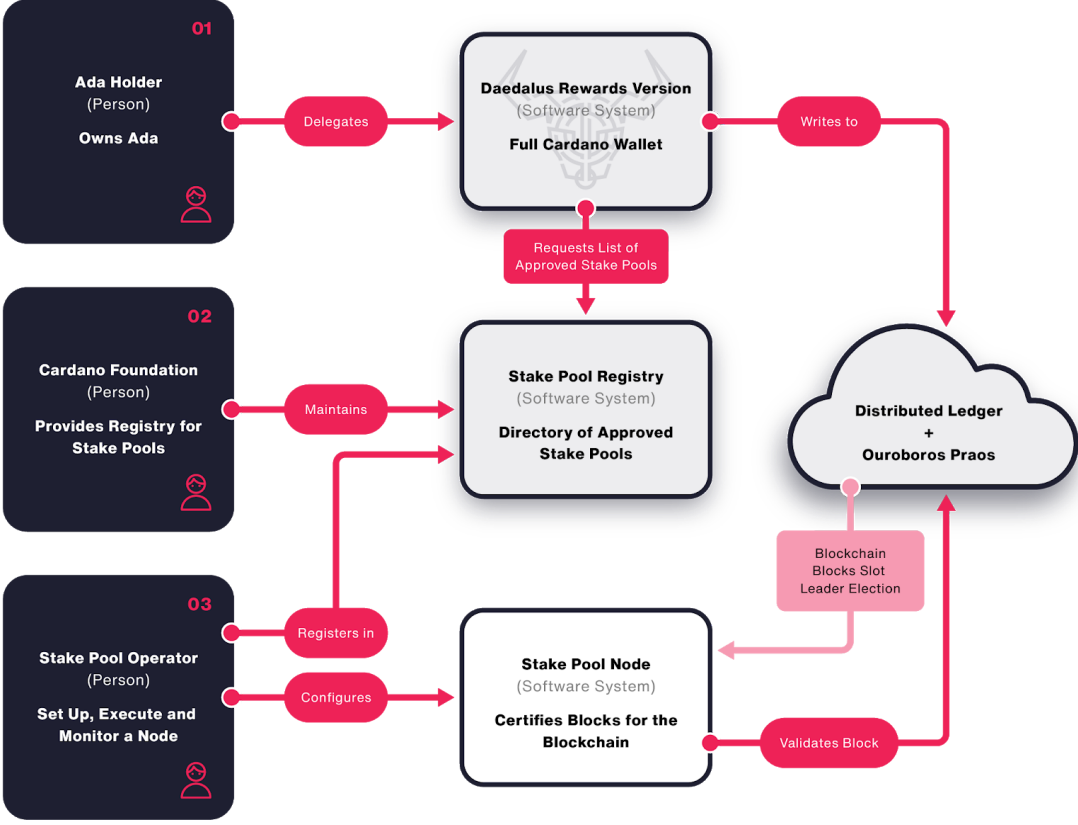
Minimal Installation

In order to set up a minimal stake pool, you just need a small server that fulfils the hardware requirements and a Jörmungandr node started with the --secret parameter. Although this will work, a stake pool should have close to 100% availability. That means that the node must be online with good internet connection 24/7.

This diagram outlines this architecture:
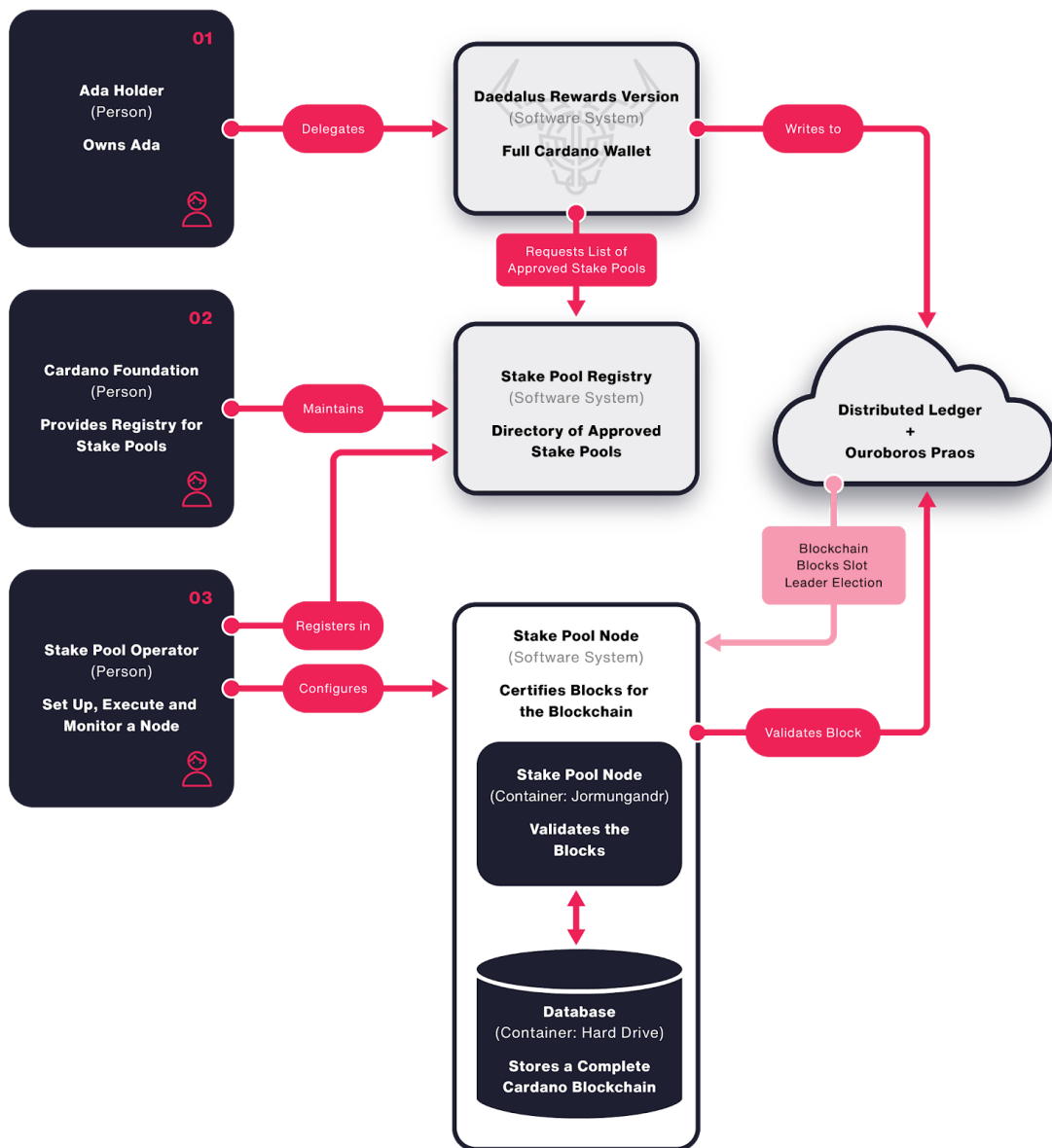
Registering stake pools with the Cardano Foundation stake pool registry

At this point we are opening the pre-registration process for new stake pools. As an operator of a public stake pool, you can pre-register it with the official Incentivized Testnet stake pool registry, which is run by the [Cardano Foundation](#). You will need to provide signed submissions in the form of Github pull requests into this registry. For details on how to register your stake pool, see the [Incentivized Testnet registry GitHub page](#). If you pre-register your stake pool at this point, your pull request will remain open until the point at which the complete network functionality is available, when it will be merged and officially registered. Once your stake pool is fully registered it will appear as a delegation option in the supported testnet wallet Daedalus.

These submissions are subject to checks and human vetting to ensure that they are well-formed, before being merged to the master repository. There are some rules and semantics that you should be aware of when submitting to the registry, please check [the registry rules](#) before you make your submission. You should also refer to the [usage policy](#) for compliance and legal information to ensure your pull request is accepted.

About the Cardano Foundation Trademark Policy

If you have any questions regarding the usage of our trademarks, please refer to the [Cardano Foundation trademark policy](#).

Please also read the associated article [Cardano Foundation Trademark Policy](#).

The stake pool dashboard

A stake pool dashboard is available to download in the [stake pool management GitHub repository](#) to help you manage your stake pool and monitor its performance. There is both a graphical user interface and a command-line interface available to use. This tool is in the early stages of development and more functionality will be added soon, we welcome your feedback at this point.

This dashboard will provide a convenient summary of data related to your pool so that you can easily assess how it is performing, as well as provide you with some useful links to supporting materials to help you manage your stake pool. The monitoring data will include details of the health status of the node, as well as reporting on the leader

schedule, chain and transaction information, rewards, fragment logs, and general stake pool settings. It also provides visibility of the performance of nodes within the network.

As this dashboard is a proof of concept, please log any issues or suggestions for new features in the GitHub repository, as the Technical Support Desk is not supporting this functionality at this point.

Resources

Cardano uses a new proof of stake algorithm called Ouroboros, which determines how individual nodes reach consensus about the network. The algorithm is a crucial part of the infrastructure that supports the Ada cryptocurrency and is a major innovation in blockchain technology. Learn more by reading What is Ouroboros?.

Quickstart:

- How to guide for stake pool operators
- Shelley Incentivized Testnet support portal
- Technical reference documentation
- How to create a new address using a script (Linux/macOS)
- How to create a new address using a script (Windows)
- How to manually send a certificate to the blockchain
- How to send a certificate to the blockchain using a script (Linux/macOS)
- How to send a certificate to the blockchain using a script (Windows)
- Starting the node as a leader candidate

Support and help

Your feedback is important because it helps us improve Cardano and the testnet. We have an active Telegram channel and a technical support desk to help with the process.

TELEGRAM CHANNEL: CARDANO DEVELOPERS

You can reach the developers of Cardano directly on the Telegram website. Just join the @CardanoDevelopersOfficial channel.

HOW TO GET TECHNICAL SUPPORT

To contact IOHK Technical Support, please submit a request using the Submit a request form.

Glossary

ADA: The name of our currency, named in honor of Ada Lovelace.

ADA holder: The person owning any amount of ada.

Consensus: A way for a decentralized system to reach a consistent view on shared collections of data. Cardano uses the Ouroboros consensus algorithm, which is an algorithm based on proof of stake.

Delegate: Designating a stake pool to act on your behalf to perform the slot leader duties when elected by the protocol.

Genesis Block: The very first block in a blockchain.

Jörmungandr: A node implementation, written in Rust, supporting the Ouroboros consensus protocol.

Node: A participant of a blockchain network, continuously making, sending, receiving, and validating blocks. Each node is responsible to make sure that all the rules of the protocol are followed.

Ouroboros: Cardano's proof of stake algorithm.

Proof of Stake: A consensus algorithm where ada holders are elected at random, proportionally to their stake, to validate the transactions that are to be included in each new block.

Proof of Work: A consensus model where a publishing node wins the right to publish the next block by expending time, energy, and computational cycles to solve a hard-to-solve, but easy-to-verify problem.

Slot leader: A node which was elected to have a right to create a block in the current slot.

Stake: In a proof of stake protocol, participants are issued a stake equivalent to the amount of coins they own. The stake is then used to allow participation in the protocol.

Stake pool: Stake pools are the trusted block creators in the genesis-praos system. A pool is declared on the network explicitly by its owners and contains, metadata and cryptographic material. Stake pools have no stake power on their own, but participants in the network delegate their stake to a pool for running the

operation.

Stake pool operator: The person responsible for the operations of a stake pool.

Testnet: An experimental blockchain, with the same technology, software, and functionalities intended to use in the mainnet. The only difference is that the tokens used in a testnet do not possess any real value outside of the testnet environment.

Trusted peer: Other trusted nodes in the network.