Proof of work

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Proof of Work (PoW) is a consensus mechanism utilized in blockchain technology to validate and confirm transactions. In the context of the Bitcoin network, miners play a crucial role in this process. Miners, essentially specialized computers, engage in solving intricate mathematical puzzles to validate transactions and create new blocks in the blockchain. These miners are incentivized to mine blocks by receiving rewards for their computational work. Transactions that are yet to be included in blocks are stored in the memepool, awaiting validation.In the PoW system, miners compete to solve mathematical problems, with the first miner to solve a problem adding a block to the blockchain. Subsequently, other miners validate this block using the consensus protocol. If the block is deemed valid, the miner receives a reward; otherwise, no reward is granted. In the event that multiple miners solve a problem simultaneously, the PoW mechanism ensures that the longest chain, representing the most computational effort, is accepted as the valid chain.The integrity of the blockchain network relies on the majority decision-making process, where computational power determines representation. This mechanism prevents manipulation by ensuring that the longest chain, backed by the most proof-of-work effort, is considered valid. Honest nodes, representing the majority of CPU power, drive the growth of the honest chain, outpacing any competing chains. To alter a past block, an attacker would need to redo the proof-of-work for that block and subsequent blocks, surpassing the computational effort of honest nodes. This exponential difficulty deters attackers from modifying past blocks as the chain grows longer.In summary, the PoW system's security hinges on the dominance of honest nodes over dishonest ones, ensuring the integrity and immutability of the blockchain by making it computationally prohibitive to alter past transactions.