Smart Contracts and Decentralized Finance
Transactions

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Transactions on Ethereum

A transaction is a message sent from an externally owned account (EOA).

Transactions can modify states:
- Ether balances of accounts
- Contract account's (CA) storage

Transactions optionally contain:
- Ether
- Data

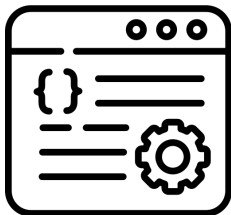**Transactions by Recipient**

EOA to EOA
ETH transfer

EOA to CA
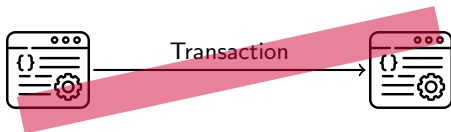ETH transfer
Contract execution

EOA to 0
Contract deployment

Internal Transactions

Contract Accounts Send Internal Transactions

CAs can only issue internal transactions / internal calls. A (non-internal) transaction can never originate with a smart contract. In other words: Initially, CAs **must** be triggered by an EOA transaction.

Transactions and Calls

Transaction: Must originate with an EOA. States can only be changed through transactions and each transaction leads to a state change. May contain multiple internal transactions and/or internal calls.

Call: A call is executed locally (on the node). It is read-only, i.e., does not lead to state changes.

Internal Transaction: An internal transaction is a transaction that is part of another transaction. The internal transaction must be executed alongside the containing transaction.

Internal Call: An internal call is a call that is part of a transaction. The internal call must be executed alongside the containing transaction. Note that, in contrast to a regular call, internal calls are s.t. network fees.

A Detailed Look at Ethereum Transactions

Ethereum Transactions **always** contain the following data points:

- **Recipient Address:** The recipient's hexadecimal address.
- **Nonce:** Transaction count from sender.
- **Signature:** Consisting of the variables V, R and S.
- **Gas Limit:** Maximum number of transaction execution steps.
- **Gas Price:** Fee the sender is willing to pay per execution step.

Depending on the transaction purpose, they **further** include:

- **Value:** Ether value in Wei, where 10^{18} Wei $= 1$ ETH.
- **Data:** Contract execution or deployment instructions.

EOA to EOA

Overview Access List State Comments	
⑦ Transaction Hash:	0xdd8888cc23048f9f577eb49eb3cdfaeaee1a3709e2730bdf8ddcf7692d71c385 ⧉
⑦ Status:	✅ Success
⑦ Block:	13281236 12 Block Confirmations
⑦ Timestamp:	⏱ 3 mins ago (Sep-23-2021 09:39:54 AM +UTC) | ⏱ Confirmed within 45 secs
⑦ From:	0xb5d85cbf7cb3ee0d56b3bb207d5fc4b82f43f511 (Coinbase 5) ⧉
⑦ To:	0xe0761fe51506eefcda41399287a1e11f397efb3b ⧉
⑦ Value:	0.02475 Ether ($77.17)
⑦ Transaction Fee:	0.001097571054909 Ether ($3.42)
⑦ Gas Price:	0.000000052265288329 Ether (52.265288329 Gwei)
⑦ Txn Type:	2 (**EIP-1559**)
⑦ Gas Limit:	21,000
⑦ Gas Used by Transaction:	21,000 (100%)
⑦ Base Fee Per Gas:	0.000000050265288329 Ether (50.265288329 Gwei)
⑦ Max Fee Per Gas:	0.000000099 Ether (99 Gwei)
⑦ Max Priority Fee Per Gas:	0.000000002 Ether (2 Gwei)
⑦ Burnt Fees:	0.001055571054909 Ether
⑦ Txn Savings:	0.000981428945091 Ether
⑦ Nonce Position	2567826 72
⑦ Input Data:	0x

EOA to CA

EOA to 0