CoinShares

ASSET HIGHLIGHT



ETHEREUM

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ETHEREUM



PURPOSE

Ethereum aims to be the settlement layer for the internet of value.

THE SYSTEM

Smart Contracts
Settlement Layer
Data Availability Layer
Proof of Stake

Source: Ethereum, CoinShares as of December 31st 2022

THE ASSET

Staking
Network Fees
Monetary Premium
Deflationary

Source: Ethereum, CoinShares as of December 31st 2022

PRICE ACTION

2019	-2%
2020	459%
2021	403%
2022	-68%

Source: Ethereum, CoinShares as of December 31st 2022
Past performance is not a reliable indicator of future results and should not be the sole factor of consideration when selecting a product.

GENERAL INFO

Creator	Vitalik Buterin
Launch	July 30th 2015
Consensus	Proof of Stake
Asset	ETH
Max Supply	Uncapped
Smallest Unit	1 ETH = 1 quintillion Wei (10^18 wei)
Core Contributor	Ethereum Foundation
Languages	Solidity, Vyper, FE, Yul, Yul+

Source: Ethereum, CoinShares as of December 31st 2022

QUICK STATS

Market Cap	$150bn
Circulating Supply	120.5m
Staking APY	7.5%
Percentage Staked	13%
Number of Validators	500k
Average Transaction Fee	$1.51

Source: Ethereum, CoinShares as of December 31st 2022

EXECUTIVE SUMMARY

Ethereum desires to be a platform[1] that hosts decentralised applications enabling developers to programmatically control digital value. Unlike Bitcoin, Ethereum is designed to be an all-purpose blockchain that's flexible in order to provide support for many types of user interactions. Rather than a specific monetary use, ether, the native Ethereum asset, has utility in executing programmes and transactions of arbitrary complexity.

Blockchains can be used for tasks other than peer-to-peer value exchange. There are thousands of blockchain projects attempting to apply data structures to a more diverse use. On the Ethereum platform, a generalised approach enables users to define their interactions through a programming language built for complexity. In effect, Ethereum gives users the ability to run any conceivable code for execution on its distributed network of computers, allowing for elaborate financial transactions and customisable, user-issued digital assets. To perform these interactions, users pay per execution in its native currency, ether.

These encoded agreements between users are called smart contracts, and Ethereum's smart contract capability vastly exceeds that of Bitcoin, which optimises for robustness and simplicity instead of flexibility. Whereas Bitcoin can run simple non-recursive[2] smart contracts, Ethereum can run contracts of arbitrary complexity, enabling broader functionality. Its smart contract capabilities hold the Ethereum environment together, encouraging creativity and attracting its large community of developers.

PURPOSE, MOTIVATION AND SOLUTION

Smart contracts can be strung together to create decentralised applications, or *dApps*. As contracts perform multi-step and conditional functions, they can also be composed to work together with other contracts. These suites of contracts are used to create products and services where transactions are seamlessly integrated. As a result, some Ethereum champions hope the project will serve as the contractual backbone of a new online economy, where ether is used as payment to access goods and services that are inherently secure, trust-minimised, and available to anyone.

Ethereum is currently being used in the following key areas (non-exhaustive):

Initial Coin Offerings

Blockchain protocols normally host their own internal token[3] units, or digital assets, as a part of their architecture. Ethereum is no exception to this, but due to its ability to execute smart contracts within its own platform, developers can issue tokens that do not require a new blockchain network — they can live entirely within the Ethereum network.

Ethereum's permissionless nature enables anyone to mint their own token. Such tokens can be linked to ownership of other assets, used to access certain services, or even be unique non-forgeable collectibles.

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[1] 'Platform' refers to a set of computers that are connected to form a network as well as the protocol that defines the rules by which they communicate

[2] Bitcoin smart contracts are written in a simple, stack-based programming language where you can know with certainty when and how a program will end (mitigating the halting problem). In simple terms, Bitcoin smart contracts do not allow for loops. Ethereum smart contracts are written in a high-level, object oriented programming language where you can run loops, making it near Turing Complete.

[3] A token is a single or number of units in a blockchain's accounting space. It is broadly analogous to money units in a total money supply. Tokens are controlled by a single or set of cryptographic keys used to authorise their spending. By way of example, US Dollar token units are called Dollars and (100) Cents, Bitcoin units are bitcoin and (100,000,000) satoshi, Ethereum units are ether and (1x10^21) wei.

Pre-selling such tokens, referred to as an Initial Coin Offering (ICO), has been widely used as a funding mechanism to subsidise the development and marketing teams behind various blockchain-related projects.

The Distributed Autonomous ICO (DAICO) model uses the same approach as an ICO in using tokens as a funding mechanism, but can also impose programmatic limitations on the usage of the raised funds. The intention is to limit or prevent fraudulent use of the ICO funding model.

Replacing Escrow

Ethereum smart contracts help replace middlemen and make transactions more efficient, faster and more transparent. The most applicable areas are real estate, wills, supply chain & logistics, enforcing rights for holders of digital assets and insurance. As of Q4 2022, Ethereum settles an average value of $21bn daily.

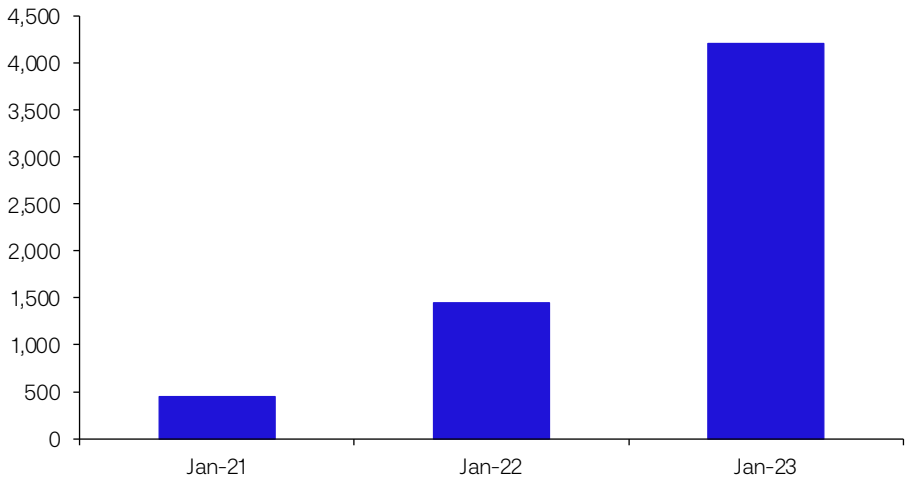
Decentralised Autonomous Organisations (DAOs)

Decentralised autonomous organisations, or DAOs, are online, community-driven entities that operate without a structured hierarchical management. In a DAO, large swaths of management, operational, and governance procedures are delegated away from humans and instead programmed directly into smart contract logic. Inputs to the business logic functions are then decided by stakeholder (token holder) vote.

DAOs typically bring a democratic approach to governance where each stakeholder, from top to bottom, can submit ideas for improvement. DAOs benefit from the smart contracting capabilities weaved into public blockchains such as Ethereum, where these organisations can reach consensus on rules, policies, and changes in a transparent, customisable, and automated fashion.

The concept of DAOs originated on Ethereum from 'The DAO,' an effort by a group of community members which intended to mimic a venture capital fund and support new Ethereum projects. In 2016, the operation launched and ballooned with enough interest to garner roughly 11.5 million ether,[4] or the equivalent of over $150m at the time.

Number of DAOs on Ethereum



Source: DeepDAO, CoinShares, data available as of close 1 January 2023

[4] www.nytimes.com/2016/05/22/business/dealbook/crypto-ether-bitcoin-currency.html?_r=1

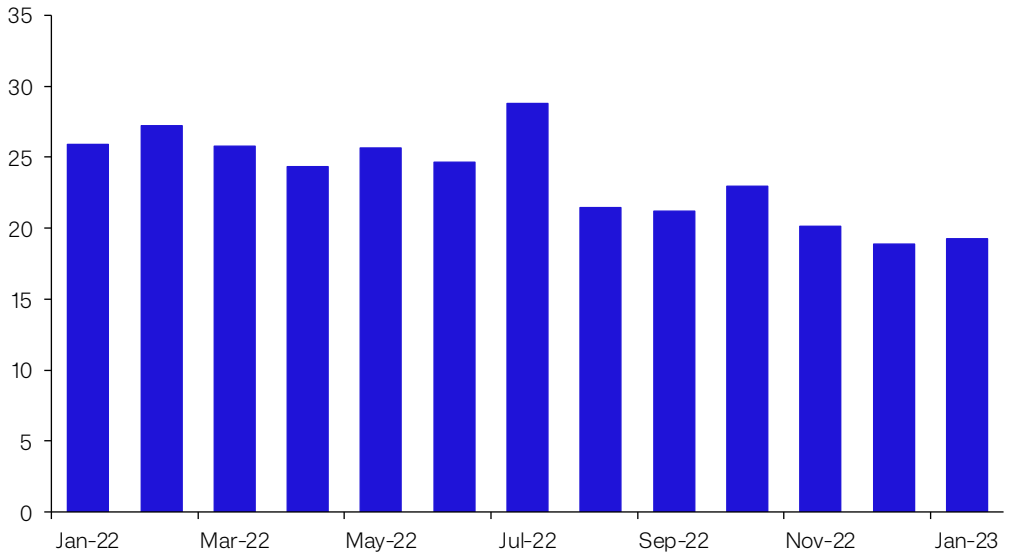
Decentralised Finance (DeFi)

Decentralised Finance (DeFi) can be described as a suite of financial services (lending, borrowing, insurance, trading, derivatives etc.) that are open to anyone with an internet connection. Developers write smart contracts (code) which can perform pre-determined transactions when called upon and paid for. These services are available without the need for intermediaries like banks or other institutions and therefore have lower transaction times and lower take rates.

Furthermore, as these DeFi primitives are written in code, they can be built on top of or added to existing products. Some examples of novel DeFi applications (that don't exist in traditional finance) include self-repaying loans, non-collateralised loans paid back in the same transaction, and token swaps. DeFi aims to provide these services in a more transparent, trust-minimised, efficient, and inclusive manner.

Within DeFi, Total Value Locked (TVL) is the sum total of assets deposited in a financial protocol. These assets are not necessarily owned by the protocol but are instead deposited by users of the dApps in search of a return on their capital (akin to AUM). Protocols usually incentivise users to add to its TVL by issuing tokens as a reward. Protocols with a large TVL are seen as more trustworthy (although this is not necessarily true) hence a large TVL can attract more funds and potentially reduce the need for unsustainable incentives. A large TVL also helps with liquidity and expands the potential use cases. As of Q4 2022, TVL on Ethereum stood at 19.3 million ETH or USD 31 billion (shown below).

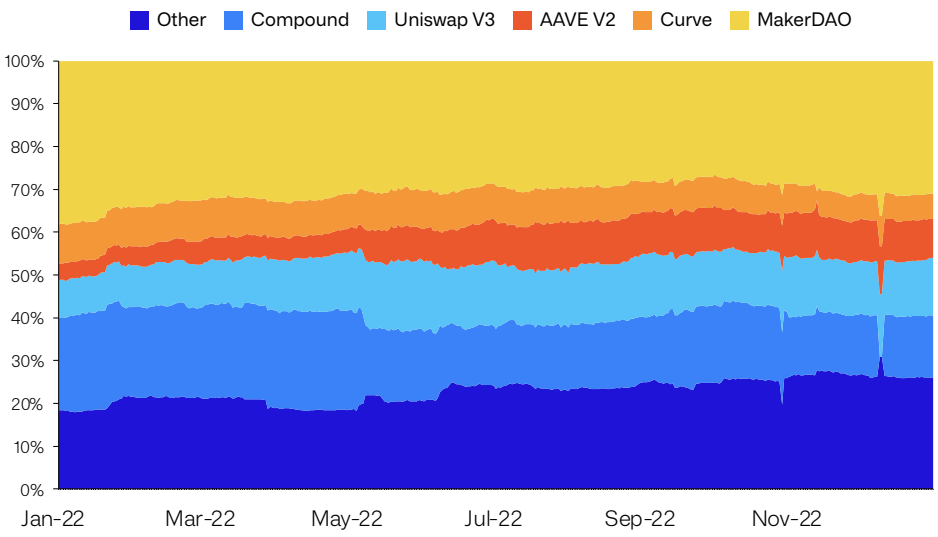
TVL on Ethereum (in millions of ETH)



Source: DefiLlama, CoinShares, data available as of close 1 January 2023

As of December 2022, the five largest decentralised applications (dApps) on Ethereum represent 78% of total TVL.

Ethereum Project by TVL (%)

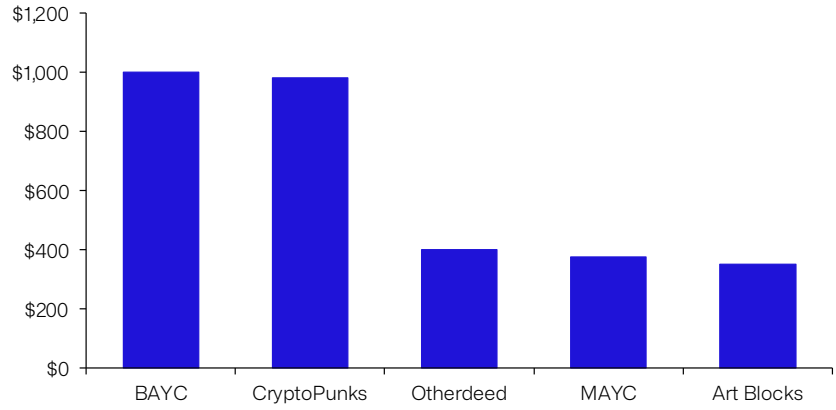


Source: DefiLlama, CoinShares, data available as of close 16 January 2023

Non-Fungible Tokens (NFTs)

Non-fungible refers to any item that is unique or distinguishable. Unlike shares or cash which are fungible and equally interchangeable for one another, art and patents are non-fungible and each have their own value. NFTs are tokens that may be used to signify ownership of unique goods. NFTs allow users to tokenize items like works of art, valuables, and even real estate. The Ethereum blockchain secures asset ownership; nobody can alter the ownership record or copy/paste a new NFT into existence. The largest five collections are all on Ethereum and are collectively worth over $3bn.

Top 5 NFT Collections by Value (USD millions)



Source: OpenSea, CoinShares, data available as of close 1 January 2023

Gaming

Blockchain gaming allows players to earn while they play. In fact, in 2021 this became a viable alternative to a full-time job in some developing countries. The gaming industry is new to Ethereum and there are still many challenges ahead (scaling, hacks, economics) so the feasibility remains to be seen.

PEOPLE

While Vitalik Buterin is commonly known as the Ethereum founder, there were 8 total co-founders. Out of these 8, Vitalik is the only one who remains actively working on the Ethereum platform. Many have since moved onto other blockchain related initiatives, started competing protocols, or left the industry altogether.

Originally, the 8 founders met in Zug, Switzerland, with the intention of deciding the structure of the Ethereum platform and signing a document of incorporation. Eventually deciding against a corporate model, they instead established the non-profit Ethereum Foundation.
The Ethereum Foundation was created as a research, development and advocacy arm of the overall Ethereum Project, with the objective of ensuring the Ethereum infrastructure works fairly. It is meant to operate in a similar way to what ICANN does in regards to the internet. The key people involved are Ming Chan, the executive director, Jeffrey Wilcke as head of the technical group and Vitalik Buterin as the foundation council.

In 2017 the Ethereum Foundation joined forces with various startups, research groups and large corporations to create the Ethereum Alliance, with the aim of creating new business avenues for Ethereum. This alliance includes companies such as Accenture, BP, CME group, Credit Suisse, Intel, JP Morgan and Microsoft.

Ethereum has the highest number of monthly active platform developers[5] of all crypto-protocols. As of late 2022, more than 2,000 developers are actively contributing to Ethereum-linked projects, the largest of any smart contract platform. Ethereum uses several different smart contracting languages, two of which were created with simplicity and user-friendliness in mind. This, along with the broad possibilities and flexibility offered by Ethereum has attracted a large and growing community of developers to the platform.

DEVELOPMENT

Introduction

Ethereum as a software project has been developed and implemented in phases. Each phase represents a moment in time when Ethereum has incrementally progressed to solve bugs, implement new features, and pursue a more flexible blockchain that could support more types of user interactions.

Envisioned by Vitalik, Ethereum originated with the release of a whitepaper in November 2013, announcing its intention to provide a blockchain built with tooling to create and execute contracts of any kind.

Proof-of-Concept

In 2013 and throughout 2014, Ethereum was in its nascent stages, creating and testing what would be the bare bones of the project's codebase.

Most notably, and outside of network improvements, this stage laid the groundwork for Ethereum's community and its financing. Upon reviewing the whitepaper, Ethereum's co-founders (but perhaps most notably Gavin Wood and Jeffrey Wilcke) joined Vitalik to form the Ethereum Foundation.

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[5] That is, developers working on projects related to Ethereum, or applications running on the Ethereum platform — they are not working on the Ethereum protocol itself.

The foundation launched a crowdfunding campaign (ICO) spanning 42 days in July 2014 that funded the project's development. The ICO was structured as a sale of premined[6] ether, sold in exchange for bitcoin. In total, the campaigned raised 31,531 BTC worth roughly $18,439,086[7] at the time.

Olympic

Beginning in May 2015 and running for four months, the Olympic[8] phase set out to trial the team's initial developmental concepts. Described as a pre-release, this stage launched as a testnet, encouraging participants to push the Ethereum blockchain to its limits. It featured a prize fund of up to 25,000 ether that rewarded users for their activity. The Olympic phase resulted in Ethereum overcoming several consensus failures and discovering many bugs. Notably, it also established Ethereum's long-term roadmap, consisting of four stages: Frontier, Homestead, Metropolis, and ETH 2.0.

i) Frontier

Following the end of Olympic in July 2015, Frontier represented the first livenet, official launch of Ethereum as a network and blockchain. While still in its infancy, this stage induced the public blockchain's genesis block, mining capabilities, and a command line interface to upload contracts. Essentially, this meant that technical users could send transactions, test applications and create new assets[9] (the latter setting the stage for the now infamous ICO boom of 2017). While the system remained experimental, a foundational framework was set, and along with the excitement, the Ethereum Foundation branded its project: the "world computer."[10]

ii) Homestead

Shortly thereafter, on March 14th, 2016, the second major version of the platform was released, Homestead. While the release itself included just three technical protocol changes,[11] Ethereum's ecosystem started gaining traction. This stage most notably contained the DAO hack. As previously explained, decentralised autonomous organisations, or DAOs, are online, community-driven entities that operate without hierarchical management. The first iteration of this concept was developed in 2016 whereby a distributed collection of users pooled funds into a DAO (commonly referred to as the DAO) structured as a decentralised investment vehicle. To illustrate the desired replacement of human governance with smart contract code in Ethereum, one of its marketing monikers was "Code is Law."[12] The aforementioned exploit of the DAO resulted in developers electing to rewrite the blockchain history to recover the lost funds. This action proved highly controversial and caused a network split creating the competing platform, 'Ethereum Classic', which retains the original Ethereum blockchain. To this day, the events following the DAO hack casts doubt on the reality behind Ethereum's claims of decentralisation and "unstoppable code".[13,14]

While the system had proved its ability to compute smart contracts and mobilise online communities, Homestead introduced an enduring debate as to whether the project was truly decentralised and out of anyone's particular control.

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[6] A premined blockchain unit is one that is created at no cost and typically awarded to founders and early backers. The total amount of premined ether amounts to 72m, or ~64% of total supply (March 2021)
[7] https://github.com/ethereum/ethereum.org/blob/master/templates/ether/ether-sale.html
[8] https://blog.ethereum.org/2015/05/09/olympic-frontier-pre-release/
[9] https://web.archive.org/web/20160207033817/https://ethereum.org/
[10] https://blog.ethereum.org/2015/07/30/ethereum-launches/
[11] https://ethdocs.org/en/latest/introduction/the-homestead-release.html#milestones-of-the-ethereum-development-roadmap
[12] https://twitter.com/stephantual/status/754814992592072704?lang=en
[13] https://web.archive.org/web/20160524140914/https://daohub.org/
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iii) Metropolis

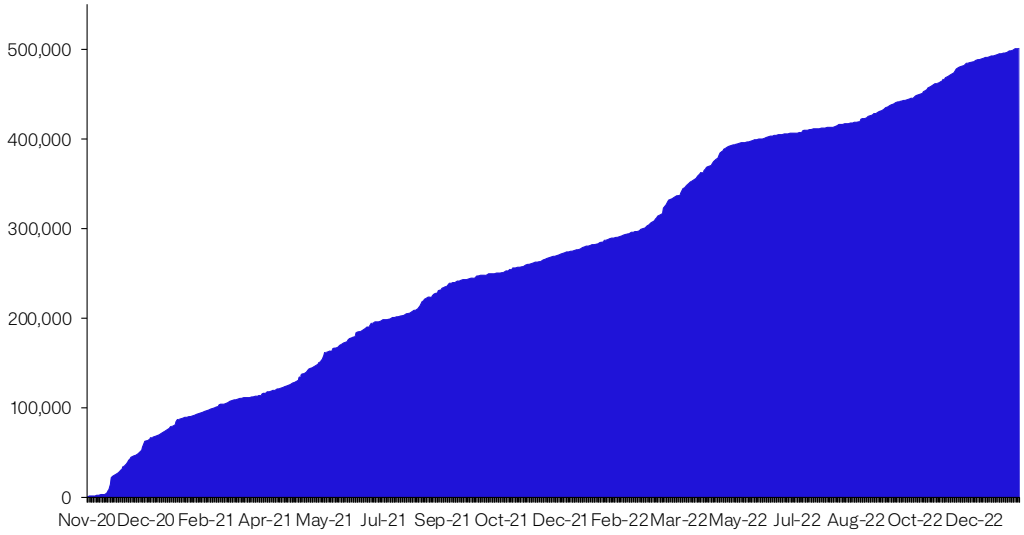
Following Homestead, the Metropolis hardfork[15] activated in October 2017, amidst a rapid rise in network activity and adoption. Over the five month period between August and December 2017, Ethereum addresses increased from just over 500k to near 18.5 million.[16]

While many changes have occurred in Ethereum since October 2017, they are highly technical and mostly apply incremental performance improvements and more general bug fixes.[17] However, it is noteworthy that some of these changes have enhanced the interactions between smart contracts, aligning with Ethereum's original goals of supporting more types of user interactions. Outside of protocol changes, this stage may be characterised by the rise of activity on Ethereum's blockchain and the adoption growth of its DeFi applications.

iv) ETH 2.0

ETH 2.0 introduced the Proof of Stake (PoS) consensus mechanism, moving the network away from its existing Proof of Work (PoW) architecture. With PoS, instead of competing and solving a mathematical puzzle, validators must obtain 32 ETH then lock it away in a contract, otherwise known as staking. In reality this means buying a computer and running the Ethereum software (or running a cloud computing solution such as Amazon Web Services). Below we show that the number of validators staking on Ethereum continues to grow and as of December 2022, has reached 500,000 validators. With a minimum requirement of 32ETH per validator, this represents over 16 million ETH staked.

Number of Validators staking on Ethereum



Source: Glassnode, CoinShares, data available as of close 16 January 2023

[15] Simply put, a hardfork can be thought of as a backwards incompatible change to the blockchain protocol. Such a change will cause the network to split in two unless all participants adopt the new code. Conversely, a backwards compatible change is called a softfork.
[16] https://etherscan.io/chart/address
[17] https://medium.com/digitalassetresearch/understanding-byzantium-what-it-represents-to-the-ethereum-network-9de3d00d552a

It should be noted that while Ethereum has upgraded to PoS, users are still on the same layer because the same technology is still used to execute transactions but instead of deriving consensus from physical miners it derives consensus from another blockchain. Since the upgrade, Ethereum continues to handle execution but has replaced the physical miners with online stakers thereby creating a new consensus "layer". This consensus layer is also a blockchain and is connected to the old Ethereum blockchain. Or another way of saying it is that this consensus layer has merged with the execution layer.

Further information on Ethereum 2.0 can be found here.

ECOSYSTEM

Outside of the founders and protocol developers working to maintain and improve Ethereum, the project is also supported operationally by its ecosystem of network and market participants.

Network Participants

Ethereum's network structure is composed of an uncoordinated set of interconnected computers (nodes) that creates and powers its blockchain. These nodes run distinct software to fulfil a variety of duties, and depending on their role, may require expensive institutional grade equipment or cheaper consumer-grade hardware.

Light Node

In its simplest form, a node is a computer running the Ethereum protocol. Their role is to broadcast, validate, and relay transactions in the network. These nodes are the recipients and transmitters of data to other nodes, while independently verifying the correctness of each transaction that's recorded on Ethereum's blockchain.

Full/ Archival Node

A more burdensome role is one of a full node, or what the Ethereum community calls an archival node. Their role is to preserve the entire history of transactions recorded on the Ethereum blockchain. Most notably this requires additional storage and synchronisation costs that dissuade the majority of network participants from assuming this duty.

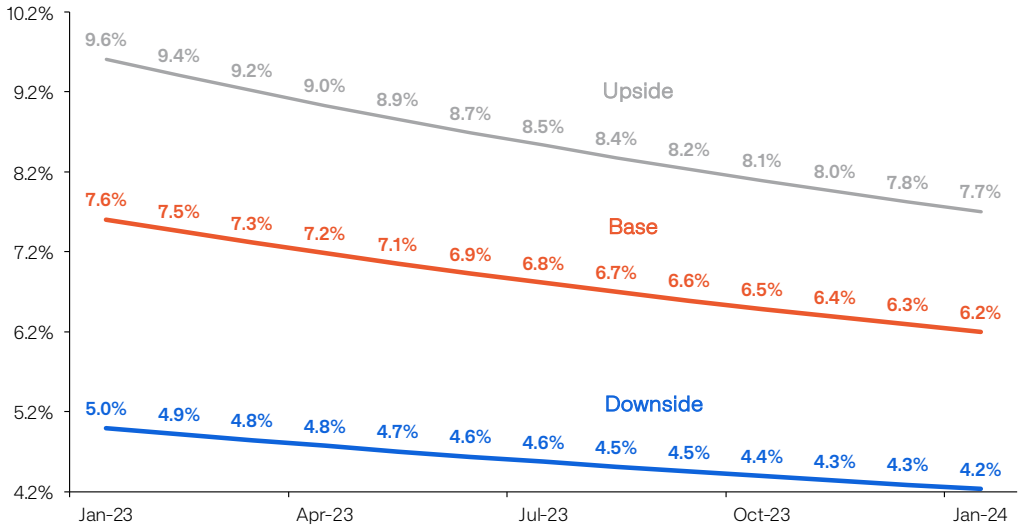
In contrast, light nodes may discard old data deemed unnecessary by their requirements. If Alice is sending 10 ether to Bob, light nodes may not find it imperative to verify how Alice obtained her 10 ether so long as her account reflects the proper balance. Meanwhile, archival nodes readily have a complete transaction record that could identify more detail into Alice's balance history.

Validator Node

Lastly, nodes that choose to act as block producers are called validators. Validators bear the same duties as light nodes, yet they also aid as service providers producing blocks so that new transactions can be added to the ledger. This responsibility requires 32ETH and a mid-range computer to secure rewards by the network via transaction fees (gas) and newly issued ether. Among the validators, the creator of the next block is randomly chosen with the chances of being chosen increasing based on how much ETH one has staked. If a participant acts dishonestly or is offline for too long, a portion of their staked funds get slashed and destroyed.

The Ethereum staking ecosystem is a multi-billion dollar industry with a geographical distribution spanning most of the world. At the time of writing, validators are earning over 1,700 ETH in block subsidies, and 1,400ETH in tips and MEV worth more than $4 million, daily.

Estimated ETH Block Reward and Tip Yields (%)



Source: CoinShares, data available as of close 1 January 2023

Market Participants

Over the course of the last 7 years, a global network of composable services has emerged to serve participants in Ethereum markets. Those in the Ethereum ecosystem can now access large international exchanges offering markets for Ethereum against most crypto and many fiat currencies. Furthermore, technical traders can access a swath of platform-specific financial services that employ automated market makers, synthetic assets, leverage, asset management, lending, and insurance.

Outside of services available to retail, larger-scale and accredited investors such as high net worth individuals, hedge funds, wealth managers, and institutional investors can choose between a broad range of traditional services related to Ethereum such as professional custody, prime brokerage, over-the-counter trading, and fully regulated derivative products.

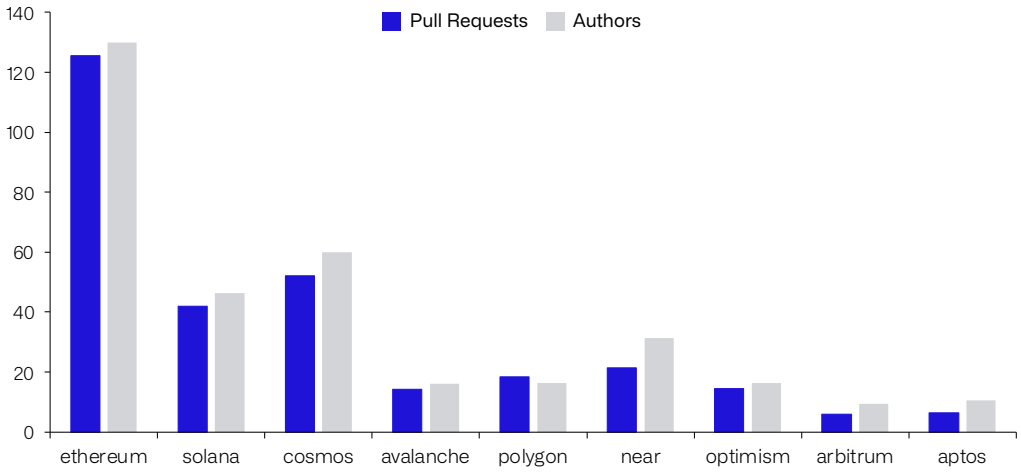
Beyond the tradable asset, Ethereum participants benefit from the utility of ether in applications hosted on its platform, including prediction and collectible markets, social networks, and games.

SWOT ANALYSIS

Strengths

Ethereum's first mover advantage has positioned it years ahead of the competition and allowed time for strong network effects to emerge. It has the largest developer activity and resources among all smart contract platforms. The developer tools in the Ethereum ecosystem are the friendliest and most expansive, making the onboarding process relatively easy. Ethereum also has the largest academic research community behind it with hundreds of papers written on the inner workings of current and proposed Ethereum upgrades and processes. Ethereum's tokenomics also allow it to accrue value (through its burning mechanism) more so than any other platform.

Developer community comparison over last 30 days

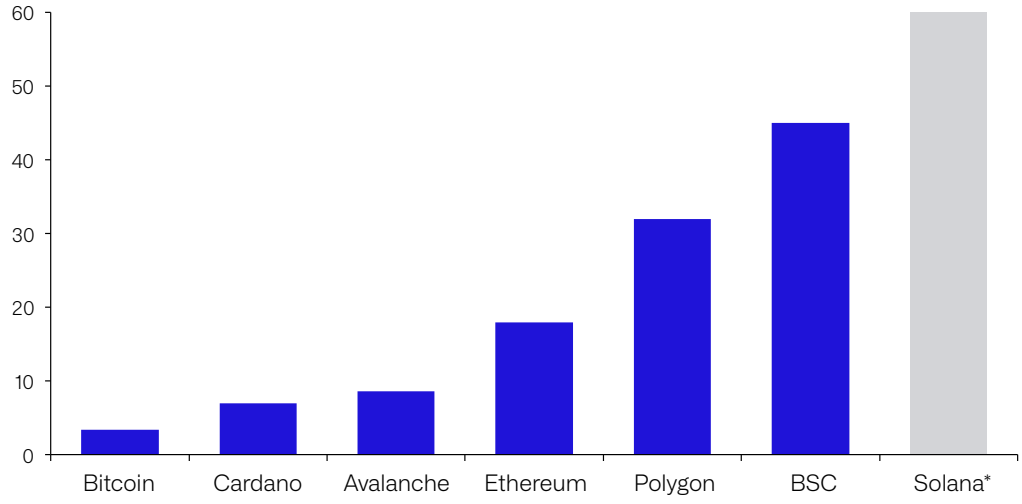


Source: GitHub, CoinShares, data available as of close 16 January 2023

Weaknesses

Ethereum runs on the Ethereum Virtual Machine (EVM) which is slow, expensive and has considerable inefficiencies. While the goal is to keep the hardware costs down, there are better design implementations that could have achieved the same.

Recorded average TPS among leading blockchains

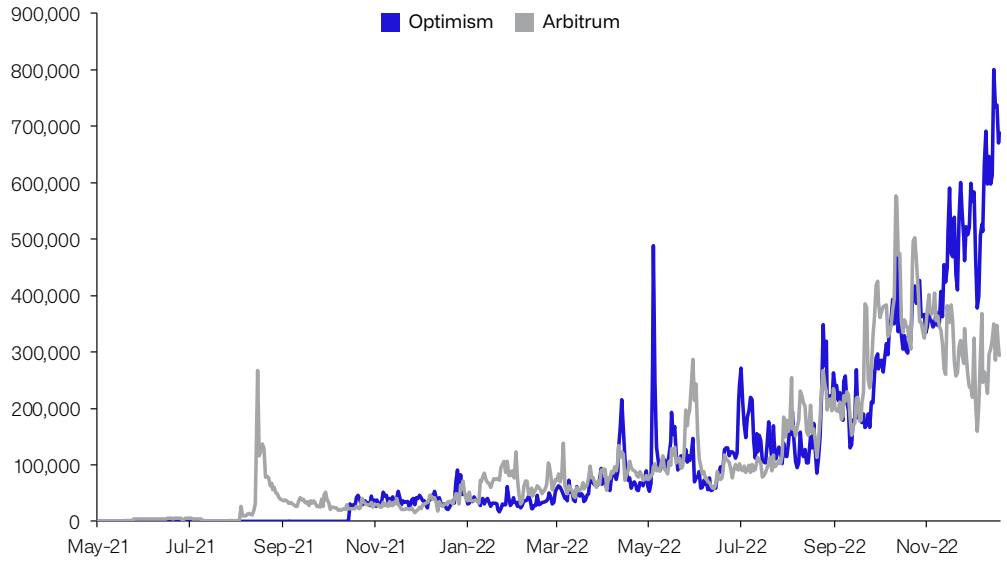


Source: CoinShares, data available as of 1 Jan 23, Solana at 2,923 TPS

Opportunities

Ethereum aims to scale through the use of Layer 2s which will take the burden of executing transactions away from Ethereum and make the network cheaper and faster while preserving the security guarantees. Ethereum also continues to gain more credibility as sound money and this may grow the monetary premium.

Daily transactions on leading Ethereum Layer-2s

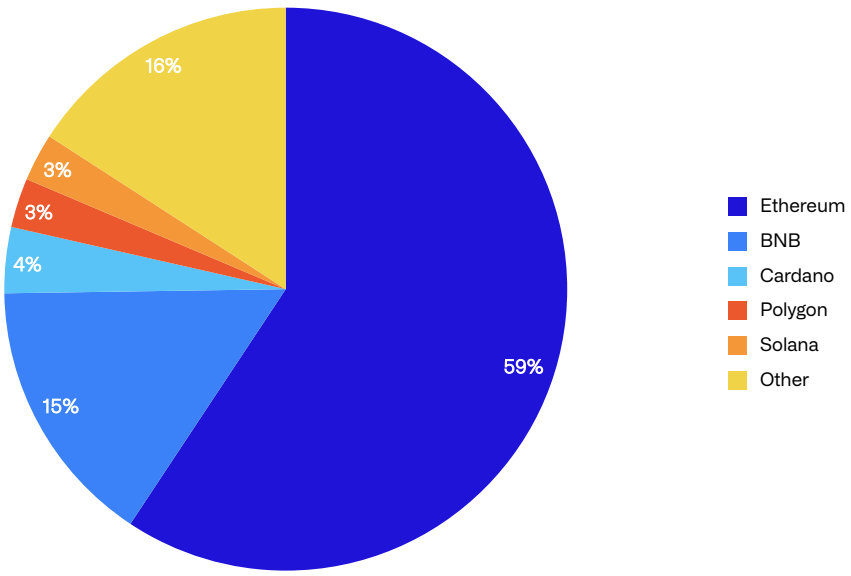


Source: Arbiscan, Ethercan, CoinShares, data available as of close 16 January 2023

Threats

The competition among smart contract platforms continues to heat up as faster and cheaper blockchains continue to gain market share. As of Q4 2022, Ethereum holds 59% of smart contract market capitalization, down from 85% three years ago.

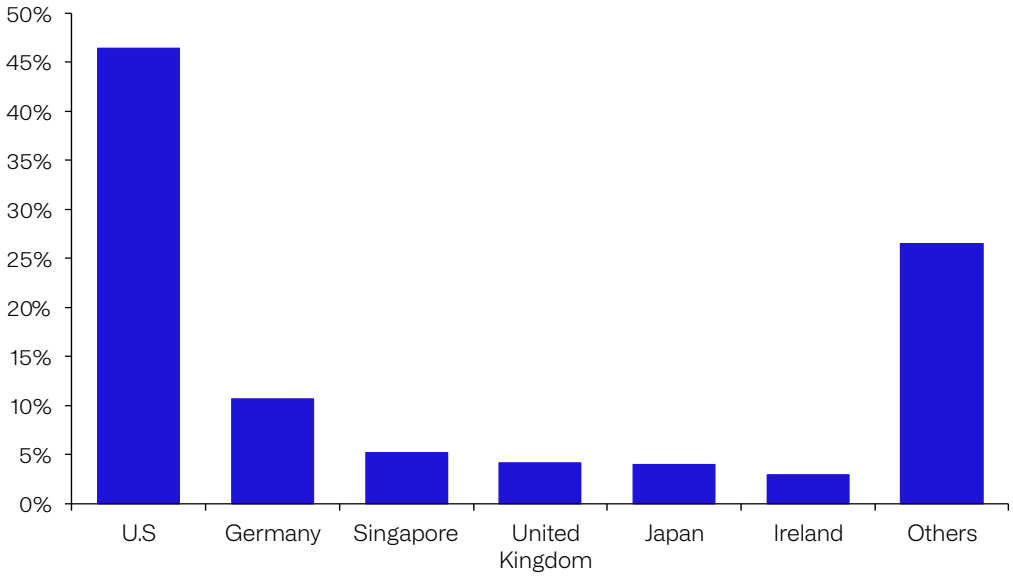
Market Share among Smart Contract Platforms



Source: CoinGecko, CoinShares, data available as of close 16 January 2023

Regulatory risks also remain present as Ethereum's transition to Proof of Stake makes the asset more likely to be treated as a security. The U.S. SEC claimed that it has jurisdiction over Ethereum transactions because nodes "are clustered more densely in the U.S. than in any other country". According to Ethernodes' data, roughly 45% of Ethereum validator nodes operate from the U.S., with Germany in a distant second at 12% and Singapore with 4%. Below we show the estimated geographic distribution of Ethereum nodes worldwide.

Ethereum Node Geographical Distribution (%)



Source: ethernodes, CoinShares, data available as of close 16 January 2023

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ASSET HIGHLIGHT

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