* Sophomore / rank *

* Learn Web3 DAO *

* "Gas is the fuel that allows ethereum to operate, in the same way that a car needs gasoline to run.

There have been two upgrades of gas. ① Pre-London ② Post London

* General Concepts :-

Gas is a unit of computation on the ethereum Network. And is used to measure the amount

of computational effort required to execute a transaction on ethereum.

* Gas fees are paid in ethereum's native currency - ether or ETH.

PRE - LONDON - UPGRADE:-

Before the london upgrade, how much ether you needed to pay for a transaction was calculated through a simple formula:

gas-fees = gas-Price * gas-spent

* Gas spent is the amount used to execute the transaction.

Gas Price :- Amount of ether you're willing to pay per gas unit.

* 1 Gwei = 0.000000001 ETH

1 Eth = 10^9 Gwei

But Wei is Eth = 10^18 Wei

Example :- The cheapest transaction, in terms of amount of ~~eth~~ gas required to execute is just the transfer of ETH from one account to another. This transaction costs 21000 gas units.

Let's suppose you wanted to pay your friend 1 ETH. Assume the gas price is 200 Gwei.

So gas fees = 200 * 21,000 = 4200000 Gwei

= 0.0042 ETH

This fees goes to the miner who mined the block containing the transaction.

* Transactions with higher gas price have a higher priority. As miners recieve a higher tip.
* Wallets like metamask provides reasonable estimates for prices

based on the current network transactions to be executed, therefore users don't need to touch the gas price value themselves.

* (Gas-Cost-Calculation):- When a smart contract is compiled into byte code, before deployment to the ethereum network, it is compiled to OPCODES. They are simple operations such as "ADD, DIV, MUL, SUB etc. that can be run & executed on the EVM. And each OPCODE has a specific cost.

Gas Limits :- It's understandable that there exist a lot of functions that are more complicated than just sending Eth. It costs alot more when there are loops & functions involved.

* Also variables play a huge part in this, since it's hard to predict the the exact amount of gas.

* It's best to setup a higher limit because the unspent Eth will be refunded to your account. And if there isn't enough gas, the transaction will fail and your gas will gone.

Block Gas Limits :- In addition to user specified gas limits per transaction, the Ethereum network also imposes a limit on the max amount of gas allowed in a single block.

* This is because each block needs to stay in a computational range, since more complex transactions cost more time to execute.

* Post London Upgrade :-

August 5th 2021, A new upgrade was implemented. Here were the benifits

* Better Gas fees estimations
* Quicker transaction inclusion
* Burning a percentage of ETH being used as transaction fees.
* Prior to London Upgrade, wallets like metamask would provide estimates for gas prices based on the past activity.

* In the new update. Every block was set to have base fees. which was the minimum transaction price per unit.

* Ethereum is limitless (unlike bitcoin)

* And a new concept (tipping) or priority fees was introduced.

In other words the price was now split into two parts.

formula: gas-fees = gas-spent * (basefees + Priority fees)
(Price)

Example :-

tip

total gas-fee = 21000 * (100 Gwei + 10 Gwei)

2310000 Gwei => 0.00231 ETH

Variable Block Size :- In pre-London times, the block gas limit was constant for all blocks. And each block had a max capacity of 15M gas.

* The new upgrade introduced variable size blocks to ethereum. Each block now can increase or decrease it's capacity according to the demand, and it can go until a max of 30M gas.

* Average is 15M now.

Variable Base Fees :-

The base fees is increased by a maximum of 12.5 % per block if the target 15M gas is exceeded.

Why does Gas Exist :-

It helps keep the ethereum network secure. By requiring a fee for every computation, bad actors are prevented from spamming the network.

* In order to avoid infinite loops etc which would cause the nodes to get stuck. Gas limits on

transactions set a limit as to how much computation a transaction can use.

* Reducing Gas Fees :- The ethereum community has solemnly swore to not hurt the decentralization & security. So the transaction fees on Solana are lower but they have compromised security.

* Ethereum is highly secure & highly decentralized blockchain.