



Haym @SalomonCrypto

Sep 12 · 19 tweets · [SalomonCrypto/status/1569397466046537728](https://twitter.com/SalomonCrypto/status/1569397466046537728)

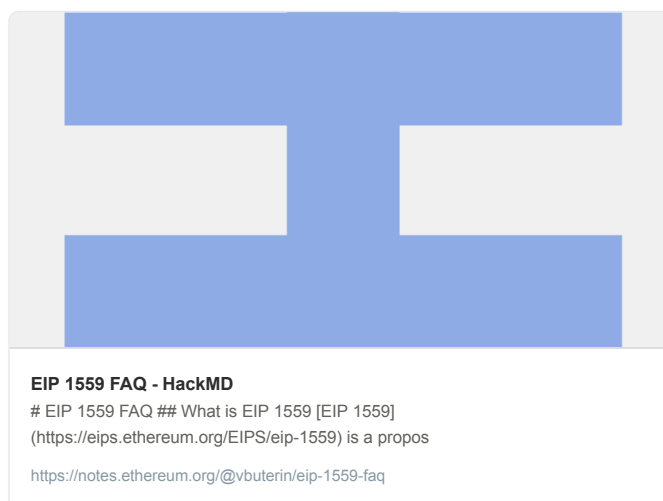
(1/18) [@ethereum](#) Fundamentals: Gas

Just like the IRL liquid it shares a name with, gas is the fuel that makes the World Computer run. But what really is gas? Why is it so important? What's going on in that [@MetaMask](#) tab?

Your guide to the lifeblood of [@ethereum](#).

(2/18) Note - On August 5, 2021 [@ethereum](#) executed the London Hard Fork which, among other things, overhauled how gas works on Ethereum. This thread only references a post London Hard Fork/EIP-1559 world.

For more info, I'll send you to the master:



(3/18) [@ethereum](#) is the World Computer: a globally shared utility that exists between a network of 1000s of computers, each running a local version of the Ethereum Virtual Machine (EVM).

Anyone can access the World Computer at any time, for any reason. Forever.

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(1/7) The Hitchhiker's Guide to [@ethereum](#)

In 2014, [@VitalikButerin](#) gave us an idea that WILL change the world. Have you wrapped your head around The World Computer yet?

DON'T PANIC, I'll break it down for you. Read on for 4 threads that will show you the future.

Ethereum
The World Computer

Virtual Machine (EVM)
Ethereum Blockchain
Ethereum Network

1:01 AM · Aug 3, 2022

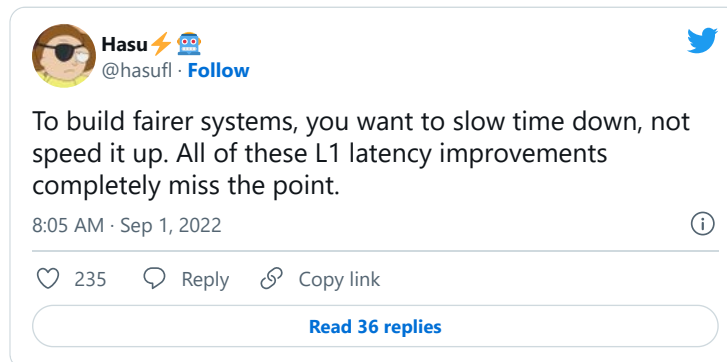
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(4/18) The World Computer was born slow, and although we've reach an era of unbounded scaling, [@ethereum](#) mainnet will ALWAYS remain slow.

Fast systems rewards fast participants, and those with more access to capital and technology will always be the fastest.



(5/18) [@ethereum](#) will always remain slow to give fair access to everyone.

That being said, the consequence of a slow computer is that computing resources are scarce.

Gas is the mechanism Ethereum uses to allocate these resources fairly and efficiently.

(6/18) A (physical) computer works by sending electricity (which has a cost) through millions of transistors, eventually aggregating to human output.

A virtual computer (like the EVM) abstracts away all of this, but conceptually the idea holds. The EVM has computational costs.

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(1/17) Heard of The World Computer, but not sure how [@ethereum](#) possibly qualifies?

You need to learn about virtual machines, the EVM and how Ethereum provides a common, trusted and secure computing environment.

After this thread, you'll never think of Ethereum the same again!

Virtual Machines and the EVM

The diagram is divided into four quadrants:

- Human - to - Machine Communication:** Shows a flow from Human Code to Machine Code to Output. It includes icons for a monitor and a processor.
- Machine Code is not Universal:** Shows a flow from Human Code to Execution to Machine Code to Execution. It includes icons for a monitor and a processor.
- Generalization via Virtual Machines:** Shows a flow from Human Code to VM to Machine Code to Execution. It includes icons for a monitor and a processor.
- The EVM and The World Computer:** Shows a flow from Human Code to EVM to Machine Code to Execution. It includes icons for a monitor and a processor.

(7/18) Every activity that touches the World Computer can be boiled down to the machine code readable by the EVM.

That bytecode is made of operations that each have a specific gas cost. Gas measures the amount of computational effort required to execute specific operations.

(8/18) In order to actually run a transaction, you must supply the World Computer with enough gas to execute it.

Your wallet ([@MetaMask](#), [@Rabby_io](#), etc) can examine your pending transaction and give you a (usually good) estimate of how much gas it will take to execute it.

(9/18) This gas is consumed by the World Computer in the same way that electricity is consumed by a (physical) computer; it is gone forever.

[@ethereum](#) does this by "burning" the gas, or sending it to a permanently unrecoverable address.

(10/18) But the World Computer doesn't run on altruism. It is a network of independent nodes that are running the EVM locally, keeping their copies in sync by a process known as Consensus.

Node operators (myself included) aren't in it for the vibes. We are in it for the \$ETH.

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(1/23) Coordination in The World Computer:
@ethereum Consensus

The Merge is weeks away... are you caught up on Proof of Work (PoW), Proof of Stake (PoS) and the systems that form the backbone of Ethereum?

Read up anon, time is running short. The world is about to change forever

The diagram, titled "Ethereum Consensus", is divided into four quadrants:

- Ethereum Block Production:** Shows a Mempool feeding into a block, which is then added to a chain. The process involves EVM data, hashing, and network approval.
- Proof of Work (PoW):** Illustrates the process where a block is hashed (Ethash) and signed. If the signature is correct, the block is added to the blockchain; otherwise, nodes mine again.
- Proof of Stake (PoS):** Shows nodes staking ETH, with a validator chosen at random to produce a block. Misbehavior is punished by deducting from the validator's stake.
- The Future of Ethereum Consensus:** A timeline showing the transition from PoW to PoS via "The Merge". It includes "Single-slot Confirmations" (reducing block time to 12 seconds), "Secret Leader Election" (randomly selecting a leader), "PoS & MEV Improvements" (allowing block construction before proposal), and "The Purge" (removing old blocks to save space).

4:12 PM · Aug 2, 2022

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(11/18) The tip incentivizes nodes to include a transaction in a block; without tips it would be economically viable to leave blocks empty just to collect block rewards

This also allows users to express urgency: transactions that need to be executed quickly can pay a higher tip

(12/18) Take a look at an [@ethereum](#) transaction. You can see exactly what's going on.

A transaction has a gas cost, gas has a price, users make a bid for gas (maxFeePerGas) and offer a tip to nodes (maxPriorityFee).

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(1/18) [@ethereum](#) Fundamentals: Transactions

Sent **\$ETH**? LP'ed into an AMM? Deployed a new contract? Everything you do on the World Computer leaves an on-chain record. Ever wonder what's inside your transactions?

A field-by-field guide to the atomic unit of Ethereum computing

Ethereum Transaction

| | | | |
|---|---|--|---|
| Metadata chainId: id 1 for Ethereum type: new contract (0x2) or other (0x0) hash: hash of the transaction blockNumber: block containing this - null blockHash: block containing this - hash transactionIndex: block position of this from: address of the tx generator nonce: index of tx generator to: address of the tx receiver value: ETH transferred (0x0) gas: gas used by the tx gasPrice: price (0x0) paid per unit of gas maxFeePerGas: max bid per unit of gas (0x0) maxPriorityFee: max tip per unit of gas (0x0) (r, s, v): values for authentication | Transaction Metadata Cache Data | Cache accessList: (optional) address/byte array access | Data input: type 0x0 New contract code type 0x2 contract ABI (with branching, linking) |
|---|---|--|---|

4:22 AM · Sep 9, 2022

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(13/18) Gas is complicated, there are 2 markets you need to follow when making a txn: \$ETH (priced in \$) and gas (priced in \$ETH/GWEI).

But think of it this way: does your computer care about the cost of electricity? Why would the World Computer care about the cost of \$ETH?

(14/18) Gas is an abstraction that allows us to have a distinct value layer for computational expenses vs the valuation of \$ETH.

The World Computer is a globally shared, scarce resource. Gas is how we divide up the units of the EVM, and then we let the market distribute it.

(16/18) The implicit question: where does this scarcity come from?

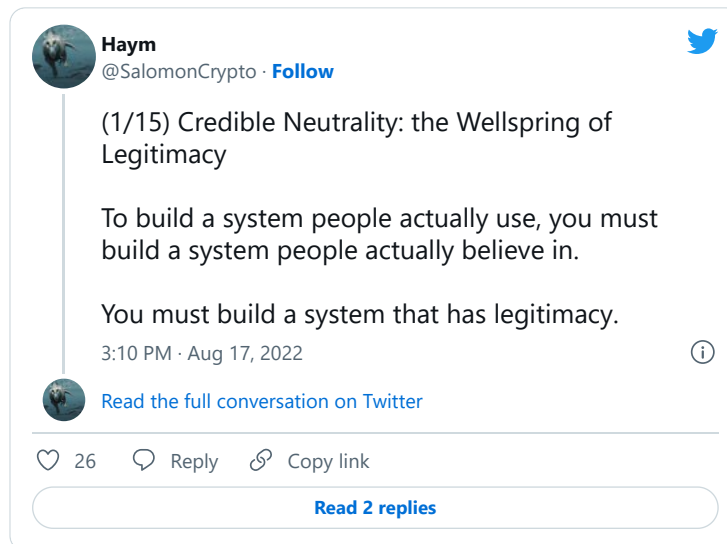
Technically, each block has a target gas limit which adjusts up or down based on network usage (max 2x).

Even more technically, the limit is bounded by the hardware requirements of the nodes in the network.

(16/18) [@ethereum](#) is built on a single core principle: decentralization. From decentralization flows credible neutrality. From credible neutrality flows world domination.

Decentralization comes from allowing anyone to run a node.

Even in their girlfriend's closet.



(17/18) Finally, gas fees keep [@ethereum](#) secure. By requiring a fee for every txn, spam attacks quickly become nonviable. Infinite loops or other computational wastage quickly burn themselves out.

And higher gas fees = more \$ETH burn = higher % staked = more economic security.

(18/18) Look, I'm not here to tell you that you should enjoy paying for gas. Especially in 2022.

But when you take a step back, [@ethereum](#) gas takes on a whole different life. Just like death and taxes, gas is here to stay.

Gas is just how the whole thing works.

Like what you read? Help me spread the word by retweeting the thread (linked below).

Follow me for more explainers and as much alpha as I can possibly serve.



A screenshot of a Twitter post from user Haym (@SalomonCrypto). The post is the first in a thread of 18 tweets. The text discusses the concept of 'gas' in the context of Ethereum, comparing it to IRL liquid and describing it as the fuel for the World Computer. It asks why gas is important and what's going on in the @MetaMask tab. The post includes a link to a guide on the lifeblood of Ethereum. The post has 38 likes and 8 replies. The interface shows icons for liking, replying, and copying the link.

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(1/18) [@ethereum](#) Fundamentals: Gas

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6:48 PM · Sep 12, 2022

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