



All Things Ethereum

September 2021



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In this month's research piece, we do a deep dive into all things Ethereum, the largest and most widely used blockchain for decentralised finance (DeFi). We explore the rapid growth in the network's user base, applications, and number of validators. We analyse the advancement towards a Proof of Stake (PoS) consensus mechanism and other material design improvements to be deployed as part of Ethereum 2.0. Ethereum is an open source, decentralised blockchain and the first to offer smart contract functionality. The protocol was first conceived by Vitalik Buterin in 2013 and officially launched in July 2015. Ethereum was the first blockchain that allowed permanent and immutable decentralized applications (Dapps) to be built above it. It is the development of this application layer which has led to the creation of DeFi. Ethereum operates as a not-for-profit Foundation and resides in Switzerland.

Ether (ETH) is the currency that is used to pay for all transactions validated on the Ethereum blockchain. Payment is made to the miners (soon to be validators) who provide the computational memory to validate, process and store transactions on the blockchain. Gas is the unit of account used in the calculation of an Ethereum transaction fee. The continued high gas costs associated with using the Ethereum blockchain has resulted in a number of spin-off blockchains starting and winning business away from Ethereum. The topic of gas costs is particularly relevant when addressing the scalability of a network which we will discuss in further detail.

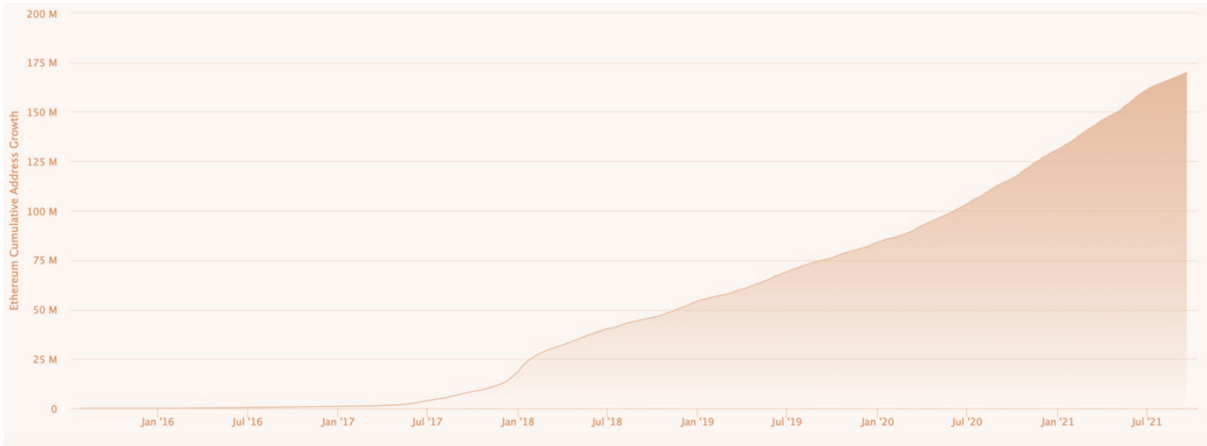
Ethereum's rise to be the most dominant network for DeFi transactions can be assessed through several metrics. The four we believe are most relevant:

- Number of Ethereum addresses. Chart 1 demonstrates the growth in the number of unique Ethereum wallet addresses used to move ETH within the Ethereum network.
- Value of digital assets being used as collateral on the network as measured by Total Value Locked (TVL). Chart 2 illustrates the growth in the collateral within the DeFi ecosystem is growing at record pace.
- Value of transactions that a network verifies. Chart 3 illustrates the growth of the Ethereum network since inception, with the network processing daily ~1.25million transactions. This is well below the 150million transactions the Visa network processes but will scale very quickly with the role out of Ethereum 2.0.
- Number of validators. There are currently over 200,000 validators operating on testnet as part of the Ethereum 2.0 upgrade. This large number of nodes or validators ensures the security of the network whilst maintaining the decentralised nature of the network. The aggregate amount of ETH staked by these validators currently sits at USD\$21bn.

Ethereum Unique Addresses Chart

Source : Etherscan.io

Click And drag in the plot area to zoom in



Ethereum Daily Transactions Chart

Source : Etherscan.io

Click And drag in the plot area to zoom in



Total Value Locked (USD) in DeFi

TVL (USD) | ETH | BTC

All | 1Year | 90 Day | 30 Day



Private companies have emerged to profit from the growth of the Ethereum blockchain by offering software that facilitates development of applications directly on chain. The largest of these companies is Consensys, a US software company run by Ethereum co-founder Joe Lubin. Whilst it remains a private company, the company has undertaken several high-profile seed capital raises attracting investments from heavyweight traditional finance names. The growth of Consensys' built MetaMask Ethereum wallet (now at 10million downloads) is another metric we follow to understand the growth of the Ethereum ecosystem.

The Future of Ethereum

Ethereum 2.0 is a continuation of many planned upgrades to the Ethereum mainnet following the mainnet launch in July 2015, namely:

Homestead, March 2016

Metropolis : Byzantium, October 2017

Metropolis: Constantinople, February 2019

Istanbul, December 2019

Berlin, April 2021

London, August 2021

The launch of Ethereum 2.0 is especially significant compared to past upgrades because of the implementation of a Proof of Stake consensus mechanism, moving the network away from its existing Proof of Work architecture.

Proof of Stake

Proof of Stake (PoS) is the most significant change in Ethereum 2.0, because it reforms the crypto-economic incentive structure for validating the blockchain. Ethereum's current architecture is maintained by a Proof of Work (PoW) consensus mechanism. The components of Proof of Work are well-known and it is the architecture used for the most utilized blockchains to date, including Bitcoin, Ethereum, Litecoin, and more. In Proof of Work, miners run nodes and expend computational energy to solve complex mathematical problems in a competition to mine the next block. The time and money that miners need to run hardware and expend electricity on PoW chains is validated by block rewards, which are distributed to miners who successfully mine a block into existence. PoW chains are extremely secure; the combined computational power required for an individual to compromise a well-established PoW blockchain would cost an extraordinary amount of money. Although extremely secure, PoW blockchains suffer from scalability and accessibility issues

Proof of Stake replaces the two primary components of PoW (miners & electricity) with validators and stake on Ethereum 2.0. Broadly speaking, validators replace miners as the individuals who maintain the agreed-upon state of the network and receive rewards for randomly selecting the next block of data. Unlike in PoW, in which miners expend

physical energy (called hash power) by burning electricity to confirm blocks, validators in a PoS system commit 32 ETH as 'skin in the game.'

On Ethereum 2.0, validators stake at least 32 ETH by depositing the funds into the official deposit contract that has been developed by the Ethereum Foundation. Validators will download and run Ethereum 2.0 client software. While running client software, they will be randomly selected to propose and attest to blocks on the Ethereum 2.0 blockchain. Validators who correctly propose and attest to blocks will receive a reward of ETH as a percentage of their stake.

On Ethereum 2.0, if a validator fails to stay online and execute their share of computational responsibilities, their block reward will moderately decrease in order to incentivize validators to stay online as consistently as possible. Should a validator maliciously attempt to compromise the network (i.e. validate incorrect data history), all or some of their 32 staked ETH will be confiscated.

The crypto-economic incentives against malicious actors are stronger on a PoS network. Whereas in PoW, the economic risk of a failed attack is equal to the cost of electricity to achieve the required hash power, in PoS the cost to launch an attack is equal to the amount of staked ETH, and therefore so is the penalty. The chances are higher that an individual is warier of directly risking money in the form of staked crypto to launch an attack compared to the more abstract cost of electricity. Whereas a failed PoW attack results in the loss of electricity costs, slashing a validator's stake is the PoS equivalent of a miner burning down an entire PoW server farm in a failed attack. In short, the economic incentive to act in the network's best interest is stronger.

The barrier to entry of becoming a validator is significantly lower than that of being a miner and is this is reflected in the explosion in the number of validators running a node for Ethereum 2.0. At time of publication there are currently ~200,000 validators operating on the Beacon Chain.

There are two solutions to the barriers to entry that are currently anticipated on Ethereum 2.0. To overcome the technical knowledge of running one's own node, companies are beginning to offer staking services through which they will manage the client operation for an individual who stakes 32 ETH in exchange for a small fee. Should an ETH holder only wish or be able to stake less than 32 ETH, they can join a staking pool, where their funds are pooled with others' to reach the required 32 ETH. Rewards, then, would be proportional to their total contribution.

In Ethereum 2.0, one of the goals is for PoS to level the playing field for more individual validators to participate, earning a shared return on maintaining the truth of the network.

Ethereum 2.0

Ethereum 2.0's release is staggered into three distinct sections: The Beacon Chain, The Merge and Shard chains. The first stage of the Ethereum 2.0 upgrade has been successfully released with the launch of the Beacon Chain in December 2020. This release successfully implemented the PoS algorithm. The original Ethereum blockchain and Ethereum 2.0 are currently operating in parallel until the next stage of Ethereum 2.0 roll out is undertaken – known as the Merge. This substantial phase will merge the Beacon Chain into the mainnet and see the end of PoW algorithms. 'The merge' should happen at some point in late 2021/early 2022.

The final upgrade mapped out for Ethereum 2.0 will see the implementation of Shard chains. This is slated for late 2022. Introducing sharding to Ethereum 2.0 should allow for heightened scaling of Ethereum, as transactions can be split across 64 new chains.

Conclusion

We continue to believe that the role out of Ethereum 2.0 will signify a meaningful development in the long run implementation of the Ethereum blockchain and the underlying distributed ledger technology.

We conclude that:

01

The network upgrade process has been deliberate and considered running in parallel with POW for multiple months. By addressing scalability and electricity consumption issues through the implementation of a PoS consensus mechanism the network will be able to grow to reach its true potential and challenge centralised networks that currently dominate the traditional world of finance.

02

Once scaled the improved infrastructure will unleash innovation at scale in many industries that benefit from high volume transaction validation, processing, and storage.

03

The impediment to a wider adoption outside the digital asset space has been scalability. Technology is a constantly changing landscape, one that relentlessly drives speed up and costs down, we believe that we are on the cusp of unleashing a wave of further technological innovation.