

# Transactions, Blocks and Mining

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- **Transactions are the heart of the Ethereum Blockchain.** Interacting with the Ethereum Blockchain means executing transactions that update 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; 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. Client constructs the raw transaction object;
2. Client **signs** the transaction and validates it locally;
3. Transaction is broadcasted to the network by the Ethereum Client and a transaction ID (txid) is returned;
4. Miner node accepts the transaction. **Ethereum Network has a mix of miner nodes and non-miner nodes.** The transaction is added to the transaction pool and waits there to be validated by the miner. Transactions in the pool are sorted by gas price;

# Transactions, Blocks and Mining (cont)

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5. Miner finds a valid block by solving the **PoW puzzle** 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 can process 15 transactions per second
  - Ethereum Block time is 20 seconds
  - A block is considered final and forever added to the blockchain after 12 confirmations.

# Transactions, Blocks and Mining (cont)

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## Transaction fields:

```
{  
  from: ...,  
  to: ...,  
  value: ...,  
  gasLimit: ...,  
  gasPrice: ...,  
  data: ...,  
  nonce: ...  
}
```

Transaction (Ex: contract deployment, token transfer)	Call (Ex: Get Balance)
<ul style="list-style-type: none"><li>- Modifies the blockchain</li></ul>	<ul style="list-style-type: none"><li>- Doesn't modify the blockchain</li></ul>
<ul style="list-style-type: none"><li>- Costs gas</li></ul>	<ul style="list-style-type: none"><li>- Free</li></ul>
<ul style="list-style-type: none"><li>- It must be mined, takes time</li></ul>	<ul style="list-style-type: none"><li>- Doesn't have to be mined, instant execution</li></ul>
<ul style="list-style-type: none"><li>- Return a txid</li></ul>	<ul style="list-style-type: none"><li>- Returns a value</li></ul>