Ethereum2.0 Overview

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Self-introduction

Daniel Tehrani

Former student of National Institute of Technology (KOSEN), Maizuru College. Dropped out after one and a half years; became Chief Engineer at Gene A.I.dols Incorporation. Engaged in development of Smart Contracts (ERC721), etc. Freelance from July 2020. Member of ICOVO (Ethereum2.0 node-related research, etc.). Grew up in Japan.

What is Ethereum?

- Public blockchain
- A platform for developing Decentralized Applications (DApps) and Smart Contracts

What is Ethereum2.0?

- A major upgrade of Ethereum
- Adoption of new technologies to solve issues (scalability, burden on the infrastructure, etc.)

Why?

To solve the following issues and to enhance resistance

- Scalability
- Security
- Sustainability

Changes and technologies adopted in Ethereum2.0

- Proof of work (mining) → Proof of stake
- Sharding

Proof of stake

From "Proof of work" to "Proof of stake"

Proof of work

- Obtain consensus on the basis of mining capability
- Malicious behavior results in a waste of the power consumed
  → Incentive to engage in proper behavior

Proof of stake

- Obtain consensus on the basis of amount of coins held
- Malicious behavior results in a loss of coins
  → Incentive to engage in proper behavior

Proof of stake: What is staking?

- Deposit a minimum of 32 ETH
- Validate chain to obtain reward (about 1% - 25%)
- Failure to behave according to protocol results in confiscation of stake

Economics of staking

- The fewer the ETH staked, the higher the return per validator
- The more the ETH staked, the greater the overall amount issued and the lower the return per validator

Total Network Stake	Validator Interest	Network Issuance
1,000,000	8.02%	0.08%
2,000,000	5.67%	0.11%
3,000,000	4.63%	0.13%
5,000,000	3.59%	0.17%
10,000,000	2.54%	0.24%

Eth2 Launch Pad

https://launchpad.ethereum.org/

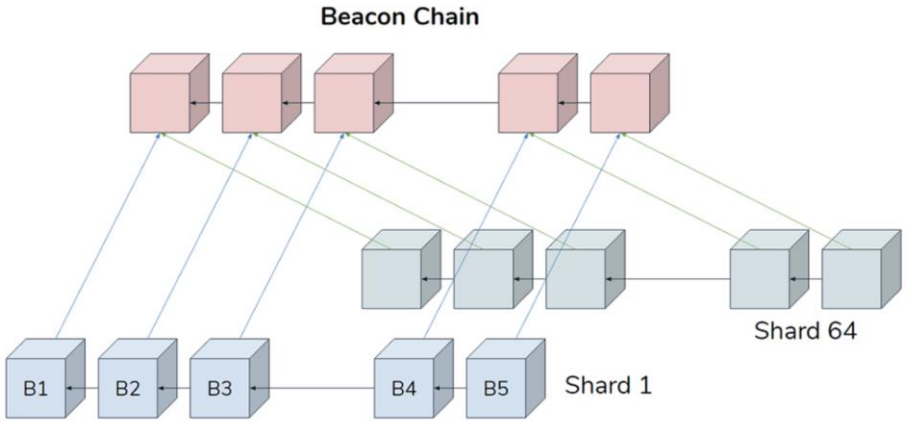
Staking pool

- Abstraction of technical aspects
- Staking from 32 or fewer ETH is possible
- Low cost of entry

Sharding

Sharding

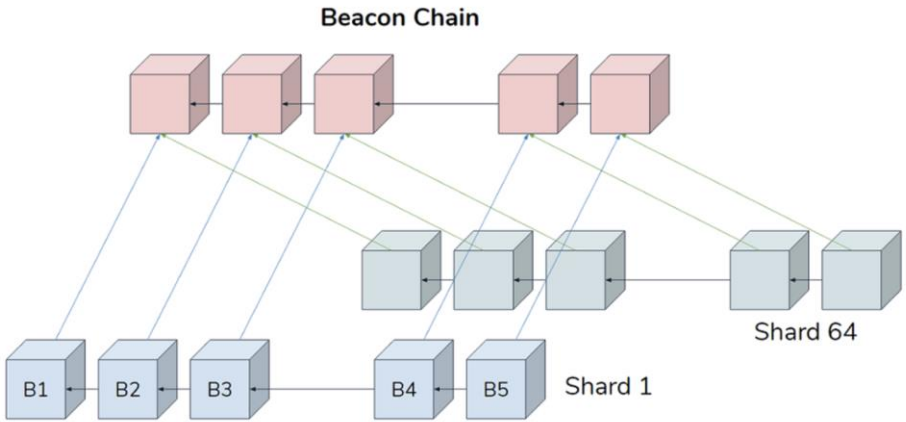
- What is Sharding? → Dividing the chain
- Improvement of processing capability



From [The Beacon Chain Ethereum 2.0 explainer you need to read first]

Beacon Chain

- Proof of stake system and Sharding control



From [The Beacon Chain Ethereum 2.0 explainer you need to read first]

Beacon Chain Explorer

https://beaconscan.com/

Phases

Phase 0: Start of Beacon Chain (scheduled for December 1, 2020)

Phase 1: Implementation of Sharding (scheduled for 2021)

Phase 1.5: Docking of Ethereum with Ethereum2.0 (2021/2022)

Phase 2: TBD (Further improvement of Sharding?)

ETH2 technical deep dive

Sharding

Issues facing Ethereum

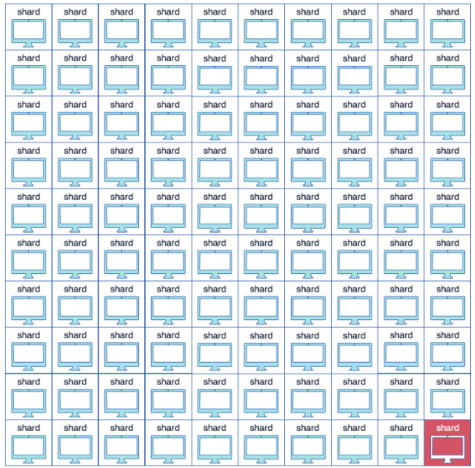
- All nodes must execute all transactions

Requirements for scaling:

1. Elevating the processing capability of nodes, and other vertical scaling
2. Parallel processing and other horizontal scaling ← avoid being centralized

Sharding

- In a Beacon Chain, validators are divided into 64 subsets and assigned to each shards→ Is security also distributed?



1% Attack

“In 100 shards system, it takes only 1% of network hash rate to dominate the shard.”

Credits Hsiao-Wei Wang

Sharding: RANDAO

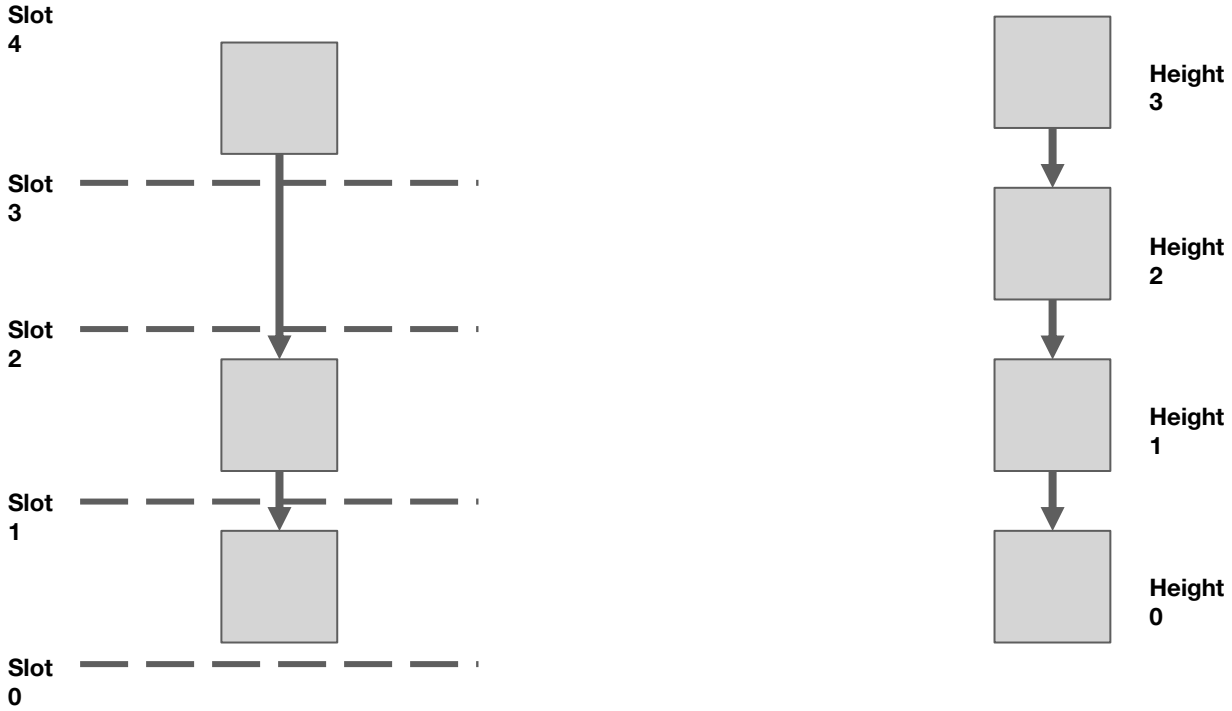
- Generate pseudorandom sequence
- Shuffle the validator set on a regular basis and reassign to shards

Slots and Epochs

Slots

- Blocks are generated to slots every 12 seconds
- The concept is applied to both Beacon Chain and shard chains

Difference between slot and block height



Epochs

- 32 slots = 1 epoch
- 1 slot = 12 seconds
- 1 epoch = 6.4 minutes

From [The Ethereum 2.0 Beacon Chain Explained]

Validators

Validators

- Validators work as proposers or as attesters

Proposer

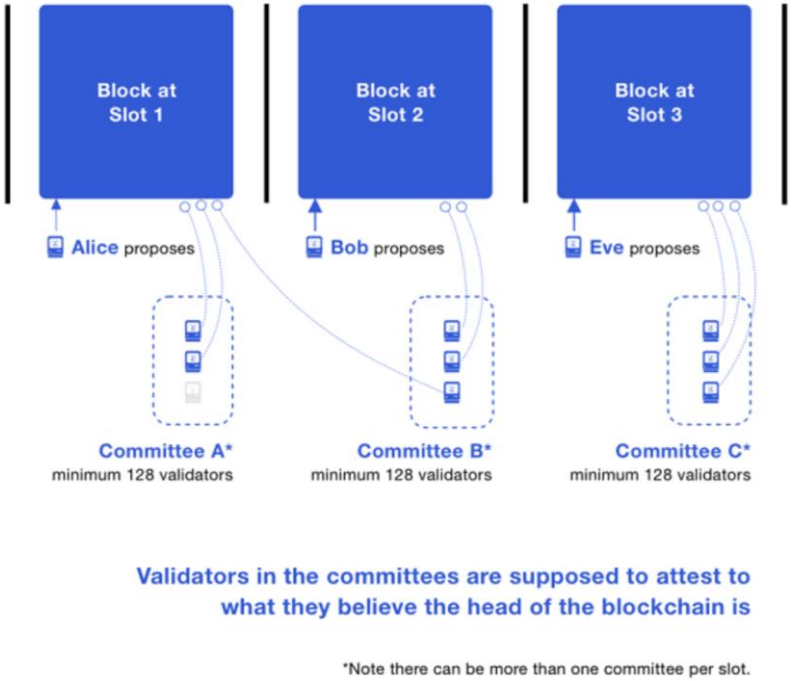
- Block generator
- Chosen (pseudo-) randomly

Attester

- Votes on block generated by proposer
- Chosen (pseudo-) randomly

Committees

- Aggregation of validators
- 1 committee is set up by a minimum of 128 validators
- A committee is assigned to one of the slots at the beginning of an epoch
- A validator can only belong to 1 committee within 1 epoch
- Validators in a committee vote for blocks "believed" to be the endpoint of the chain



From [The Ethereum 2.0 Beacon Chain Explained]

Case involving 4,096 validators

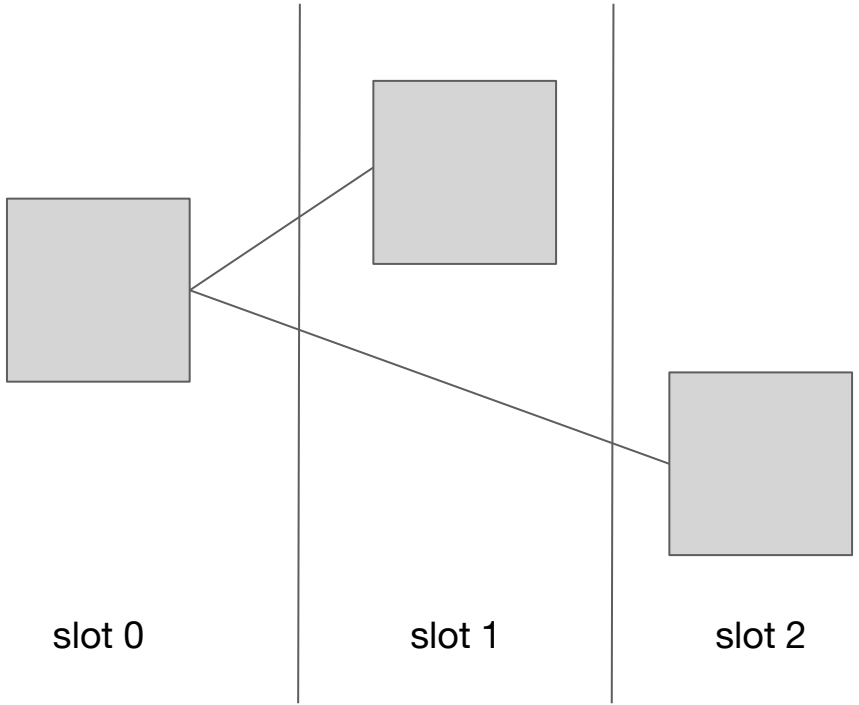
- At the beginning of each epoch, 4,096 validators are divided among 32 slots. A committee of 128 validators can be created with the validators assigned to a slot.

Case involving 12,288 validators

- At the beginning of each epoch, 12,288 validators are divided among 32 slots. For each slot, 3 committees of 128 validators can be created.
- Committee B in Slot 3 is in charge of Shard 30, and Committee A in Slot 12 is in charge of Shard 5.

Voting (LMD GHOST)

- Attesters vote on the block that is the endpoint
- The attester in charge of Slot 2 wants to invalidate the block in Slot 1 / does not know of the existence of the block
  → Casts vote "Slot 0 is the endpoint"
- This method to determine the endpoint of the chain is called LMD GHOST



Ethereum2.0 initiatives by ICOVO Japan

Offering an environment for safe and easy staking with Ethereum2.0

ONGOING

ETH2.0 PoS Project

Token ETH2.0 node pre-installed

Staking Server