
Variants of Proof of Stake
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Variants of **Proof-of-Stake**

Delegated PoS (DPoS)	**Liquid** PoS (LPoS)	**Cosmos** PoS (BPoS ¿?)	**Nominated** PoS (NPoS)
e.g. EOS	e.g. Tezos	e.g. Cosmos Hub e.g. IrisNet	e.g. Polkadot

Let's get an overview on the four variants, which are: Delegated PoS, used by networks such as EOS, Liquid PoS, for example in Tezos, the Cosmos PoS (informally known as the BDSMPoS, which, by the way, to avoid confusion, it stands for Bonding Delegation Slashing, Merkle PoS), and finally Polkadot's Nominated PoS.

	Delegated PoS (DPoS)
Who is allowed to participate?	By holders' votes (21/100)
How is leader elected?	21 *Producers* / round voted
What is at stake?	None
What are the slashing conditions?	None
What are the rewards?	Fixed rate + % on blocks
Consensus Mechanism?	Voting

In Delegated PoS, token holders have voting power which is weighted by the amount they hold. In this model, there is a constant number of active block producers of 21 plus 100 standby block producers. Voting is made by generating a smart contract and the results are recalculated every 2 minutes. Once you're elected, either as an active producer or standby, there is an amount of rewards allocated for you, a fix rate plus a percentage based on the amount of blocks you validate. So, all that matters is that you get enough votes, there is no punishment for misbehaviours. The assumption is that if you misbehave as a producer, people will not vote for you anymore.

	Delegated PoS (DPoS)	**Liquid** PoS (LPoS)
Who is allowed to participate?	By holders' votes (21/100)	10,000 XTZ self-bonded
How is leader elected?	21 *Producers* / round voted	Pseudorandom slots
What is at stake?	None	*Bakers*' self-bond, rewards
What are the slashing conditions?	None	Double-Baking / Endorsing
What are the rewards?	Fixed rate + % on blocks	Baking + fees Endorsement
Consensus Mechanism?	Voting	Nakamoto Consensus

In Liquid PoS, currently there is the requirement of 10,000 XTZ to be bonded if you want to become a baker. On top of that, other token holders can delegate to you up to a certain amount. The risk is carried by the bakers, which can lose 512 XTZ plus all the rewards generated per double signed block, and up to 64 XTZ per double endorsed block. On the other hand you earn rewards for baking, including the fees paid for transactions in that block, and for endorsements. The concept of liquidity comes from the idea that delegators can easily switch their delegation to different bakers. And just like DPoS, LPoS relies on Nakamoto Consensus.

	Delegated PoS (DPoS)	**Liquid** PoS (LPoS)	**Cosmos** PoS (BPoS)
Who is allowed to participate?	By holders' votes (21/100)	10,000 XTZ self-bonded	Top 100 by economic stake
How is leader elected?	21 *Producers* / round voted	Pseudorandom slots	Weighted Round-Robin
What is at stake?	None	*Bakers*' self-bond, rewards	Self-bond, delegation, rewards
What are the slashing conditions?	None	Double-Baking / Endorsing	Double-signing Liveness
What are the rewards?	Fixed rate + % on blocks	Baking + fees Endorsement	Validation rewards + fees
Consensus Mechanism?	Voting	Nakamoto Consensus	Tendermint Consensus

In Cosmos PoS, you can become a validator if you stake enough tokens to be ranked top 100. The amount staked is the amount you self-bond plus the delegation you may receive. The slots are assigned following weighted round-robin, just another pseudorandom way of assigning slots. As opposed to LPoS, in Cosmos' model, everything is at stake. Moreover, you get penalised for double-signing and for liveness. And what's more interesting is that it relies on Tendermint Consensus, which basically means that 2/3 of of the network have to reach consensus, otherwise it just halts. Which explains why liveness is penalised.

	Delegated PoS (DPoS)	**Liquid** PoS (LPoS)	**Cosmos** PoS (BPoS)	**Nominated** PoS (NPoS)
Who is allowed to participate?	By holders' votes (21/100)	10,000 XTZ self-bonded	Top 100 by economic stake	*Sufficiently high bond deposited*
How is leader elected?	21 *Producers* / round voted	Pseudorandom slots	Weighted Round-Robin	-
What is at stake?	None	*Bakers*' self-bond, rewards	Self-bond, delegation, rewards	Self-bond, rewards
What are the slashing conditions?	None	Double-Baking / Endorsing	Double-signing Liveness	Double-signing Liveness
What are the rewards?	Fixed rate + % on blocks	Baking + fees Endorsement	Validation rewards + fees	Validation rewards + fees
Consensus Mechanism?	Voting	Nakamoto Consensus	Tendermint Consensus	Tendermint, HoneyBadger

And finally, Nominated PoS is somewhat similar to Cosmos, but I can't say too much for now as the specifications have not been published. According to the white paper, one difference is that besides validators and nominators, there are two additional agents, which are collators and fishermen and that their consensus is inspired from Tendermint and HoneyBadger.

Resources

- Larimer, D. (2014). Delegated proof-of-stake (dpos). Bitshare whitepaper.
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- Buchman, E., Kwon, J., & Milosevic, Z. (2018). The latest gossip on BFT consensus. arXiv preprint arXiv:1807.04938.
- Arluck, Jacob (2018). Liquid Proof-of-Stake. URL: https://medium.com/tezos/liquid-proof-of-stake-aec2f7ef1da7

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