ETHEREUM ROADMAP  /  BEACON CHAIN

# The Beacon Chain

- The Beacon Chain introduced proof-of-stake to the Ethereum ecosystem.

- It was merged with the original Ethereum proof-of-work chain in September 2022.

- The Beacon Chain introduced the consensus logic and block gossip protocol which now secures Ethereum.

*Page last updated: July 19, 2024*

WHEN'S IT SHIPPING?

## Shipped!

The Beacon Chain shipped on December 1, 2020, and formalized proof-of-stake as Ethereum's consensus mechanism with The Merge upgrade on September 15, 2022.

# What is the Beacon Chain?

The Beacon Chain is the name of the original proof-of-stake blockchain that was launched in 2020. It was created to ensure the proof-of-stake consensus logic was sound and sustainable before enabling it on Ethereum Mainnet. Therefore, it ran alongside the original proof-of-work Ethereum. The Beacon Chain was a chain of 'empty' blocks, but switching off proof-of-work and switching on proof-of-stake on Ethereum required instructing the Beacon Chain to accept transaction data from execution clients, bundle them into blocks and then organize them into a blockchain using a proof-of-stake-based consensus mechanism. At the same moment, the original Ethereum clients turned off their mining, block propagation and consensus logic, handing that all over to the Beacon Chain. This event was known as The Merge. Once The Merge happened, there were no longer two blockchains. Instead, there was just one proof-of-stake Ethereum, which now requires two different clients per node. The Beacon Chain is now the consensus layer, a peer-to-peer network of consensus clients that handles block gossip and consensus logic, while the original clients form the execution layer, which is responsible for gossiping and executing transactions, and managing Ethereum's state. The two layers can communicate with one another using the Engine API.

# What does the Beacon Chain do?

The Beacon Chain is the name given to a ledger of accounts that conducted and coordinated the network of Ethereum stakers before those stakers started validating real Ethereum blocks. It does not process transactions or handle smart contract interactions though because that is being done in the execution layer. The Beacon

Chain is responsible for things like block and attestation handling, running the fork choice algorithm, and managing rewards and penalties. Read more on our node architecture page.

# Beacon Chain impact

## Introducing staking

The Beacon Chain introduced proof-of-stake to Ethereum. This keeps Ethereum secure and earns validators more ETH in the process. In practice, staking involves staking ETH in order to activate validator software. As a staker, you run the software that creates and validates new blocks in the chain.

Staking serves a similar purpose that mining used to, but is different in many ways. Mining required large up-front expenditures in the form of powerful hardware and energy consumption, resulting in economies of scale, and promoting centralization. Mining also did not come with any requirement to lock up assets as collateral, limiting the protocol's ability to punish bad actors after an attack.

The transition to proof-of-stake made Ethereum significantly more secure and decentralized by comparison to proof-of-work. The more people that participate in the network, the more decentralized and safe from attacks it becomes.

And using proof-of-stake as consensus mechanism is a foundational component for the secure, environmentally friendly and scalable Ethereum we have now.

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If you're interested in becoming a validator and helping secure Ethereum, learn more about staking.

## Setting up for sharding

Since the Beacon Chain merged with the original Ethereum Mainnet, the Ethereum community started looking to scaling the network.

Proof-of-stake has the advantage of having a registry of all approved block producers at any given time, each with ETH at stake. This registry sets the stage for the ability to divide and conquer but reliably split up specific network responsibilities.

This responsibility is in contrast to proof-of-work, where miners have no obligation to the network and could stop mining and turn their node software off permanently in an instant without repercussion. There is also no registry of known block proposers and no reliable way to split network responsibilities safely.

[More on sharding](#)

# Relationship between upgrades

The Ethereum upgrades are all somewhat interrelated. So let's recap how the Beacon Chain affects the other upgrades.

## Beacon Chain and The Merge

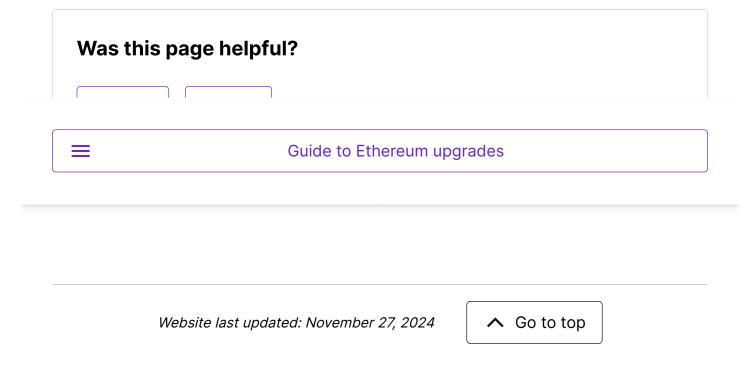At first, The Beacon Chain existed separately from Ethereum Mainnet, but they were merged in 2022.

The Merge

## Shards and the Beacon Chain

Sharding can only safely enter the Ethereum ecosystem with a proof-of-stake consensus mechanism in place. The Beacon Chain introduced staking, which 'merged' with Mainnet, paving the way for sharding to help further scale Ethereum.

Shard chains

# Further Reading

- [More on Ethereum's future upgrades](#)
- [More on node architecture](#)
- [More of proof-of-stake](#)

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