Ethereum Transactions

- **Transactions are the heart of the Ethereum Blockchain**. **Interacting with the Ethereum Blockchain means executing transactions that update the blockchain state.**
- The term "transaction" is used in Ethereum to refer to the signed data package that stores a message to be sent from an EOA to another account on the blockchain.
- Any transaction requires a fee to be paid (gas).
- Contracts have the ability to send "messages" to other contracts.
- **An EOA produces a transaction and a contract produces a message.**

Life Cycle of an Ethereum Transaction

1. The client constructs the raw transaction object;
2. The client signs the transaction with the private key and validates it locally;
3. The transaction is broadcasted to the network by the Ethereum Client and a transaction ID (txid) is returned;
4. The transaction is added to the transaction pool and waits there to be validated by the miner.A miner node accepts the transaction. **Ethereum Network has a mix of miner nodes and non-miner nodes.**
5. Miner finds a valid block by solving the PoW puzzle (or PoS) and adds the new block to the existing blockchain. The number of transactions in the block depends on the block gas limit.
6. The miner node broadcasts the new block to all other nodes; **All nodes execute the transactions from the new block, but only the miner gets paid. (block reward + transactions fee - gas).**

Ethereum Parameters

- Ethereum 1.0 can process 15 transactions per second and Ethereum 2.0 up to 100,000 transactions per second.
- Ethereum Block time is 20 seconds.
- A block is considered final and forever added to the blockchain after 12 confirmations.

Transaction's Fields

from: "0x9300d2bB77C695FE8708692Cc56A3a4dDF14A1D5"
to: "0x22331B228721e09E6916CB7d17C8Db20bbAF5C22"
value: "10000000000"
gasLimit: "21000"
gasPrice: "120"
data: "0xabcd",
nonce: "5",
hash: "0x1009e8720dc6250e095dca3f4f296c8b8940302be0b367e85dbfe5caace057ca"

Transaction vs. Call

Transaction (Ex: contract deployment, token transfer)	Call (Ex: GetBalance)
- Modifies the blockchain	- Doesn't modify the blockchain
- Costs gas	- It's free
- It must be mined, takes time	- Doesn't have to be mined, instant execution
- Returns a transaction id (hash) - txid	- Returns a value