EOS: Analysis and Valuation

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Disclosure: Multicoin Capital owns EOS tokens.

SUMMARY

Introduction

EOS is a blockchain and smart contract platform with a focus on speed, scalability, and user experience. EOS uses delegated proof of stake (DPoS) and a “token ownership as bandwidth” model to achieve high throughput and zero transaction fees.

The EOS open-source software is currently being developed by Block.one, a Cayman Islands company. Block.one is conducting a year-long token sale for an ERC20 token called EOS. This token is merely a placeholder until the free software is released on June 1, 2018. At that time, the EOS community will be able to use the software to launch a proprietary blockchain, honoring the distribution of the EOS ERC20 token at the genesis block.

EOS Background

EOS was first announced in May of 2017 at Consensus. It is the third blockchain project by Dan Larimer, whose past projects include BitShares and Steem, two application-specific blockchains that

are currently among the most used blockchains in the world. All three of these projects are built on a framework called Graphene, developed by Larimer and his team to enable high-throughput, low-latency blockchain applications.

BitShares, a decentralized exchange (DEX), was Dan's first project. In order to create a DEX in which all operations were logged on-chain and processed quickly, the BitShares team needed to create a radically different blockchain architecture, and thus Graphene was born. It's also worth noting that BitShares popularized the concept of a DAO (or DAC), pioneered the first decentralized stablecoin, bitUSD (which served as a precursor to Maker's Dai on Ethereum), and created the first implementation of DPoS. To better understand DPoS, we highly recommend reviewing our report on the topic.

After leaving BitShares in 2016, Dan cofounded Steem and Steemit with Ned Scott. Steemit is a decentralized social network built on the Steem blockchain. Steem was an experimental project in many ways; it introduced a new economic model for blockchains and enabled entirely new features. One of the most prominent features was a new token model that treated the base token as ownership of network resources. Instead of paying transaction fees for each on-chain operation, users are entitled to network resources like bandwidth in proportion to how much of the network token they own. If a user owns 1% of all the tokens, the user is entitled to 1% of network resources when the network is at capacity. This allows Steem to achieve the unique paradox of zero transaction fees and Sybil resistance.

Steemit was arguably the first decentralized application (dApp) to gain widespread adoption. Today, Steem processes, by far, more transactions than any other blockchain.

Larimer left Steem in early 2017 and announced EOS just a few months later. While both BitShares and Steem were application-specific blockchains (for a DEX and social network, respectively), EOS is a general-purpose, Turing-complete platform on which many decentralized applications can be built. EOS is openly and aggressively attempting to complete with Ethereum and other decentralized smart contract platforms like NEO, Cardano, Dfinity, Tezos, and Rchain.

Block.one describes EOS as an "operating system" for decentralized applications. It provides an architecture for validating, governing, and evolving a decentralized network, along with a few innovative features including human-readable account names, protocol-level account recovery, zero transaction fees, and more.

Block.one is an company that builds open-source software, including EOSIO. Larimer serves as Block.one's CTO, but the company is led by CEO Brendan Blumer, a serial entrepreneur based in Asia. Block.one currently employs more than 50 people and is rapidly growing.

EOS THESIS

Per The Smart Contract Network Effect Fallacy, Multicoin Capital doesn't believe that we will see convergence around a single smart contract platform, at least in the near-to-medium term. Rather, we believe that a handful of dominant platforms will emerge, each offering a different set of features and tradeoffs. Not every decentralized application requires the same throughput, security guarantees, level of decentralization, programming language, expressivity, privacy, latency, or consensus structure. Different use cases have different requirements, and developers will choose to build on the platforms that most effectively support their goals.

EOS takes a unique approach to creating a highly scalable platform for smart contracts. EOS prioritizes scalability and end-user experience rather than maximal censorship resistance. EOS aims to maintain censorship resistance to the point of delivering real utility as a neutral database, but does not aim to be maximally resistant to censorship in the same way that Bitcoin or Ethereum do. The EOS team recognizes that decentralization requires tradeoffs in both economics and performance. For most blockchain-based applications, being hosted on a distributed, neutral database that offers high throughput and fast finality is much more important than maximizing decentralization. EOS recognizes that for global scale dApps, having each and every transaction validated by a large network of consumer-grade computers all over the globe is both unrealistic and unnecessary.

There is a lot of debate over how to define decentralization and whether certain blockchains are more or less decentralized. For a detailed exploration of delegated proof of stake (DPoS), the consensus mechanism used by EOS, see our DPoS report here. **EOS attempts to optimize for speed and throughput by using only as much decentralization as necessary to maintain useful levels of openness, censorship resistance, and lack of a single point of failure.**

With these goals in mind, EOS is able to take a design approach that is much different from that of other smart contract platforms. Ethereum borrowed a lot from Bitcoin in its original design, including PoW consensus that is slow and expensive. While this may have helped to bootstrap the network, it has also led to a lot of challenges for Ethereum. At peak capacity, the network becomes practically unusable. Historically, a single dApp such as Cryptokitties has brought the Ethereum network to a halt. Everyone involved in Ethereum recognizes the need for radical changes to the architecture of the protocol, but they are attempting to change out the engine of a ~60 billion dollar network as it is speeding down the highway. Not only is it risky, but the proposed changes are themselves experimental—even if the *transition* to PoS is successful, the security and scalability of Casper PoS and sharding may not be sufficient.

Ethereum's leadership has openly stated that they are attempting to solve the scalability trilemma and offer safety, scalability, and high levels of decentralization of block production. This is a very difficult problem to solve. In theory it is ideal, but in practice it may be unrealistic. Even if Ethereum manages to scale well beyond its current capacity, the market may prefer even faster and more user-friendly platforms that have theoretically lower levels of decentralization.

EOS is designed from the ground up to be scalable, user-friendly, and *fast*. It uses DPoS, Graphene, message-based architecture, the web assembly virtual machine (WASM), accounts and usernames, protocol-layer account recovery, and a variety of other optimizations that will be explored below. Betting on EOS is a recognition that there is a huge market for decentralized applications that simply need to be hosted on a neutral, global database that offers platform-grade censorship resistance but has high throughput, speed, and finality. Optimizing for sovereign-grade censorship resistance and decentralization *at the expense of performance* makes sense for certain cryptoassets like Bitcoin and Monero. For a global smart contract platform intended to host thousands of user-facing dApps, it does not.

EOS is likely to be one of several smart contract platforms that dominate the market. EOS is an Ethereum competitor in the sense that it will be courting many of the same projects that would currently choose to build on Ethereum. However, there may be a future in which EOS, Ethereum, and one or two other platforms coexist. DApps that need extremely high throughput, speed, and no transaction fees (decentralized social networks, decentralized video and audio platforms, games, ad networks like BAT, etc) will choose to build on EOS, while those that require extremely high levels of censorship resistance (prediction markets, gambling, etc) may build on Ethereum or other protocols that attempt to maximize censorship resistance.

One criticism of EOS is that EOS will only capture the market for applications that don't need to be on a blockchain in the first place. High-throughput, low-latency applications that don't require strong levels of censorship-resistance should be built on a database, not a blockchain. There are a few responses to that.

The first is that EOS could prove to be very censorship resistant in practice. While some applications that live in legal grey territory, like prediction markets or gambling, may seem like a better fit for other platforms, they may do well on EOS. We expect that application developers will deploy applications that test the limits of EOS's censorship resistance soon after the platform launches. If an individual block producer chooses to censor transactions, for example by excluding transactions from an EOS casino because gambling is regulated in the block producer's jurisdiction, those transactions would still be processed by the next block producer. Repeated attempts at censorship could get the violating block producer voted out. If this is the case, then EOS may prove just as censorship resistant *in*

practice as other platforms like Ethereum. With the added benefit of high throughput and low latency, EOS could be a more compelling choice for any number of applications.

The second response is that some applications may not *require* decentralization, but could still benefit from it greatly. Steem is a great example. Steemit is a centralized website, owned by a company, that operates on a decentralized back end—the Steem blockchain. This benefits both the company and the users. By building on top of Steem, Steemit can benefit from the rewards pool provided by the entire protocol. They can offer an attractive proposition to users—get paid for your content—without having to fund those payments themselves. Further, their platform is available worldwide, without restrictions.

Anyone in any country can contribute content on Steem (either through Steemit or another interface) and get paid for their contributions. There are no barriers to entry. Users can provide and consume content, participate economically, and buy and sell good and services within a digital realm without the barriers that traditionally keep them from doing so. These platforms could radically increase economic inclusion. For users, there is additional benefit in that they can opt out of services they don't like, while still maintaining all of their user data. If I, as a user, disagree with the terms of service or the direction that Steemit is taking, I can move to another Steem interface like Busy.org, while maintaining all of my data, content, and funds—all of which live on the blockchain rather than the servers of the centralized entity.

This architecture puts much stronger limits on the ability of centralized services to own user funds or data, and it also introduces more options for users (and thus more competition to keep centralized services honest). Finally, decentralized applications can offer products and services to a global audience without the barriers imposed by regulations, firewalls, and the need for centralized payment processors like PayPal. These benefits can be generalized to mean that decentralized applications will be globally accessible, will offer better control to users, will have lower barriers to entry, and will put less control in the hands of centralized entities, middlemen, and gatekeepers. If built on a platform like EOS that allows them to have similar user experiences to centralized applications, decentralized applications offer notable benefits.

The third response is that developers need certain guarantees about the nature of the platform upon which they're building. A developer doesn't want to deploy a Facebook application knowing that any top-down decision from the Facebook executives could destroy her business model; developers and investors see the platform owner changing the rules as too big of a risk (e.g., Instagram neutered URLs in posts which severely impacted some business built on top of it). With EOS, the network itself is a shared resource, and ownership and say over its direction is proportional to one's stake. EOS's value proposition is that it is a high-throughput, neutral, global database. This gives developers more

freedom over their applications and confidence that they will not be rendered worthless by a platform like Facebook's centralized ownership.

EOS PROTOCOL MECHANICS

Delegated Proof of Stake

For a detailed look at the features, tradeoffs, attack vectors, and advantages of DPoS, please see our in-depth report.

Delegated Proof of Stake (DPoS) concentrates block production in the hands of just a few, known, semi-trusted entities in order to achieve orders of magnitude more scalability than proof-of-work (PoW) or other proof-of-stake (PoS) blockchains.

In DPoS, those who hold the network token are able to cast votes to elect block producers; votes are weighted by the voter's stake, and the block producer candidates that receive the most votes are those who produce blocks. Users can also delegate ("proxy") their voting power to another user who can vote on their behalf; some users may choose to outsource these decisions to trusted friends or community members. **DPoS is a liquid, representative democracy with token holder suffrage.** DPoS can also be thought of as a formalized, digital version of a traditional organizational hierarchy that operates in a completely transparent way. While there are problems with both democracy and corporate governance that are beyond the scope of this paper, one compelling feature of DPoS is that the open-source nature of these protocols means that users can fork if they disagree with the majority. The same cannot be said of democracies, corporations, and other organizational structures. DPoS adopts ideas from many traditional governance models, but is ultimately far more flexible and transparent.

Block producers can be voted in or out at any time, so the threat of loss of income and reputation is one of the major incentives against bad behavior. Additionally, slashing conditions can be implemented in DPoS rather trivially. Most traditional PoS implementations allow users to produce blocks proportional to their stake in the network. DPoS allows users to cast votes proportional to their stake to decide who produces blocks. Block producers themselves do not necessarily need to have a large stake, but they must compete to receive votes from users.

Every one of Larmier's projects has used DPoS, but it has evolved with each project. With EOS, Dan has introduced the concept of BFT DPoS (Byzantine fault-tolerant DPoS). Larimer describes the system as follows:

> "Blocks are produced with 99.9% finality every 0.5 seconds and confirmed with absolute finality every 2 seconds or better. We achieve this by having block producers send out a block confirmation every time they extend their local chain. A byzantine fault is proven if a block producer sends out two confirmations for the same block height or block time stamp. Producers include an incrementing sequence number with each confirmation they send. A producer who sends two confirmations with the same sequence number is also proven to be byzantine.
>
> Since only one producer can produce a block at any time, and producers only switch forks when a longer chain is found, forks that would create different irreversible blocks are only possible if over ⅓ of producers commit cryptographically provable byzantine faults. In such a situation, the community through the constitution can take actions to freeze the producer's accounts and the misbehaving producers can automatically be removed from the block schedule. The DPOS chain would still continue under the longest-chain rule until the issue is resolved."

For a further details, see this video interview with Larimer and this section of the EOSIO white paper.

WebAssembly (WASM) Virtual Machine

EOS will launch using the WebAssembly (WASM) virtual machine. Ethereum currently uses a proprietary VM called the Ethereum Virtual Machine (EVM). WASM is widely acknowledged to be a faster and all-around better solution than the EVM. Even Ethereum is working on a WASM implementation. Other Ethereum competitors such as Dfinity will launch with WASM. WASM has the following advantages:

1. Improvements in terms of speed and performance
2. Support for C, C++, and Rust, with compilers for other languages in progress

This means that developers who already have experience with those languages can quickly begin building on EOS, instead of having to learn a new language like Solidity in order to create dApps and smart contracts. Further, this means that developers can leverage all sorts of tooling and software libraries that have already been built for those languages when building on EOS. Finally, the use of WASM will provide superior optimization and debugging tools. All of these features will help to accelerate and simplify the development process.

EOS FEATURES

Below, we explore the main features of EOS.

Scalability

EOS will be far more scalable than Ethereum and will likely be more scalable than other competitors. The developers of EOS realized that a smart contract platform for large-scale dApps would require radically higher throughput, speed, and bandwidth than Ethereum currently offers. Ethereum's scaling problems are well known, with certain ICOs and Cryptokitties causing the network to become unusable. The few dApps that have launched have almost universally resulted in network congestion issues, and Ethereum clearly can't support an ecosystem of large dApps in its current state. Ethereum developers are now racing to find scaling solutions, with several in the works including Plasma, Sharding, PoS, and state channels.

Instead of starting with PoW and gradually scaling up as Ethereum is doing, EOS will launch with scalability as a primary design goal.

Part of EOS's scalability is derived from its use of DPoS. DPoS allows for blocks to be produced and propagated *much* faster and more efficiently than PoW or PoS does. BitShares and Steem both have 3-second block times, while EOS is targeting 0.5 second blocks. As mentioned above, the use of the WASM VM and the exclusion of state in consensus allow for further speed improvements.

The EOS community testnet is currently up and running with 2-second blocks, and recently achieved 600 transactions per second. This was accomplished on consumer-grade hardware, which is substantially less powerful than what mainnet block producers will utilize. In a recent development update, Larimer said that the network is set to debut with 1000-6000tps (depending on certain optimizations), 0.5 second block times, and ~1-second finality. Further improvements can be made in the future with parallel execution and interoperable chains. Ethereum offers 15 tps, 15 second block times, and ~2 minute transaction guarantees with no explicit finality. Performance numbers for Casper PoS are not yet available, but Ethereum's use of sharding should provide similar features to EOS's use of interoperable chains (though perhaps with more latency, depending on time to finality).

When new blockchain projects emerge with grand promises relating to scalability, they should always be taken with a grain of salt. It's quite easy to promise 100,000 transactions per second; it's entirely different to build a blockchain that's capable of that. What makes the claims about EOS different is that Larimer has built highly scalable blockchains using similar architecture before. At the very least, EOS should be expected to match the performance of BitShares and Steem. Based upon current development progress, we expect it to be even faster.

Token Ownership as Network Resources / Zero Transaction Fees

Perhaps the most interesting feature of EOS is its unique token model. In most existing smart contract platforms, the native token (e.g. ETH) is used primarily to pay transaction fees on the network. Each

operation on the network requires the user to pay a small fee to compensate block producers for performing a computation and updating the state. This system serves two functions:

1. It prevents Sybil attacks or spamming of the network by making those things prohibitively expensive.
2. It compensates block producers for securing the network.

Because validators receive transaction fees from the blocks they produce, transaction fees contribute directly to network security—they provide an incentive for validators to participate in the validation process. Networks like Ethereum and Bitcoin currently operate on a hybrid model—validators are compensated through inflation (block rewards) and through fees. Unfortunately, due to limited network resources, transaction fees can become prohibitively expensive.

Growing transaction fees on Bitcoin have changed the narrative from Bitcoin as "digital cash" to Bitcoin as a store of value or settlement layer. But high transaction fees are arguably even more prohibitive on smart contract platforms like Ethereum, since network operations aren't just value transfers. On Leeroy, a decentralized Twitter clone built on Ethereum, for example, users have to pay a small fee for every tweet, like, retweet, and response. Even at just a few cents, these fees result in a terrible user experience.

Furthermore, if the network is operating at capacity, users compete to outbid one another to have their transactions included by paying higher gas costs than other users. Miners may even be incentivized to take advantage of users by gaming these incentive models.

EOS uses an entirely different token model. Instead of using base tokens to pay network fees, EOS tokens represent network ownership and access to network resources. If a user owns 1% of all EOS tokens, the user is entitled to 1% of total network resources such as bandwidth, CPU, and memory. **As a result, EOS transaction fees are always zero**. Users don't have to pay transaction fees to use the network—instead they must own (or rent) network tokens. Instead of using a hybrid model of fees and inflation to pay block producers, EOS just uses inflation.

You can think of EOS tokens as a digital commonwealth: In this model, EOS tokens represent ownership of digital, fungible real estate. It is a scarce resource that not only entitles owners to governance rights (via delegated on-chain voting), but also can be utilized by the owner for access to network resources or trustlessly rented out to others. EOS token holders that aren't actually using the network themselves could, for example, rent out their resource access to dApps built on EOS. This is akin to collecting rent on a digital property. We think this token model is one of the most profound and interesting developments in the entire blockchain space. It enables entirely new business models for dApps and token holders, and it also allows for the creation of dApps and services that simply

wouldn't be possible on platforms that require transaction fees. In our valuation section, we'll dive into how value will likely accrue to this platform token.

Usernames and Accounts

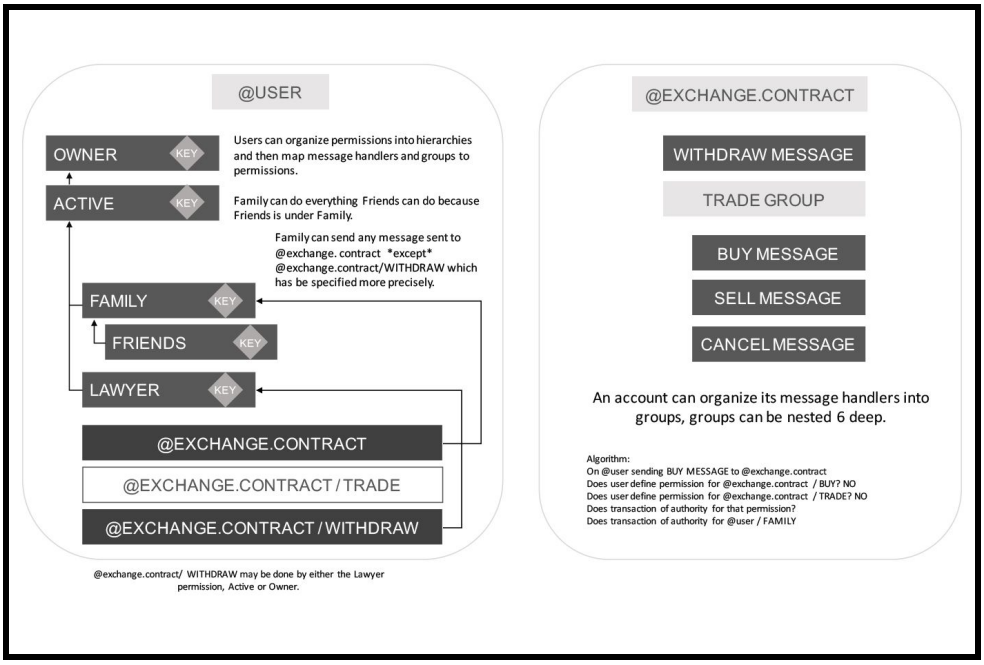
Another important and innovative feature of EOS is its use of human-readable usernames and account recovery, both of which are implemented at the protocol layer.

In most blockchains like Bitcoin and Ethereum, "accounts" are represented by long strings of letters and numbers. These addresses are difficult for humans to read, remember, distinguish, and type. It's hard to imagine all of the UX issues and lost funds that have resulted from the lack of human-readability for these addresses. It's widely recognized as one of the most pressing UX issues in the crypto space, and has led to projects like the Ethereum Name Service and Monero's OpenAlias.

EOS, like BitShares and Steem before it, makes usernames an inherent feature of the protocol. A user could register the name @multicoincapital, and those who were sending funds to that address would simply have to verify the username in the same way they do with Venmo or Twitter. The protocol also allows for namespaces; the user who owns @multicoincapital would be the only one who could create sub-accounts like @myles.multicoincapital or @kyle.multicoincapital. Accounts can also be transferred between users.

EOS also offers accounts the ability to have flexible permission management systems. This means that accounts can be controlled by a weighted group of other accounts, and accounts can delegate permissions to others without handing over their private key. This could mean, for example, that the account @myles could be given permission to post to social media under the account @multicoincapital. @myles would not control any of @multicoincapital's keys, but @myles could still send certain messages from @multicoincapital that would be authenticated. Importantly, the messages would still be signed using the keys from @myles, so it would be possible for the account that grants authority to know exactly which account took which actions on its behalf. This makes it possible for organizations to create flexible but secure ownership and permission structures, just like they do outside of the blockchain.

The details around how these permissions are implemented can be found in the EOS white paper. All accounts automatically create two permission groups. The first is the "owner," and the second is "active." The active permission can do anything except change the owner. New subsets of permissions and configurations can be built down from the active permission, while the owner permission key can be a multisig and/or kept in cold storage.



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The software also allows for accounts to specify time delays on certain types of transactions. For example, if a user wishes to transfer ownership of their entire account, they could specify a 7-day delay after the transaction is broadcast before it is executed. During that delay time, they could cancel the transaction if need be. These time delays can be configured in many different ways by users and application developers, but this functionality has the ability to greatly increase security and drastically reduce incentives for theft in certain situations.

The single most innovative feature of EOS's account system is the introduction of protocol-level account recovery. In Ethereum and Bitcoin, the idea of protocol-layer account recovery simply doesn't exist; the only way to achieve account recovery is to outsource key management to a third-party service like Coinbase. That is helpful for some users, but it requires using a trusted third party and thus means that users don't actually own their keys. Without using a third-party custodian such as Coinbase, if a user loses her keys, she's out of luck. Ethereum smart contracts could be used to approximate protocol-layer account recovery, but none exist yet, two years after Ethereum's launch.

On EOS, users can maintain complete control of their own private keys, while also having recourse in the case that their keys are stolen. Users can specify one or more "account recovery partners." If the user's private keys are stolen, they can work with their account recovery partners to reset their owner private key. They can use any owner key that was active in the last 30 days, plus the approval of their recovery partner(s), to reset the owner private key. Unlike a multi-signature account, the account recovery partner only helps with account recovery and otherwise has no control over or access to the

account. This setup leverages the power of real-world social networks to make key management more user friendly. It is extremely powerful for consumer adoption.

To date, blockchains have mostly seen wide adoption with a very technical crowd. Those that aren't technical often utilize third-party services to manage their private keys, since this can be a daunting and risky task to undertake. With EOS, non-technical users can have much more confidence that having a private key stolen won't cause them to completely lose access to their funds. In a way, this recovery system bridges the gap between a user's real world identity and her set of private keys.

This also carries huge implications for businesses that, to date, have been hesitant to use blockchain technology. Using EOS, companies could much more comfortably utilize blockchain platforms, assigning permissions to employees without handing over private keys, customizing ownership structures, and knowing that the risk of theft or loss was greatly diminished as compared to alternative platforms. EOS assets (including usernames and accounts) are still bearer instruments; now there are options for account recovery that are built in at the protocol level.

Once this structure is in place, businesses across the board will likely become much more willing to adopt blockchain technology. Organizations could create permissions systems that spread out ownership (and thus risk of single points of failure), while also trustlessly creating hierarchical structures that mimic those of the real world.

On-Chain Governance (and Off-Chain Politics)

EOS, through its use of DPoS, offers on-chain governance. This means that token holders can use their tokens to vote on protocol decisions that are automatically put into place. The most important use case for on-chain governance in EOS is to vote on block producers. However, the token holder voting can be used in a variety of other ways—to vote to change system parameters, to update the constitution, to decide on inflation rates, and more. For an in-depth look at some of the features and pitfalls of DPoS as on-chain governance, see our DPoS report.

Governance is one of the most hotly debated issues in the entire blockchain space. There are many layers to this debate, but one of the most contested is the simple question of whether blockchain governance should take place on-chain or off-chain.

While there are some arguments to be made against on-chain governance, it is an experiment worth taking. There are very few examples of existing protocols that have implemented on-chain governance at scale. Whether or not Bitcoin and Ethereum's off-chain governance is "working" is largely a matter of opinion. It is difficult to say which model is better. The basic argument in favor of on-chain

governance is that all blockchain communities are political by nature, so it is better to formalize a system for decision making than to let informal governance devolve into gridlock.

EOS is built on on-chain governance—it is a core feature of the protocol. EOS's biggest competitor is Ethereum, which has no formalized governance. It will be interesting to watch these two platforms operate in practice. The market will ultimately decide whether on-chain or off-chain governance is a better approach. Some use cases may require formalized governance, while others may prefer the less formalized approach. It is likely that many businesses will prefer to know that there is a well-defined structure by which they could resolve disputes, upgrade faulty contracts, freeze buggy accounts, and update the constitution.

Off-chain governance makes sense for something like Bitcoin, which aims to be an immutable and highly decentralized store of value. It makes less sense for something like EOS, which intends to be fast, flexible, and support many businesses built on top of it.

With on-chain governance comes an increase in organized off-chain politics. Because the decision making process for EOS is well-defined, various groups see a greater opportunity to push their agenda and actually have it enacted. The EOS blockchain has not even launched yet, and ecosystem politics are already beginning to play out. Several different parties have already launched campaigns to be voted in as early block producers when the network launches. The EOS community is engaged in active debates over whether block producers should pay for votes, whether token holders should be required to lock up their tokens in order to cast votes, and more.

EOS is one of several prominent blockchain projects that will launch this year with on-chain governance (Tezos and Dfinity are both also using on-chain governance; Dash is already live with on-chain governance). **The blockchain space is about to become a lot more political**. With on-chain governance, there's a very direct and clear path to determining changes to the protocol. This is not possible with Bitcoin and Ethereum. It will be very interesting to witness the effects of this process.

On one hand, it seems likely that on-chain governance will result in protocols that evolve faster, as on-chain governance *forces* decisions to be made when there are disputes. With off-chain governance, disputes often devolve into gridlock and favor the status quo. On the other hand, this approach may actually lead to *more* forking. On-chain governance will make it explicitly clear where the majority of the community stands on certain issues. Those who are in the minority may decide to fork as soon as a decision they've opposed is enacted. It is difficult to predict the long-term consequences of on-chain vs. off-chain governance, but we look forward to watching this experiment play out.

EOS Storage

EOS block producers, in addition to validating transactions, will offer storage services. EOS.IO Storage is a system that uses the InterPlanetary File System (IPFS) for content addressing and block producers for physical storage.

Unlike other decentralized storage systems like Filecoin and Storj, EOS Storage doesn't require users to pay ongoing fees. In those systems, users enter into contracts with hosts for a specific duration of time. When this time has elapsed, the user must renew the contract in order to continue having the files hosted. With EOS storage, users must put a certain number of EOS tokens into a storage contract, and they are guaranteed to have those files stored, in perpetuity, until they decide to remove their tokens from the contract. This guarantees that files will be available no matter what. This will help to make sure that smart contracts and dApps that reference certain files will always have a direct path to that file, no matter what, as long as the creator's tokens are still held in escrow.

The tokens used for storage are essentially a fully refundable deposit—another form of access to network services. Another way to think about it is that tokens that are used to secure *permanent* storage are effectively burned. Because EOS pays block producers through inflation, users who lock up tokens to access storage are being diluted through inflation during the time the storage is being provided. In this way, users are paying for storage without having to make a stream of recurring payments.

For more specifics on how EOS Storage works, including how prices and capacity are calculated and how files are uploaded and replicated, see the EOS Storage white paper. EOS storage is not expected to be available upon network launch in June; it is a feature that will be added in later.

Digital Constitution

EOS has proposed the idea of a "digital constitution," described as a peer-to-peer terms of service agreement that binds all users who sign it. Every user must include a hash of the constitution each time they send a transaction, which signals their agreement to the terms contained within. The constitution is meant to serve as a human-readable expression of the intents and rules that all participants have agreed to. Some things that may be contained in the constitution could be enforceable at the protocol level, but much of it can't be. So while each user is required to include a hash of the constitution, that action in and of itself doesn't force them to adhere to its terms. But the idea is compelling nonetheless. If EOS is a digital commonwealth, the constitution is the EOS version of the US Constitution, Bill of Rights, and current legal frameworks rolled into one.

Most blockchains are designed in a way that incentivizes users and participants to act a certain way using economics, game theory, and cryptography. Terms of service agreements and national constitutions, on the other hand, don't in and of themselves incentivize people in any certain way. They simply define and formalize the desires of the community so that any actions that violate those terms can be identified—what happens next depends on the community itself. The EOS digital constitution attempts to fuse these two principles. There are certain features that can be designed into the protocol itself (for example, a way to agree on the ordering of transactions), and there are certain features that can be incentivized (for example, incentivizing block producers to act honestly so as not to lose their jobs). But there is a wide swath of desired outcomes that can't be enforced or even incentivized easily. EOS introduces a constitution to define these community values and will introduce a system of dispute resolution to interpret and enforce against violations.

The EOS constitution can also be updated (with a time delay) after 15 of 21 block producers agree to the new changes. We fully expect the EOS constitution of evolve as time goes on. There are currently many lively governance discussions happening on Telegram, EOS forums, and other venues about the first draft of the constitution that will launch with the blockchain in June.

Self-Funding Though Inflation

All blockchains must pay for security through either inflation or transaction fees. In order to incentivize validators, whether they are PoW miners or PoS block producers, blockchains must pay these network participants for their services. Currently, both Bitcoin and Ethereum use a hybrid model; miners are funded through inflation (in the form of block rewards) and through transaction fees. Ethereum intends to move to a PoS model that is also a hybrid, while Bitcoin will eventually transition to a model of pure transaction fees.

Using transaction fees to pay for network security is a poor user experience. It seems highly unlikely that Bitcoin can sustain its security through just transaction fees unless those fees are exorbitantly high; many in the Bitcoin community have postulated that securing the Bitcoin network may become infeasible as inflation approaches 0%. Transaction fees also force active users of the network to pay for security, while passive users get a free ride. Those using Bitcoin as a long-term store of value could benefit from the network's security to protect their value without ever contributing to the security through transaction fees. Transaction fees are also highly variable and create unpredictable rewards for validators.

The situation is arguably even worse for Ethereum. Ethereum is intended to be a world computer and platform for user-facing decentralized applications. Forcing users to pay a transaction fee for every operation is extremely prohibitive and offers a terrible user experience. Certain classes of applications are simply unimaginable in this paradigm. Forcing users of a social network to pay for every like,

repost, and follow, even if it is a small micropayment, is not likely to attract many users (see Peepeth). This approach naturally forces applications to take many operations off-chain, which potentially decreases their security.

EOS has no transaction fees, which means that it uses inflation to fund network security. The software has a hard cap of 5% annual inflation hard-coded, and users can vote on how much inflation to allow. Block producers all vote on how much of this inflation they want paid to them, and the median of the block producer requests is implemented (users can also vote out block producers who request too much inflation, so this parameter is ultimately up to token holders). Once block producer pay has been set, users can vote on what to do with the rest of the inflationary funds. One option is to simply burn the additional tokens, reducing overall inflation. Another option is to use these funds to bankroll the development of the blockchain itself.

If block producers consume, for example, 3% of the 5% annual inflation, then 2% is left over to be used at token holder discretion. These additional funds can be allocated to community benefit contracts—this means that they can be spent in any number of ways as dictated by token holder votes. The funds could be directed to several different smart contracts, each of which pays a different development team. Some of the funds could be used to offer bounties or to host hackathons. In this way, the blockchain could use inflation to fund its own development. Developers with ideas for how to improve the blockchain in any number of ways can campaign to be funded *by the blockchain itself*, contingent upon token holder approval. This is also interesting in that these funds could be directed not only towards projects that improve the blockchain, but also toward projects built on top of it (or even off-chain projects) that the community thinks are valuable.

Upgrades and Bug Fixes

All code is subject to bugs. EOS recognizes this and attempts to formalize ways to mitigate damage.

In any blockchain, validators can choose which transactions to include. This effectively gives them the power to censor certain transactions. EOS recognizes that there is a difference between malicious censorship that attempts to exclude certain participants from the digital economy, and benign censorship that simply attempts to prevent buggy code from executing.

EOS offers two options for block producers to deal with buggy, faulty, or aberrant code. The first option is to “freeze” accounts. If 15 of 21 block producers agree, an account or contract can be frozen until it is updated. This can help prevent buggy contracts from consuming too many network resources, inadvertently leaking funds, or other issues. Block producers can also, through a 15 of 21 agreement, change the code of applications or contracts. Again, a majority of block producers must

agree before these actions can take place. If users of EOS disagree with the decision, they can vote out the block producers and replace them with others who support the community consensus.

Inter-blockchain Communication

EOS's prioritization of scalability comes in several forms. The various scalability optimizations described above can improve scalability significantly, but the throughput of a single chain eventually caps out, even with hardware and software optimizations. EOS's plan for higher levels of scalability involves not just scalable single chains, but perhaps thousands of interoperable, communicating chains.

EOS approaches interoperability by making it possible to implement a light client as a smart contract. Light-client validation is baked into the protocol from the beginning, meaning that one chain can verify that events on other chains are valid and then take actions based on those events.

This approach, combined with EOS's one-second finality, means that round-trip communication between two EOSIO chains can happen in three seconds or less. This low-latency communication means that applications and block producers can spread out transaction loads across different chains, all of which have shared security and are validated by the same set of block producers. Further, the core group of block producers could validate hundreds or thousands of different chains but use the same EOS token for resource access on all of them. This would create strong network effects and value accretion around the EOS tokens.

MISCELLANEOUS

Block.one Capitalization

EOS is likely the most well-capitalized project in blockchain history. Block.one's year-long ICO has been the most successful token sale in history, having raised well over $2B USD. The company now has a war chest of capital.

The legal wording of the EOS token sale defines these proceeds as revenue for Block.one, but the company has announced its intention to reinvest the vast majority of these proceeds into the EOS ecosystem.

We certainly don't believe that capital alone allows projects to succeed. In fact, it can often do the opposite. Too much capital can cause teams to become unmotivated and wasteful. Still, the potential advantages to such a war chest, if it is used correctly, cannot be understated. In addition to its

massive amount of capital, Block.one has an allocation of 10% of all EOS tokens. Block.one will not control the EOS blockchain that launches in June (in fact, there may be several blockchains that launch using the software), but they can use their proceeds to build up the EOS ecosystem and drastically increase the value of their token holdings.

Block.one is already making aggressive moves to promote EOS through key partnerships and hires. They recently brought on Richard Jung, the former CEO of Bithumb, as the Head of Korea, a key market for the blockchain industry. We expect Block.one to continue making strategic moves along these lines and to continue to deploy capital towards making EOS successful.

Ecosystem Funds

One of the ways that Block.one has been reinvesting its token sale proceeds is through various ecosystem funds. The first of these was a $50M fund in collaboration with Tomorrow Blockchain Opportunities. The second fund announced was a $325M fund managed by Mike Novogratz's Galaxy Digital. Two more were announced recently: a $100M fund with FinLab AG and a $200M Asia-focused fund called EOS Global. More of these funds are in the works.

Ecosystem funds have become quite popular in the last year. Dfinity announced an ecosystem fund led by Polychain, Ethereum announced an ecosystem fund led by L4, Rchain has a $190M dedicated fund, and Tezos and other projects are expected to do the same. These funds are a way for well-capitalized foundations to outsource fund management to professional investors who can make strategic investments that increase the value of the projects and tokens. These EOS ecosystem funds should help ensure that proper EOS infrastructure is built and that many teams are incentivized to build projects on top of EOS.

Airdrop Culture

One interesting development in the EOS ecosystem has been the emergence of an "airdrop culture" as part of the community social contract. Everipedia, one of the first major projects to announce that they will be building on EOS, has stated that instead of conducting a token sale, they will be airdropping their platform tokens (called IQ) to all existing EOS holders at the genesis block. Several other projects have followed suit.

Airdropping is a great way to earn the support of the EOS community, and in many ways it represents a "dividend" for EOS holders. It will be interesting to see how this evolves. Currently, there seems to be a strong norm in the EOS community in favor of having projects airdrop to EOS token holders. This certainly isn't required, and it is likely that some projects will distribute their tokens in other ways—through an ICO or by selling them to private investors. Airdropping is, however, a smart option

for many projects because it will greatly help them to earn the goodwill and support of the EOS community. Everipedia set the example, and other projects have followed suit. As this continues, it will become an even stronger part of the EOS community culture.

RISKS

Legal Risk

Block.one's token sale is legally ambiguous. The year-long sale is the longest ICO ever conducted. It's also one of the largest crowdsales in history, so it wouldn't be shocking to see the project draw the attention of regulators. Block.one has been clear in its legal language, stating that the ERC20 tokens being issued are merely placeholders for an optional community launch distribution snapshot and that they don't have any value. They also blocked US and Chinese citizens from participating directly in the sale. The terms and conditions of the crowsale specify very clearly that the proceeds from the token sale are revenue for Block.one and don't imply any fiduciary obligation.

It's easy to see how these conditions are off-putting for investors.

A year-long token sale means that people have the option to increase or decrease their positions in response to development progress, market sentiment, and more. It also means that, *at launch*, the EOS distribution will have gone through a year's worth of market churn. The distribution at launch will more greatly reflect those who have strong conviction in the project and are more likely to participate in things like voting and using dApps. The overall distribution may even be more wide and equitable as a result. ICOs with short windows necessarily exclude those those who don't have liquid, available capital during that time window. The EOS token sale, using a daily pro rata Dutch auction, makes it hard for a single whale to purchase a large chunk all at once.

By not selling an actual network token for the software, Block.one may be avoiding serious legal liabilities. But investors should understand that owning the EOS ERC20 tokens is a strong guarantee that they can access EOS tokens when an EOS chain launches. The year-long sale on ERC20 tokens allowed the market to set a value for what holders of that token believe EOS tokens should be worth. The holders of the ERC20 tokens are those who have decided that the EOS blockchain is valuable. If someone were to launch an EOS blockchain and *not* honor the distribution of the ERC20 token, it seems highly unlikely the community would adopt it. While it's possible that multiple chains launch using this distribution, users will have access to their tokens on each chain. Eventually the market will likely converge on a single initial chain.

That being said, we recognize the legal risk for Block.one and believe that should be factored into any investment decision.

Multiple Chains at Launch

Given the above legal structure, it is entirely possible that after June 2, multiple blockchains will launch that use the EOS software and honor the distribution of the ERC20 token. There are currently upwards of 50 block producer candidates. Whether they all agree on a single chain at launch is difficult to know. It is possible that several different groups of block producer candidates launch chains. The chains may be split along Eastern/Western lines, or they may have different constitutions. One project, called Evolution, has announced that it will launch an EOS chain that distributes tokens using an airdrop instead of using the ERC20 distribution, among other changes. This chain will be unlikely to gain any support from the existing EOS community, but it will be interesting to watch it evolve nonetheless.

One group, called EOS Go, has emerged as an early leader in the community launch of the EOS blockchain. Of the 50+ block producers mentioned, all had participated in an EOS Go-sponsored listing of all candidates. The vast majority of block producers may all agree to launch on a single chain, with votes cast during the first few minutes of blocks to determine the initial 21 block producers.

If multiple chains launch, the market will likely converge quickly around a single chain. The only scenario in which this wouldn't happen would be if a large community split occurs *before* the software is released. Two different groups might plan different implementations of the EOS software, changing different parameters, rules, or constitutions. Evolution is the first example of this, but there may be others.

The good news is that owners of the ERC20 token have a choice for which iteration of the project to support; they will have access to each (as long as they honor the ERC20 distribution), and the market will decide from there. Thomas Cox of Block.one has outlined a potential launch scenario in this article.

Execution

Every new blockchain project involves some sort of execution risk. EOS is no different. While EOS is attempting to introduce several novel features, many of the core principles are taken from Larimer's first two projects, BitShares and Steem, both of which are live, functioning blockchains.

There are few people in the world who are qualified to build a proprietary blockchain from scratch, and Larimer is among the most experienced of all. Because Block.one is such a well-capitalized organization, Larimer in his role as CTO is able to focus on building the software, and not on running a business. Given Larimer's successful history of delivering Graphene-based chains, we are confident that he will deliver a quality product.

Still, there are aspects of EOS that are more ambitious than past projects, and we recognize the technical risks here. EOS has some experimental features, but we look forward to seeing all of them play out on the open market. It will be a fascinating experiment to watch.

Attack on Consensus

DPoS is one of the few PoS implementations that is live and running on several different blockchains. There are some attack vectors for DPoS that are hard to predict. Some seem possible in theory, but are unlikely to play out in practice. Others might emerge only after EOS has reached sufficient scale. We've spent a lot of time analyzing these attack vectors, and we don't believe that any presents an existential threat to EOS in the foreseeable future. We've analyzed each in our DPoS report.

User Acquisition Costs

Because EOS has a unique token model, onboarding users in EOS is harder than it is on other platforms. In order for a user to register an account on EOS, she must have a minimum balance. And because token ownership gives access to network resources, users can't use the network without owning or leasing some tokens.

This means that there is a cost to onboarding users for dApps, wallets, and other infrastructure providers. While these costs may be small, they will add up over time, and these parties will have to put systems in place to ensure that these faucets aren't Sybil attacked. Many dApps will likely have low profit margins since open competition on blockchain protocols often pushes profits towards zero. It will be difficult for some of these parties to onboard users while still covering their costs. Further, services like Scatter (similar to Metamask but for EOS) can't just create addresses for free for each new user. They'll have to find a way to recoup the costs of giving the user a minimum balance and purchasing an account name.

The good news is that once a user is onboarded to *any* dApp within the EOS ecosystem, she can use that same account across all EOS services. This means that dApps and other infrastructure providers will only have to onboard those who are completely new to anything EOS. We expect to see some creative user acquisition models emerge as soon as the network goes live.

COMPETITORS

EOS is a smart contract platform for dApps. While there are certain features of EOS that make it technically competitive with many different projects, it is directly competitive with Ethereum (as the current incumbent) as well as all of the other platforms in development that are going after the same market. These include Dfinity, Rchain, Cardano, Tezos, NEO, Kadena, Cosmos, and more.

Each of these platforms has elected to make a unique set of trade-offs. Because some of these trade-offs are so fundamental in nature, the smart contract platform market is unlikely to converge onto a single winner in the short-to-medium term.

Different applications and projects have different requirements, and one platform is unlikely to be able to satisfy all of them.

1. Ethereum seems to be prioritizing decentralization, even at the expense of performance. DApps that require very high levels of censorship resistance as their defining feature will likely gravitate there.
2. Dfinity is taking a more experimental approach, using novel cryptography and consensus with on-chain governance to create a platform that aims to be as decentralized as Ethereum but that is faster, more flexible, and not subject to the “code is law” ethos that has created so many problems in the Ethereum ecosystem.
3. Kadena is optimizing for PoW scalability while also offering formal verification with human-readable and updateable smart contracts. They will likely go after financial applications that require the high levels of security that PoW and formal verification offer.
4. Tezos is making on-chain governance its central feature, while also offering formal verification.
5. Rchain is using esoteric math that in theory will enable huge improvements in scaling parallelizable processes.
6. Cardano is attempting to bundle formal verification, on-chain governance, and quantum-computing resistance.
7. Cosmos envisions in a world with many sovereign chains that can effortlessly communicate. Cosmos hopes most of these chains will be Ethermint chains.
8. An indirect competitor, Polkadot envisions a world with many non-sovereign chains, each of which optimizes its own state-transition function.

Compared to its competitors, EOS offers a unique value proposition. It will likely be the first serious Ethereum competitor to go live, and it will almost surely be the most scalable upon launch. EOS won’t natively support backwards compatibility for Ethereum dApps, but the Everipedia team is working on

tools that would allow projects to easily port over. New projects will be incentivized to build on EOS for a few reasons—there will be plenty of access to funding through the EOS ecosystem funds; there will be more developer tools available as a function of building on WASM; and EOS will actually be able to support dApps that reach significant scale in the near term. Finally, there are certain classes of dApps that make more sense on EOS than on any other existing platform. Any dApps that require very high throughput and low or zero fees will be attracted to EOS. These include things like decentralized social networks, games like CryptoKitties, decentralized versions of existing businesses (YouTube, Soundcloud, Wikipedia, Uber, etc), decentralized exchanges, supply chain services, and more. We expect EOS to be very competitive with Ethereum and other platforms and to quickly carve out a large market share.

VALUATION

Attempting to value EOS is much different than trying to value other projects. In our valuations of projects like Augur and Factom, we were able to construct clear valuation models based on a net present value (NPV) model or a supply and demand equilibrium model, respectively. With EOS, this is simply not feasible given the underlying token mechanics. The EOS model is unique among all token models.

EOS as a Store of Value (SoV)

In his famous essay, John Pfeffer argues that Ether should be valued as a function of the marginal cost of computation on the Ethereum network. The problem with this outlook is that, in our view, smart contract platforms stand likely to become Menger goods as they increasingly fulfill the utility hypothesis. The tokens are scarce, are valuable for the utility they provide to users of the platform, and thus become a store of value for people. The more that the tokens take on this feature of "moneyness," the more their market value can decouple from their true "utility" value. **Achieving global SoV + Medium of exchange (MoE) status is the ultimate holy grail for any cryptoasset; given the extremely strong network effects around money, a global, digital SoV and MoE stands to be a multi-trillion dollar asset.** The question then becomes one of how a cryptoasset becomes a SoV.

EOS is not optimized to be a purely store of value (SoV) digital asset, like Bitcoin or Monero. SoV cryptoassets often optimize for security, decentralization of block production, and predictable supply schedule above all else. Cryptoassets like ETH and EOS, on the other hand, optimize for other forms of utility (e.g. access to the platform); this utility, however, may ultimately lead to these tokens becoming SoV goods. The "moneyness" of an asset is an emergent property. In this case people don't choose to store wealth because it is optimized as a SoV; people use it because it is useful for other

reasons, and it becomes a SoV as a result. If Bitcoin is digital gold, then EOS can be seen as digital real estate. Gold is one form of SoV, used simply because it has historical precedent for keeping value protected. But not everyone stores their wealth in just gold. They diversify across gold, real estate, fiat money, stocks and bonds, and more. Value storage in the digital realm may well follow suit.

Yet EOS has unique properties that must be considered in any valuation. Compared to other "pure" SoV cryptoassets, EOS has relatively high inflation. At 5% annually, this significantly impacts its ability to be used as a SoV. Even if token holders collectively decide to pay block producers with 1% inflation and the rest is burned, cryptoassets like Bitcoin that are ultimately deflationary may be more appealing as a SoV. The Ethereum community has been exploring the implications of inflation on SoV status and network security in recent weeks. Inflation is known, in some cases, to stimulate economies and encourage spending. Low, predictable inflation may be superior to deflation, especially if the inflation can eliminate transaction fees and/or incentivize validation in perpetuity. This property may ultimately benefit EOS from a utility perspective.

The most novel factor of EOS is that it doesn't get "spent" to access its utility. Ether, for example, is spent by users (in the form of gas) every time they use the platform. EOS, on the other hand, is a token that gives you the right to access certain resources, in perpetuity. Once a user owns EOS, she can access all network services, pro rata, as long as she maintains ownership of those those tokens. Further, tokens are effectively locked, or even burned, when they are used to access resources permanently. Users who want to access storage have to stake tokens. If they plan to store data in perpetuity, these tokens are effectively burned. This feature is likely to significantly reduce the velocity (and to some extent the inflation) of EOS as compared to other tokens.

A bet on EOS, in the most bullish case, is a bet that the utility hypothesis plays out and that EOS becomes a SoV because it is widely useful for access to EOS network resources.

EOS as a Pure Utility

Another way to value EOS (we'll call this the base case) is to assume that it never achieves SoV status and that the token price simply reflects the fair market price for access to network resources. To think about it from the perspective of a user: If the EOS market cap is $6B, and the user needs 1% of all network resources for whatever reason (to operate a dApp, etc.), then the cost to purchase those rights would be $60,000,000. Or to put it another way, if the EOS market cap is $6B, the transactional capacity of the network is 5000 tps, and a user needs to do 5 tps, then they would need to purchase $6M of EOS. These numbers, of course, seems astronomically high. And they might be. But the "fair" price here ultimately depends on *what the total capacity of the network is*. Below, we'll explore some scenarios of how this situation might play out.

Ownership of EOS tokens entitles token holders access to the following:

1. Bandwidth
2. Storage
3. Voting rights (governance)
4. Access to dApps (for users)
5. Access to users (for dApps)
6. Future access to resources (tokens allow for access in perpetuity)
7. Income from renting out bandwidth
8. Airdrops

If a user owns tokens and doesn't need or want to utilize the resources she has access to, she can lease out unused capacity. That means that EOS will develop an internal market for leasing out bandwidth in addition to the external markets that guide the price of the token itself. These markets will be intimately related, but it is hard to predict how they will behave and interact in practice.

It is possible that the external rental market will decouple from the internal market. The internal market will reflect the price, at any given time, that the market assigns to resource access. The external market will reflect more speculation—what people think demand for EOS will be in the future and what sort of income they expect to earn from leasing out bandwidth rights.

Like real estate, EOS prices will fluctuate based on perceived future value, and those looking to utilize EOS must decide whether the up-front cost of *purchasing* tokens is a better use of capital than simply renting out what they need at any given time. One important note, however, is that while EOS token holders can rent out their bandwidth, they can only delegate access to network resources. Thus, those who are renting tokens don't get access to things like governance and airdrops. So the speculative (external market) value of EOS tokens will not only reflect the ability of token holders to earn income leasing out bandwidth, but also access to these other features.

The price of the token on external markets will likely be guided primarily by two forces: the total capacity of the network, and the average capacity being utilized. When the network is at capacity, users are rate limited based on their stake. When the network is not at capacity, users are free to utilize as much of the share as is available. If I am the only one staking for access to bandwidth, I can utilize all of the network bandwidth. As others join the fold, my proportional share of network resources goes down until the network is at full capacity. At that point, I am only guaranteed my pro rata share. Thus, a user's stake is a guaranteed minimum allocation when the network is at capacity.

Some users and dApps may choose to maintain a minimum guarantee higher than what they utilize on average because they want to be prepared for surges in demand. Others may simply hold a small amount of tokens, assuming that the network is mostly below capacity, and simply rent additional bandwidth as needed. Those that hold excess capacity will be able to provide that additional capacity to those who need it temporarily through the internal rental market.

Thus, it stands to reason that the internal rental market will only come into play when the network is at capacity. If it is not, then users (even those with small token holdings) will be free to utilize any available network resources.

When the EOS network is consistently at capacity, the price of the token will likely rise, and leasing tokens instead of purchasing them will become an attractive option for many users. A network at capacity means that resources are more in demand, and that income from renting out resources is higher. Both of these factors should push up the token price. If the network has long periods where it is not at capacity, then token holders will be able to access more resources for less, and the price of the token on external markets may fall. Internal markets would provide little to no income, and users wouldn't need to purchase additional tokens to access resources. These factors should cause the price of the token to fall. At that point, purchasing tokens may be a more attractive option for many potential users, or for users who are anticipating future increases in demand for resources. These users will begin purchasing tokens, putting steady buy pressure on the market and increasing price.

Under this scenario, the market would converge around a "fair" price for access to resources at any given time, based upon total network capacity and current usage. Given that this token model is such a new concept, what constitutes a fair price is hard to predict. If the network offers 2PB of storage and 3000 tps, the fair price should be significantly lower than if the network offers 10PB of storage and 1,000,000 tps. Coming up with hard numbers here is difficult until the network is actually up and running. Even then, these valuations must take into account future increases in network capacity.

Given what we know about EOS and its future capacity, we believe that we will see substantial improvements in bandwidth, storage, and other resources beyond what is available at network launch.

How Token Price Might Decouple from "Utility Value"

Above, we noted that the best-case scenario is for a cryptoasset to become a SoV, essentially decoupling from its pure utility value. At first glance, it may seem like this would be impossible for EOS. If the tokens are overpriced relative to network resources, then access to resources becomes prohibitively expensive, and users and dApps would simply choose to move elsewhere. However:

If the total capacity of the EOS network is higher than the average used capacity, then the token price can disconnect from "rationality" and become somewhat arbitrary. If this is the case, then users only need some minimum balance in order to transact without limitations. If EOS tokens are $100 each, but the network is not at capacity, then a user could purchase 0.10 EOS for $10 and still have plenty of bandwidth. If at any point the network temporarily reaches capacity, then that individual user would of course be rate limited. At that point, however, she could simply elect to rent out additional bandwidth from the internal market for a fee. We expect that in time this leasing process will be incorporated directly into wallets or browser extensions and will be largely seamless. Thus users can access resources *as needed* without having to purchase a large stash of tokens up front.

This, of course, begs the question of why anyone would hold excess tokens if the network were not consistently at capacity. There are a few reasons:

First, dApps and individual users may want to be prepared for surges in demand. They want guarantees about their available bandwidth in any scenario, without having to rely on the internal leasing market. If a dApp were doing a strong marketing push and expected increased usage, this might be a prudent strategy. A similar outcome could apply to other scenarios with users and dApps. If a user is staking tokens for access to storage, the external price of the token does not matter, as the user gets the utility regardless. If the price of the token increases dramatically, some users may choose to remove their data from storage and sell tokens, but in some cases where that storage is required for contracts or other use cases, they would not sell their tokens.

Another possibility is users speculating on future increases in total capacity or future increases in demand for token leasing. If the network were not at capacity but a user expected that it would hit capacity in the near future, she might decide to hold tokens to lease on the internal market when the network hits capacity. Or, if the network were not at capacity, but the user believed total capacity would still increase and the tokens would be even more valuable in the future, she would continue to hold.

Finally, if EOS tokens were to be used as a SoV, some users would hold tokens regardless of network capacity. These users would be holding tokens primarily to store wealth, rather than to access network resources. This would guarantee two things:

1. The price of the token would be much higher than its “utility value”
2. There will always be excess capacity, since many users aren’t accessing resources

This situation means that EOS could be a SoV with a price that is higher than the price of the resources themselves, while still being useful and not cost-prohibitive for users. It is unclear what the ratio of utility value to market price will be. One could make reasonable arguments for 50% and 95%. Under this paradigm, the external market price would reflect the price of EOS as a SoV as well as the value assigned by speculators, while the internal market would reflect the “fair” price of network resources at any given time that the network hits capacity.

Final Thoughts

The most bullish case for EOS is that it becomes one of the dominant global smart contract platforms and that its attractiveness as a store of value emerges as a result. Store of value is a multi-trillion dollar opportunity, and the sheer fact that cryptoassets are global and digital will likely expand this total addressable market (TAM). If EOS follows this path, it could grow 100x or more from its current valuation.

Our base case for EOS is that it does not become a store of value, but simply reflects the value of the access to network resources that the token provides. The price of the token should grow in tandem with

the total capacity of the network, perhaps with an additional premium for access to things like governance, airdrops, and storage. Currently, almost all of the potential block producers have outlined plans to use their proceeds to scale up their hardware in order to increase network capacity. How much capacity the network needs or can provide will ultimately be a function of how much is built on top of it. We think it is safe to say that network capacity will *at least* grow by 5x in the next two years after launch. If the network launches at 5,000 tps, that would mean an increase to 25,000 tps. After having observed Graphene in production settings over the last few years, we know that this is along the lower limit of what is possible with the right hardware. Further optimizations and interchain communication could increase capacity even more.

The bear case for EOS could involve any number of scenarios—it does not outcompete Ethereum or other competitors, does not scale to the capacity it would need for global adoption, or that dApps simply don't choose to build on the platform. Based on our analysis above, we think that these outcomes are unlikely, but they are possible. In these scenarios, the price of the token could stagnate or even fall from current prices.

CONCLUSION

EOS is making a strong play in a specific market sector—high throughput, no fee, user-facing dApps. This is a huge market, and we expect EOS to gain an early lead in becoming the default platform for these use cases. Given that it is a general-purpose platform that offers maximum flexibility to developers, we expect it to fuel additional use cases and to inspire entirely new business models.

EOS has strong differentiators that make it unique among smart contract platforms. These include its acute focus on scalability, on-chain governance, options for upgrades, and human-friendly usernames and account settings. EOS will also likely be the first major Ethereum competitor to market. EOS is in many ways an experimental project, and we look forward to watching it grow and evolve.

We believe that the EOS token model lends itself particularly well to value capture. We expect to see very significant upward price action in the near to medium term. At current valuations, we continue to be bullish on EOS.

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