**Grayscale Research** | Matthew Beck, CFA | November 2018

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# Horizen (ZEN) Investment Thesis

*The Secure & Private Platform for Money, Messages & Media*

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*The Secure & Private Platform for Money, Messages & Media*

## The Privacy Problem

We live in a multifaceted digital world comprised of 4.2 billion active internet users.[1] For most of us, digital interactions are seamlessly woven into our everyday lives. We work, bank, shop, socialize, share, and consume content online daily, and can do all of this at our fingertips with a smartphone. In many ways, it seems irrefutable that the Internet Revolution has had an even more profound impact on global economic growth, knowledge sharing, and human interaction than the Industrial Revolution.

Despite its overwhelmingly positive impact over the past few decades, the rapid proliferation of internet accessibility has led to an acceleration in the development of information technologies with the capacity to collect, analyze, and disseminate information on those who use it. As a result, privacy invasion – or at a minimum, the potential to invade privacy – has increased correspondingly.[2]

**We believe that privacy is a fundamental human right, and one that market participants would be willing to pay a premium for in the age of private, distributed networks. The growing importance and complexity of the right to privacy in the Internet Era is what sparked our interest in Horizen – an end-to-end encrypted platform over which money, messages, and media can be securely and privately transmitted and stored.**

1. Source: Statista. Worldwide digital population as of October 2018. https://www.statista.com/statistics/617136/digital-population-worldwide/.
2. Source: Global Internet Liberty Campaign: Privacy and Human Rights – An International Survey of Privacy Laws and Practice. http://gilc.org/privacy/survey/intro.html.

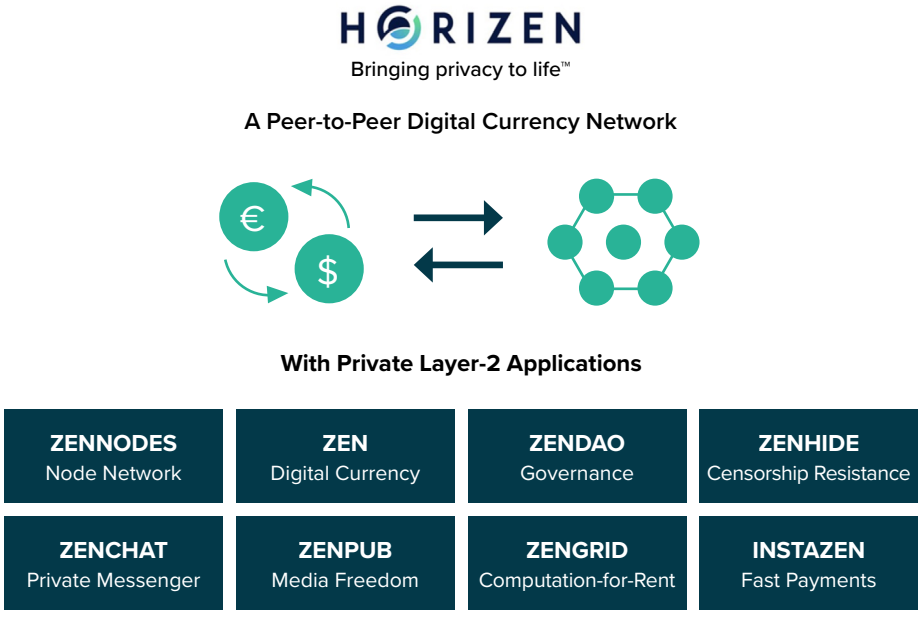
Our investment thesis for Horizen (formerly known as ZenCash), and its native digital currency ZEN (where we believe the majority of network value will accrue), is built on six key elements:

- **A powerful vision** to satisfy an unmet market need
- An **innovative protocol design,** with built-in incentives
- **Expert** protocol **development**
- Early indications that **the "network effect" is underway**
- **Large opportunities ($)** spanning both existing and next-generation markets
- The role ZEN can play as part of an **optimal digital asset allocation**

## The Horizen Vision

Horizen was launched in May 2017 as a privacy-oriented digital currency ecosystem built on zk-SNARKs ("Zero-Knowledge Succinct Non-Interactive Argument of Knowledge"), an innovative cryptographic technique first introduced by the Zcash team and recently featured in MIT Technology Review's 10 Breakthrough Technologies of 2018. Building upon the Zcash team's core focus on privatized value storage and transmission, the Horizen team realized that zk-SNARKs had wider applications for private messaging, publishing, media curation, voting, record-keeping, internet browsing and more, void of a "backdoor" that a central authority can access. With zk-SNARKs built into its foundation, Horizen aims to create a high-performing platform for money, messages and media by directly integrating ZEN into a suite of privacy-focused applications. **In its fullest form, Horizen represents an important distributed-network alternative to the public internet that may allow users to control their digital footprint, including how they manage, distribute, and monetize proprietary information and exchange value with one another.**

FIGURE 1: **THE HORIZEN VISION**



Below you can find a brief description of some of the first-generation applications being developed for launch on the Horizen network:

**ZenChat**, a private, encrypted communications network. ZenChat allows for secure and censorship resistant messaging.

**ZenPub**, an anonymous media publishing platform. ZenPub could allow individuals to freely publish data or information without fear of reprisal.

**ZenGrid**, a decentralized data hosting and processing service.

**InstaZen**, a "zero-delay" payments network.

**ZenHide**, a "domain fronting" tool to hide internet connection endpoints and prevent intermediaries from distinguishing between what they consider to be acceptable versus unacceptable web traffic. ZenHide could prevent internet censorship.

**ZenXchange**, a decentralized digital asset exchange. ZenXchange could eliminate the custody and counterparty risks that accompany centralized exchanges.

**ZenUSD**, a fully-collateralized, USD-pegged digital asset. ZenUSD could provide a stable risk-transfer mechanism for Horizen users who may not wish to hold ZEN given its volatility.

**ZenDAO**, distributed autonomous organizations, with decentralized governance and fair voting procedures.

**ZenNodes**, a tiered-node network forming the basis of an interconnected economic, governance, and technology stack on Horizen. ZenNodes consist of secure and super nodes, which will be discussed in further detail in this paper.

Today, the Horizen team is primarily working on infrastructure projects, but the goal is to open the platform to third-party developers as well. This can foster the development of a robust, utility-based application ecosystem with near endless possibilities.

## Protocol Design

Governance, economic, and development principles are key factors to consider when evaluating the merits of any digital currency network. Principles guide a network's evolution and ultimately ensure a structure that supports the collective values of participants.

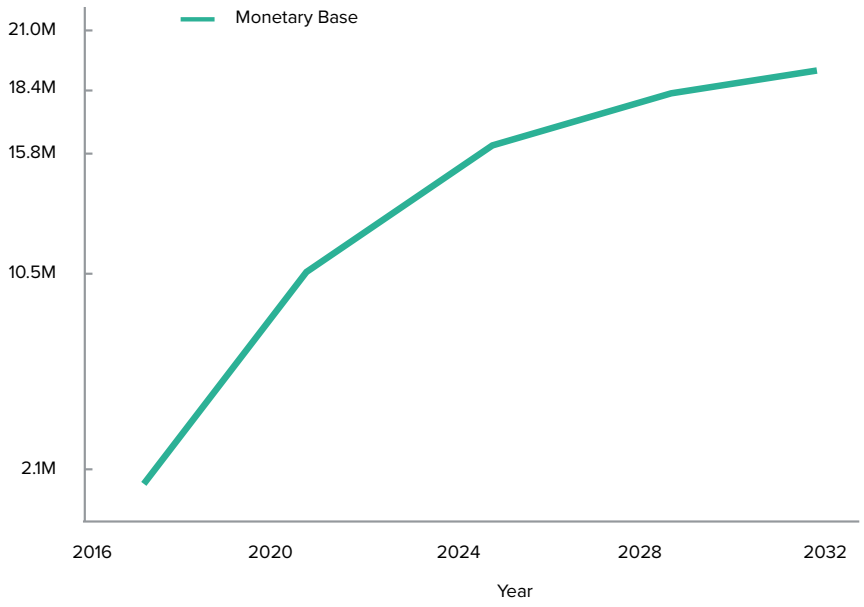


The Horizen monetary model closely resembles Bitcoin, exhibiting the following key features:

1. **The supply of ZEN is capped at 21 million coins**, thus preserving the economic principle of scarcity.

2. **The ZEN supply schedule is disinflationary.** The number of ZEN awarded for a solved block will be "halved" every four years. As of October 31, 2018, there were approximately 5.1 million ZEN in circulation.[3] It is anticipated that more than 90% of the total ZEN supply will be in circulation by 2032.

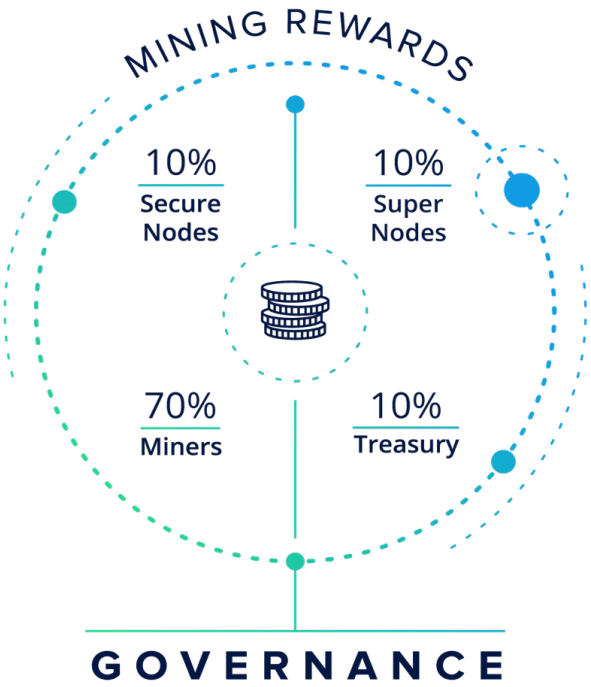
FIGURE 2: **ZEN MONETARY BASE & SUPPLY SCHEDULE**[4]




While Horizen preserves the foundational economic principles of Bitcoin, it introduces a new block reward distribution policy that is better suited to meet the goals of the network. Like Bitcoin, the beneficiaries of the ZEN block reward include miners (70%), but Horizen also introduced three new beneficiaries as well: secure node operators (10%), super node operators (10%), and treasury (10%).

3. Source: OnChainFX.com. As of October 31, 2018.
4. Zcash Blog: Founders' Reward Transfers. Nathan Wilcox, November 15, 2016. https://z.cash/blog/founders-reward-transfers.html. Note: The ZEN monetary base and supply schedule is practically the same as Zcash as the Horizen network was a fork of ZClassic, which in turn was a fork of Zcash.

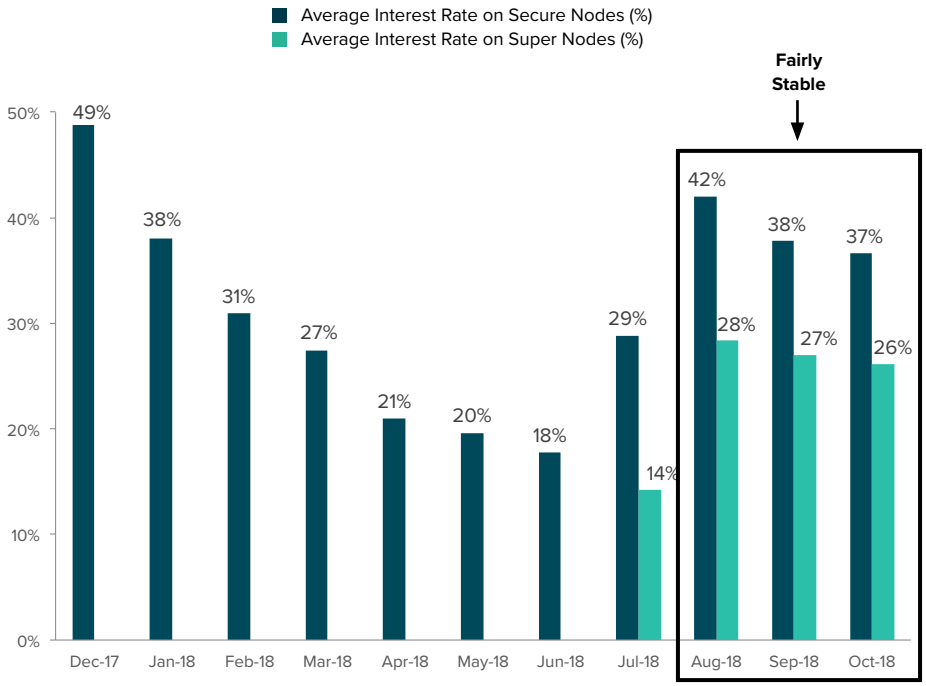
FIGURE 3: **DISTRIBUTION OF ZEN BLOCK REWARDS**




By modifying the block reward distribution in this way, Horizen:

1. **Creates a Self-Sustaining Economic Network.** Bitcoin introduced the concept of digital scarcity and solved the "double-spend" problem by incentivizing miners to participate honestly in block creation. However, the system was not programmed with explicit incentives for other key stakeholders, such as investors, network users, or node operators. Recognizing this gap, the Horizen team embedded modified incentives directly into the protocol, targeted towards these groups. The new policy allows holders of ZEN to operate secure and super nodes in which they can "stake" (i.e., lock-up) ZEN to earn a portion of the block reward. You can think of staking like earning cash interest payments on bonds or other credit instruments, except in this case, the interest is earned directly in the form of ZEN. As shown in Figure 4, the average annualized interest rate earned by secure and super nodes in October was 37% and 26%, respectively. Additionally, the introduction of a treasury model in partnership with IOHK ensures that Horizen development is well-funded going forward, in a decentralized, censorship-resistant manner.

FIGURE 4: **IMPLIED INTEREST RATES ON ZEN NODES (ANNUALIZED)[5]**




2. **Improves Security, Scalability and Network Utility Through A Tiered-Node Architecture.** In addition to its economic benefits, the Horizen node system (i.e., secure and super nodes) forms the basis of a unique compensated blockchain network with enhanced encryption (for privacy) and sidechain functionality (for application optimization). Secure nodes consist of full node operators who obtain a valid SSL/TLS certificate (to facilitate encrypted communications and transactions), hold at least 42 ZEN staked in a transparent address (t-address), successfully respond to at least 92% of challenges[6] sent to shielded addresses (z-addresses), and maintain daily uptime of 92%. Secure node operators also maintain a full copy of the Horizen blockchain to preserve the integrity of the system. Super nodes consist of operators who hold at least 500 ZEN staked in a t-address, maintain multiple CPU cores, possess 8GB of RAM or more, possess 100GB of storage or more, and maintain node uptime of 96% per day. Super nodes form the basis of multi-layered sidechains, which will ultimately support user applications. Sidechains seek to provide an efficient way for application developers and businesses to use blockchain technology without needing to run their own blockchains.

5. Source: https://metrics.zencash.com/blockchain_metrics.csv. As of October 31, 2018. Chart start date is December 2017 as this was when secure nodes were first introduced to the Horizen network. Super nodes were first introduced in July 2018.
6. Recurring zk-SNARKs "challenge" messages are sent to secure nodes on the Horizen protocol by design. Secure nodes are required to respond to these requests with identifying information. This information is used to verify that secure nodes are running minimum hardware requirements to support high-volume privacy functionality and a robust application ecosystem.

This could take the form of a fee-for-service model, with super nodes on the Horizen blockchain running sidechains, processing transactions, and collecting a new set of fee income. Since ZEN needs to be staked to initialize and maintain sidechains, it further boosts organic demand for the coin. Secure and super nodes serve as critical infrastructure for a scalable, privacy-oriented application ecosystem.[7]

3. **Creates an Environment in which Decentralized Governance is Possible.** The block reward distribution policy decentralizes governance by fostering multi-stakeholder empowerment beyond miners. Per the original Horizen whitepaper, *"[t]he core philosophy of the governance model is that decentralization of power maximizes inclusion and creativity."* Horizen has been designed such that participation in the network is voluntary and that decision-making power over resource allocation is balanced across a range of different stakeholder types.[8] As the Horizen community rolls out formal specifications for their broader governance plan, including the treasury model, their goal will be to create an open governance landscape with full competition. This could manifest in multiple decentralized autonomous organizations (DAOs) competing to build, maintain, and improve Horizen's infrastructure, allowing stakeholders to vote, delegate votes, and get paid to vote with ZEN.[9] With its "skin-in-the game" governance model, Horizen has the potential to become a permissionless and comprehensive peer-to-peer ecosystem that can evolve with user preferences.[10]

## Protocol Development

Horizen's development and maintenance is conducted by a globally diverse, expert team of over 50 security-specialized engineers, computer scientists, cryptographers, finance, business, legal, operations, and marketing professionals. Leveraging Bitcoin's open-source development framework, Zcash's revolutionary privacy technology, and partnerships with established blockchain research and engineering firms like IOHK, the Horizen team is on the path to building a comprehensive socioeconomic network that combines complete privacy with a global blockchain, capable of supporting more than peer-to-peer value transfer.

7. Source: Horizen.Global. System Upgrade Specification – Horizen Application Platform: Tiered Node System and Sidechains to Decentralize the Network, April 2018. Stabilini, Viglione, and Garaffolo. https://www.horizen.global/assets/files/Horizen-Application-Platform-Whitepaper.pdf.
8. Source: Horizen.Global. Zen White Paper, May 2017. Viglione, Versluis, and Lippencott. https://www.horizen.global/assets/files/Zen-White-Paper.pdf.
9. Source: See previous footnote.
10. Source: See previous footnote.

In addition to building high quality technology, the Horizen team has consistently demonstrated an operating model of complete transparency with respect to the evolving governance, economic, and technical aspects of the protocol. In particular, the team has published a number of white papers, system upgrade specifications, and proposals detailing new functionality, governance improvements, and methods to enhance network security in the wake of the June 2018 51% attack. You can review some of these papers and proposals here:

- Horizen (ZEN) White Paper (May 2017)
- Horizen Application Platform: Tiered Node System and Sidechains to Decentralize the Network (April 2018)
- Proposal to Modify Satoshi Consensus to Enhance Protection Against 51% Attacks (June 2018)
- Horizen Sidechains: Decoupled Consensus Between Chains (October 2018)

## Horizen (ZEN) Network Effects

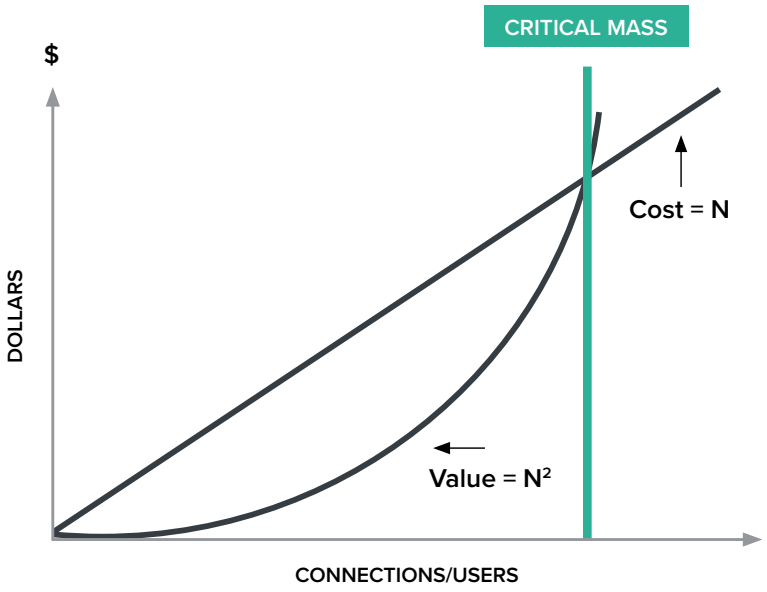
**What is Metcalfe's Law?**

For those who are unfamiliar, *"Metcalfe's Law is a valuation framework that seeks to explain the value of a network as an exponential function of the number of connected users of the system ($n^2$). Metcalfe's Law was first formulated by George Gilder in 1993 and attributed to Robert Metcalfe regarding the Ethernet."*[11]

Recently, proponents of Metcalfe's Law, including Timothy Peterson of Cane Island Alternative Advisors, Tom Lee of Fundstrat Global Advisors, and Xingzhou Zhang of the Chinese Academy of Sciences Institute of Computing Technology have cited evidence through their own research that network value is in fact a real phenomenon. For example, Lee has identified that roughly 91% of the enterprise value of FAANNG Composite[12] companies is intangible and that network effects are a meaningful driver of that value. As the number of users grow, the value of the networks rises exponentially.[13]

11. Source: Technopedia: Metcalfe's Law. https://www.techopedia.com/definition/29066/metcalfes-law.
12. FAANNG Composite consists of Facebook (Symbol: FB), Amazon (Symbol: AMZN), Apple (Symbol: AAPL) , Netflix (Symbol: NFLX), Nvidia (Symbol: NVDA), and Alphabet (Symbol: GOOG).
13. Source: Fundstrat Global Advisors. "Network effect" explains majority of BTC, ETH and LTC. August 23, 2018. Lee et al.

FIGURE 5: **A VISUALIZATION OF METCALFE'S LAW**




Both Lee and Peterson draw similar conclusions when it comes to applying Metcalfe's Law to Bitcoin and other digital currency networks, particularly those with hardened economics (i.e., predictable monetary policies with finite supplies). Peterson asserts that Bitcoin's price appears to follow Metcalfe's Law in the medium- to long-term, with explanatory power above 80% depending on the periods used. He also postures that *"Bitcoin is perhaps the first widespread, transparent application of a network that is directly monetized with the inception of each wallet."*[14] Reinforcing this point, Lee notes that Metcalfe's Law is a useful framework for assessing changes in Bitcoin's value and that, *"rising adoption and usage (measured either via active addresses or wallets as a proxy) underpins approximately 73% of the rise in the Bitcoin price since 2009."*[15]

We agree with the independent findings of Lee and Peterson and subscribe to the notion that Metcalfe's Law can be used as a model for evaluating digital currency network value.

14. Source: Metcalfe's Law as a Model for Bitcoin's Value. Alternative Investment Analyst Review, Q2 2018, Vol. 7, No. 2, 9-18. Timothy Peterson. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3078248.
15. Source: Fundstrat Global Advisors. "Network effect" explains majority of BTC, ETH and LTC. August 23, 2018. Lee et al.

**Metcalfe's Law & Horizen (ZEN) Network Activity**

Our excitement about Horizen is driven by a powerful vision to satisfy an unmet market need, built on cutting-edge technology, with a sound incentive structure to perpetuate network effects. As a borderless digital token with store-of-value properties, a virtuous investment cycle for ZEN might function as follows:

1. **Speculative demand by investors over the economic potential that Horizen possesses can drive appreciation of ZEN.** The economic threshold at which speculators might consider getting involved has been reduced given Horizen's innovative multi-stakeholder incentive structure. For example, even if you think ZEN will not appreciate over the next few years, you might consider running a secure node to earn interest in the form of ZEN that you can convert into fiat or other digital currencies, such as Bitcoin. For investors, the interest payments also provide some level of downside protection. To reiterate, in October 2018 the average annualized interest rates offered by secure and super nodes were 37% and 26% ZEN, respectively.

2. **This triggers a self-reinforcing cycle, in which more miners validate transactions to earn ZEN rewards, while new node operators stake ZEN to earn interest in the form of a valuable asset.** Increases in the number of miners and node operators enhances the speed, security, and scalability of network infrastructure.

3. **As the network becomes more secure and stable, developers can build real-world applications,** attracted by a novel platform that can be used to generate new business models and revenue streams.

4. **A robust application ecosystem can drive consumer adoption.** New privacy-focused applications may not exist or be possible with current internet infrastructure. There could also be creative ways to drive consumer adoption and help Horizen reach critical mass via explicit ZEN rebates.

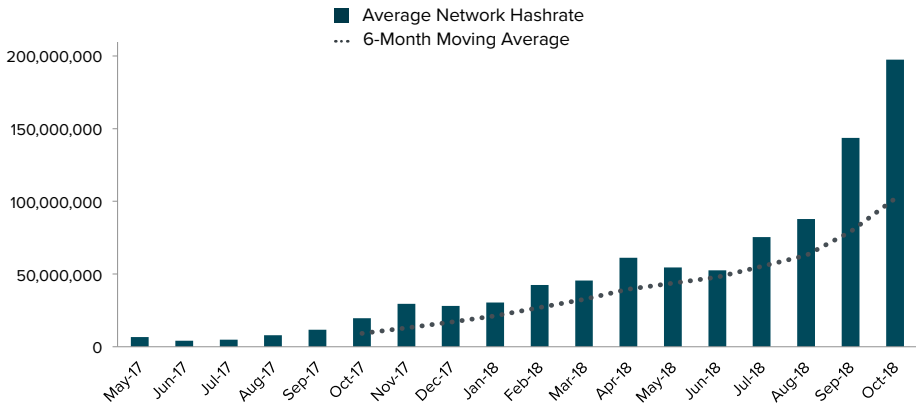
This model of a self-reinforcing cycle is theoretical, but we can test how it is playing out[16] by applying a 'Metcalfe's Law-lens' to Horizen across several activity dimensions. Though Lee and Peterson use active wallets as a simple proxy for measuring digital currency network effects, we'll look at a few other metrics that we believe further reinforce that a positive cycle is underway. For example:

16. Note: Given the maturity of the Horizen network, we are primarily focused on how steps 1 and 2 in the theoretical model are playing out now, though 3 and 4 remain critical for widespread adoption.



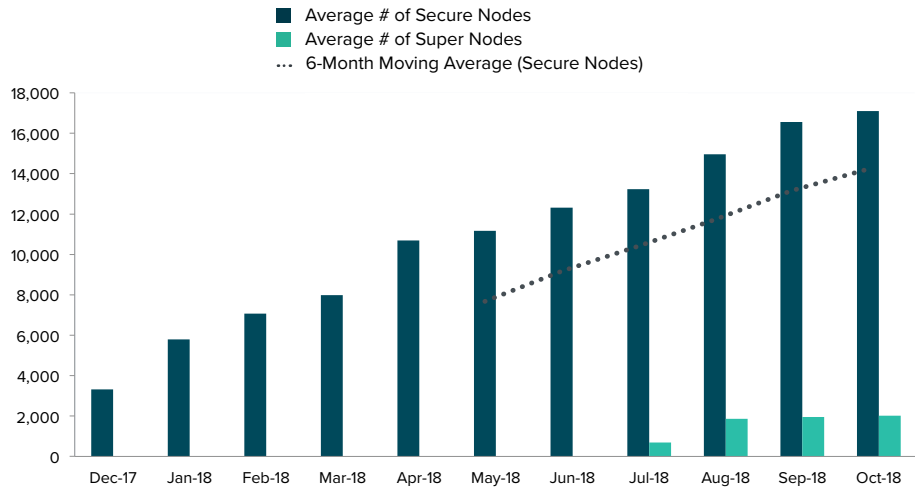
1. Horizen network hashrate continues to grow at a healthy pace. Hashrate indicates how much computing power is being contributed to secure the blockchain and is driven by increases in dedicated mining resources.

FIGURE 6: **MONTHLY AVERAGE NETWORK HASHRATE (H/S)**[17]




2. The number of secure and super nodes running on the network has increased steadily since their introduction in December 2017 and July 2018, respectively. As previously outlined, interest rates on nodes remain high and fairly stable over the last few months.

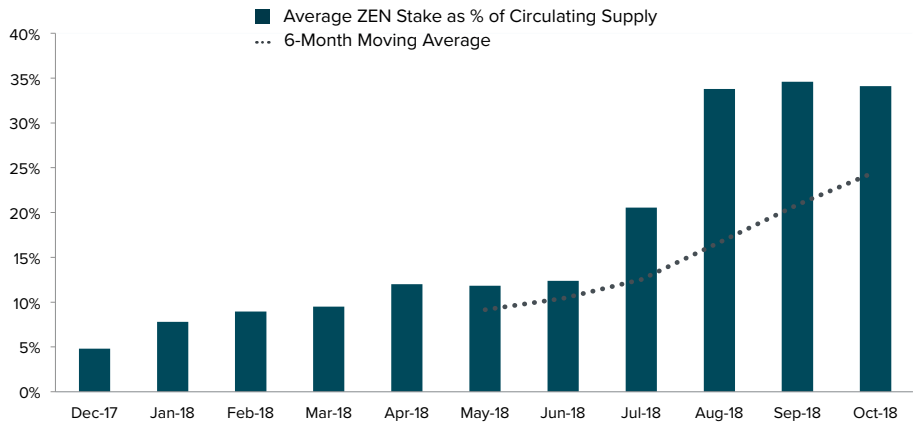
FIGURE 7: **MONTHLY AVERAGE NODE COUNT**[18]




17. Source: https://metrics.zencash.com/blockchain_metrics.csv. As of October 31, 2018. Chart start date is May 2017 as this marks the inception of the Horizen network (f/k/a ZenCash).
18. Source: https://metrics.zencash.com/blockchain_metrics.csv. As of October 31, 2018. Chart start date is December 2017 as this marks the introduction of secure nodes to the Horizen network. Super nodes were introduced in July 2018.

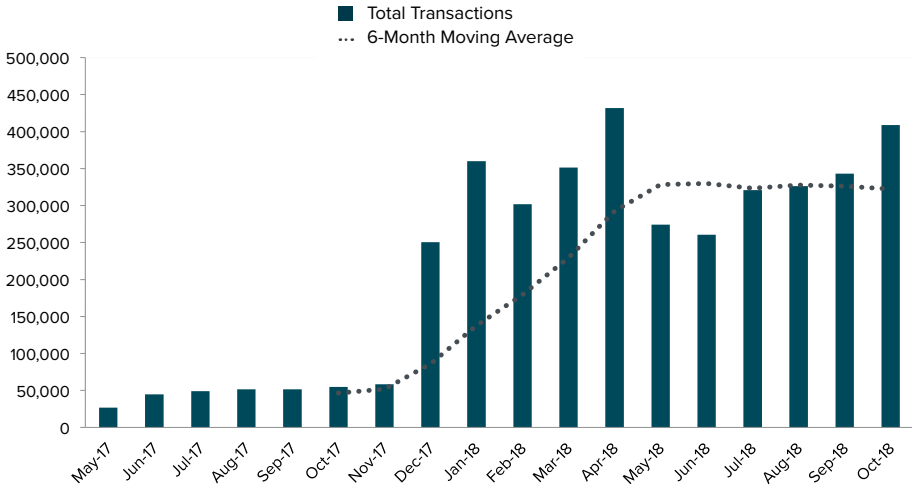
3. Growth in the total ZEN stake as a percentage of circulating supply reinforces that the multi-stakeholder incentives are playing out harmoniously with economic theory. An average of 34% of the current ZEN supply was staked in October.

FIGURE 8: **MONTHLY AVERAGE ZEN STAKE AS % OF CIRCULATING SUPPLY**[19]




4. Thousands of transactions are now occurring on the Horizen network each day, and hundreds-of-thousands of transactions are occurring each month.

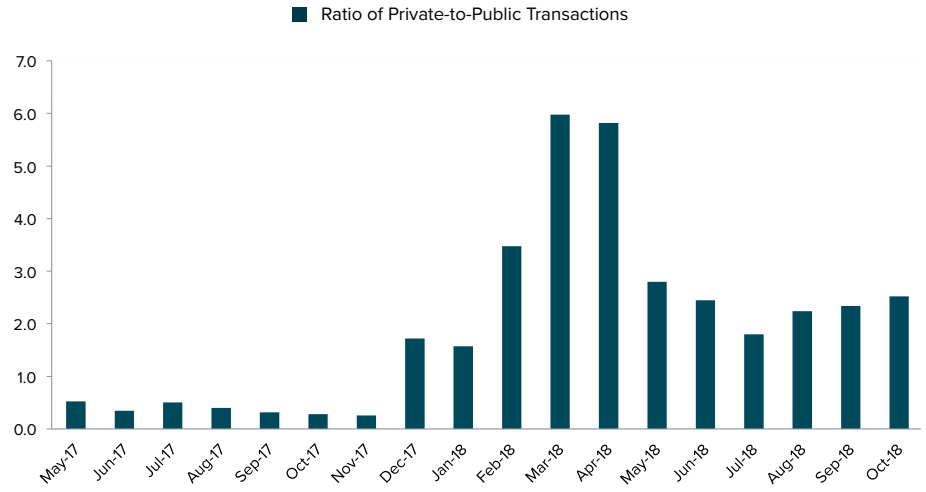
FIGURE 9: **TOTAL MONTHLY NETWORK TRANSACTIONS**[20]




19. Source: https://metrics.zencash.com/blockchain_metrics.csv. As of October 31, 2018. Chart start date is December 2017 as this marks the introduction of secure nodes to the Horizen network. Super nodes were introduced in July 2018.
20. Source: https://metrics.zencash.com/blockchain_metrics.csv. As of October 31, 2018. Chart start date is May 2017 as this marks the inception of the Horizen network (f/k/a ZenCash).

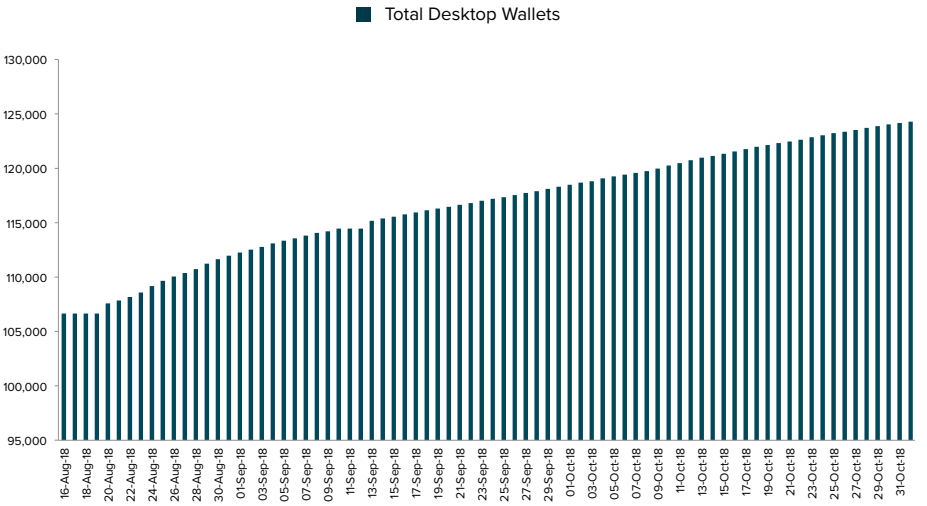
5. Like Zcash (ZEC), ZEN is selectively-private, meaning that a user can choose if they want to make transactions private or public. We can see that ZEN is currently being used for both private and public transactions.

FIGURE 10: **MONTHLY RATIO OF PRIVATE-TO-PUBLIC TRANSACTIONS**[21]




6. Finally, the number of active ZEN wallets continues to increase. We can see that over 120,000 desktop wallets have been downloaded since inception. Moreover, ZEN wallets are also available via secure hardware devices, like the Ledger Nano S and Blue, which are more difficult to track but would also boost these numbers.

FIGURE 11: **TOTAL DESKTOP WALLETS**[22]



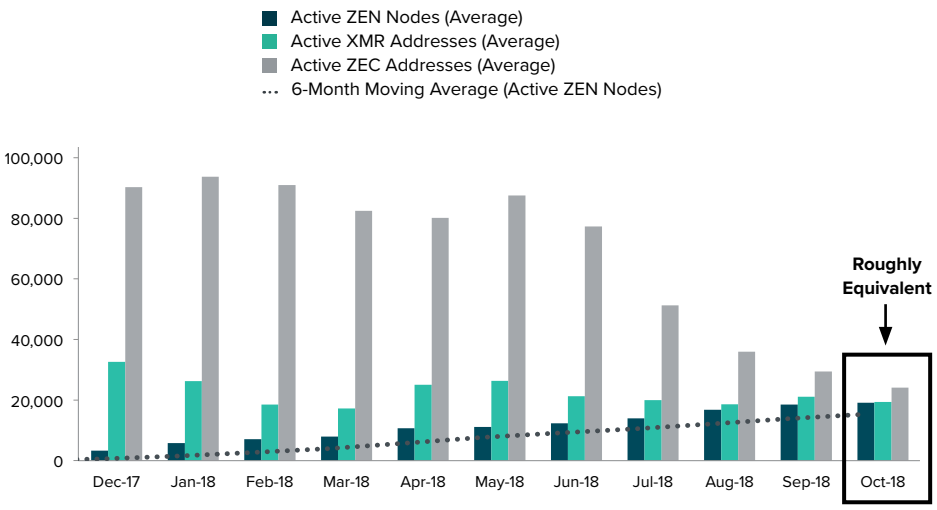

21. Source: https://metrics.zencash.com/blockchain_metrics.csv. As of October 31, 2018. Chart start date is May 2017 as this marks the inception of the Horizen network (f/k/a ZenCash).
22. Source: https://metrics.zencash.com/blockchain_metrics.csv. As of October 31, 2018. Chart start date is August 16, 2018 due to data limitations. Note that the chart incorporates the complete cumulative historical data prior to August 16, 2018.

### Privacy Network Comparisons

These trends are interesting in isolation, but it's also worth considering how they stack up against other leading privacy-focused digital currencies, like Zcash (ZEC) and Monero (XMR). Despite limitations on the availability of high quality, standardized data in the digital currency ecosystem, we think we've come up with some creative ways to source network data and draw meaningful comparisons from them. As we go through the following comparative analysis, it's important to keep in mind that the total market value of all ZEN in circulation is only $66.7 million, and its fully-diluted market cap is roughly $277 million. That is less than 12% of the fully-diluted market caps of Zcash and Monero (~$2.4 billion and ~$2.3 billion, respectively) and less than 5% of the privacy sector overall (~$6 billion).[23]

Although we had difficulty acquiring active address data from the Horizen blockchain, we went back to Metcalfe's Law to explore other ways to evaluate relative network effects. If you recall, Metcalfe's Law states that, *"the value of a network is an exponential function of the number of connected users of the system ($n^2$)."* Since secure and super nodes also represent connected users (there is an active wallet address associated with each for staking), we decided to map a time-series of the node count on Horizen against active addresses on the Zcash and Monero blockchains.

FIGURE 12: **MONTHLY PRIVACY NETWORK ACTIVE CONNECTIONS[24]**
**ZEN ACTIVE NODES VS. COMP NETWORK ACTIVE ADDRESSES**

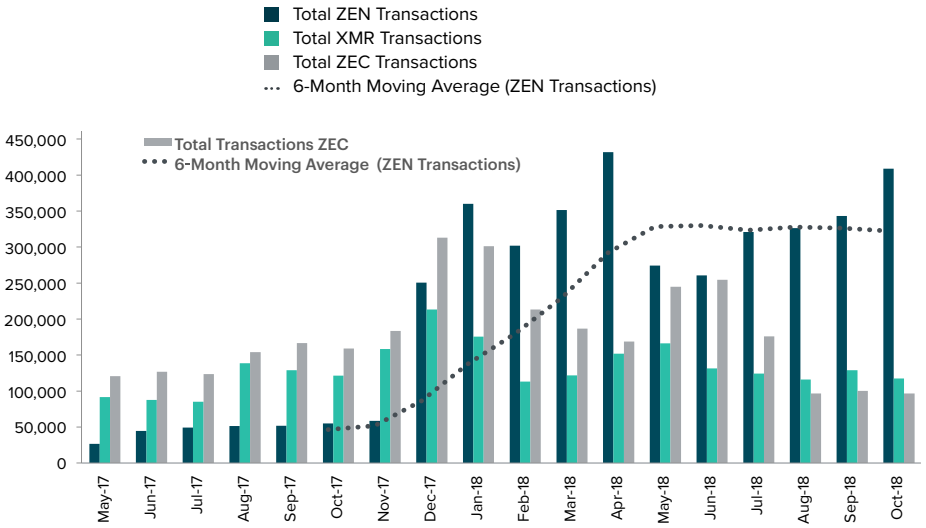



23. Source: OnChainFX.com. TradeBlock, Inc. As of October 31, 2018. According to OnChainFX.com, the "Fully-Diluted (Y2050) Market Cap" is the market cap of a digital asset accounting for known future dilution up to Jan 1, 2050. Given that digital asset supply issuance varies greatly from one asset to another, calculating market cap taking this known future dilution into account is necessary to effectively compare the market cap of one asset to another. Note that the market caps of Zcash (ZEC) and Monero (XMR) were $580 million and $1.7 billion, respectively as of October 31, 2018. Approximately 24% of the total ZEC supply and 74% of the total XMR supply were in circulation at the time.
24. Source: https://coinmetrics.io/data-downloads/. As of October 31, 2018. https://metrics.zencash.com/wallet_download_metrics.csv. As of October 31, 2018. Chart start date is December 2017 as this marks the introduction of secure nodes to the Horizen network. Super nodes were introduced in July 2018.

From our perspective, nodes represent a lower-bound on the total number of active users. This is because there are certainly network participants that are not running nodes, but are consistently transacting. The point here is that based on a maximally conservative lower-bound figure, the number of active ZEN nodes was roughly equivalent to the active address count on both Zcash and Monero in October. Moreover, it continues to trend upwards.

As shown in Figure 13, there is a high number of transactions occurring on Horizen each month. This is part real user demand, but also a function of how the node system works. For example, Horizen requires node operators to process zk-SNARK computations on a recurring basis, leading to an inflated number of shielded transactions. These recurring processes are used to verify that nodes are running minimum hardware requirements to support high-volume privacy functionality and a robust application ecosystem. While the below might not be a pure apples-to-apples comparison, it demonstrates a growing node commitment-set that boosts Horizen's overall system privacy and performance. Any privacy commitment-set is only as strong as the number of net inputs over outputs.

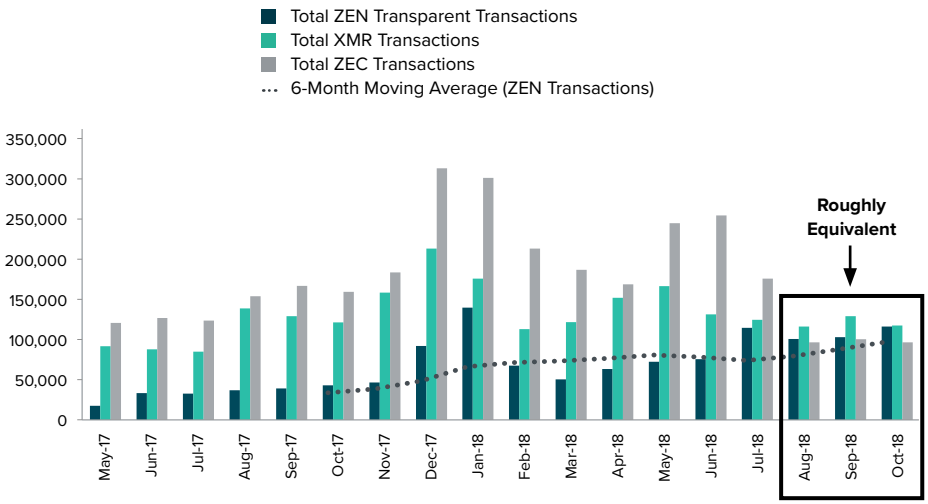
FIGURE 13: **TOTAL MONTHLY PRIVACY NETWORK TRANSACTIONS[25]**
**ZEN TOTAL TRANSACTIONS VS. COMP NETWORKS**




To normalize the transaction data for more meaningful comparisons, we took a conservative approach, realizing that it would be difficult to distinguish between utility-based shielded transactions and those that are merely a function of node system requirements. As a result, we removed shielded ZEN transactions from our analysis entirely and ran a time-series comparison between transparent ZEN transactions and the total number of transactions occurring on Zcash and Monero.

25. Source: https://coinmetrics.io/data-downloads/. As of October 31, 2018. https://metrics.zencash.com/wallet_download_metrics.csv. As of October 31, 2018. Chart start date is May 2017 as this marks the inception of the Horizen network (f/k/a ZenCash).

FIGURE 14: **MONTHLY PRIVACY NETWORK TRANSACTIONS[26]**
**ZEN TRANSPARENT TRANSACTIONS VS. COMP NETWORK TOTALS**




The results were surprising. Horizen had more transparent transactions than the total for Zcash in each of the last three months, and a count that ranged between 80-99% of Monero's over the same period.

In the next section, we'll demonstrate how ZEN's valuation might change with any increase in its share of the privacy market, among other factors, considering these trends.

## The Market Opportunity for Horizen (ZEN)

**The market opportunity set for Horizen, as a platform for money, messages, and media, is fragmented, low on trust, and global.** It's no secret that consumer privacy concerns are real and growing. According to the TRUSTe/ National Cyber Security Alliance U.S. Consumer Privacy Index, 92% of U.S. internet users worry about their privacy online, 89% say they avoid companies that do not protect their privacy, 64% think online privacy should be a human right, and 38% think online privacy is more important than national security.[27] Furthermore, this is a global problem: recent data from the 2018 Edelman Trust Baromoter evidences a broad-based decline in the trust that users around the world place in social media due to the inability to protect their personal data properly.[28] These concerns are valid given the perverse incentives that both public and private-sector entities have to track and monetize users' digital footprints. Global citizens are in dire need of dignified alternatives.

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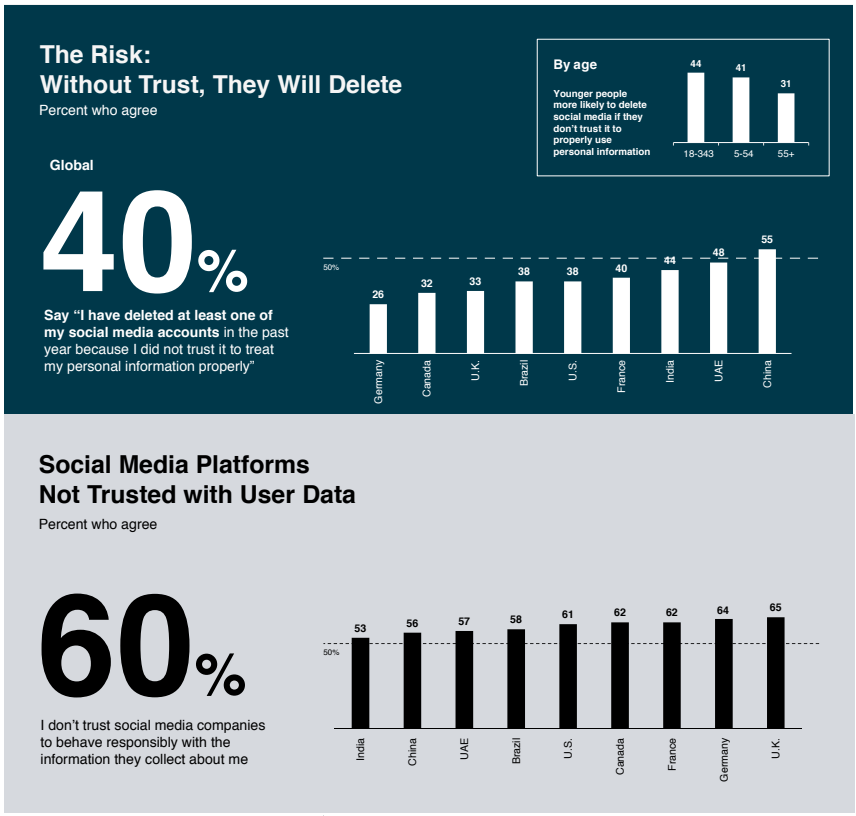
26. Source: https://coinmetrics.io/data-downloads/. As of October 31, 2018. https://metrics.zencash.com/wallet_download_metrics.csv. As of October 31, 2018. Chart start date is May 2017 as this marks the inception of the Horizen network (f/k/a ZenCash).
27 Source: 2016 TRUSTe/NCSA Consumer Privacy Infographic – US Edition. https://www.trustarc.com/resources/privacy-research/ncsa-consumer-privacy-index-us/.
28. Source: 2018 Edelman Trust Barometer: Special Report: Brands and Social Media. Q8. Below is a list of statements. For each one, please rate how much you agree or disagree with that statement using a 9-point scale where one means "strongly disagree" and nine means "strongly agree". (Top 4 Box, Agree). General population, 9- market average. https://www.edelman.com/sites/g/files/aatuss191/files/2018-10/2018_Trust_Barometer_Brands_Social_Media_Special_Full_Report.pdf.

FIGURE 15: **TRUST IN SOCIAL MEDIA NETWORKS IS ERODING GLOBALLY**[29]




The current environment of open surveillance creates a large opportunity for disruptive technologies that can better provide the privacy, trust, and protections that internet users are looking for. **We believe Horizen may have the right attributes to be the solution.**

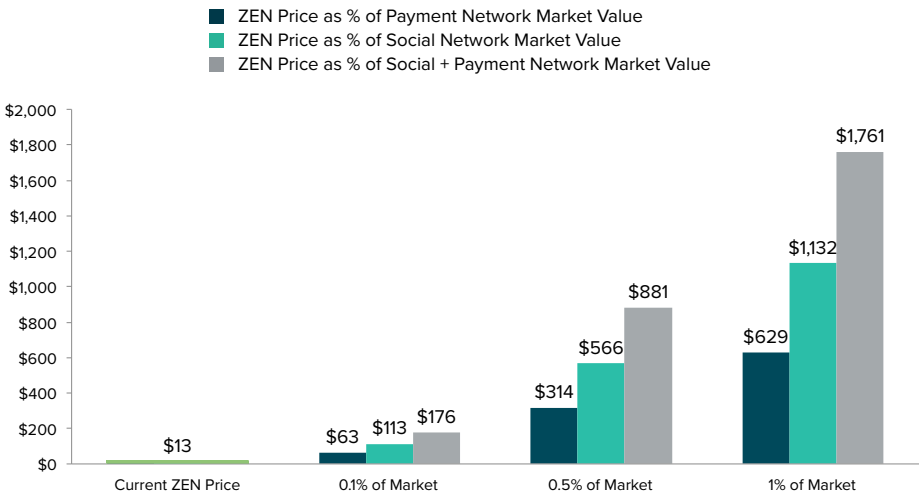
Based on our analysis of the markets that Horizen stands to disrupt, we have come up with two distinct frameworks to estimate the "full potential" market opportunity for ZEN.

***Method 1:***
***Full Potential = (Market Value of Social Networks + Market Value of Payment Networks) * (1 + Privacy Premium + Synergy Premium)***

Based on the market caps of companies comprising the Global X Social Media ETF (Symbol: SOCL) and ETFMG Prime Mobile Payments ETF (Symbol: IPAY), we estimate full potential at roughly $2.8 trillion.[30] This is before we factor in privacy and synergy premiums, which we believe are real and greater than zero, but impractical to estimate.

29. Source: See previous footnote.
30. Source: Bloomberg. Based on the market capitalizations of the Global X Social Media ETF (Symbol: SOCL) and the ETFMG Prime Mobile Payments ETF (Symbol: IPAY). As of October 31, 2018.

FIGURE 16: **HYPOTHETICAL SIMULATED PRICE OF ZEN AS % OF SOCIAL & PAYMENT NETWORKS IN 2025**[31]




This means that if ZEN were to capture just 0.1% of estimated "full potential" (based on today's value of $2.8 trillion) by the year 2025, its price could hypothetically reach $176, more than 13X its current price of $13.20.[32] Moreover, if ZEN were to capture 1%, its price could hypothetically reach more than $1,760 per ZEN.

This may be a leap for some people, so we wanted to provide an alternative way of evaluating the market opportunity for ZEN. By applying a similar framework to privacy-focused digital currency networks (i.e., Zcash, Monero) and general-purpose platforms ("GPP") (i.e., Ethereum, decentralized apps), which we believe are two digital asset sectors that Horizen may be well-suited to service, we estimate a full potential market opportunity of roughly $48 billion. This is based on a 2025 inflation-adjusted market cap estimate of $4.7 billion for privacy and $43 billion for GPP.[33]

***Method 2:***
***Full Potential = (Market Value of Privacy Networks + Market Value of General-Purpose Platform Networks) * (1 + Synergy Premium)***

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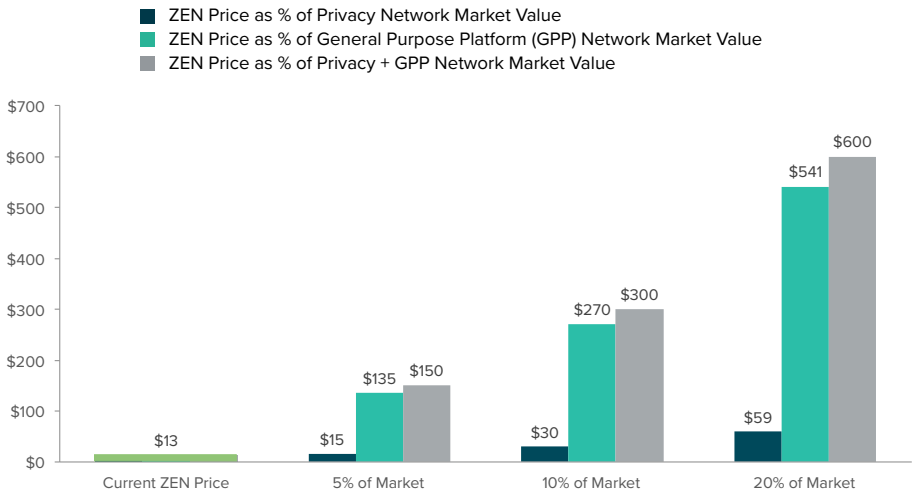
31. Source: Bloomberg, TradeBlock, Inc. Based on the market capitalizations of the Global X Social Media ETF (Symbol: SOCL) and the ETFMG Prime Mobile Payments ETF (Symbol: IPAY). As of October 31, 2018. "Current ZEN Price" is based on the TradeBlock ZEN Composite 24-hour VWAP as of October 31, 2018. Simulated price estimates are based on an estimated ZEN supply of 15.9 million in January 2025 to account for price dilution. THE FUTURE ZEN PRICES SHOWN ARE PURELY HYPOTHETICAL AND SPECIFICALLY ASSUME THAT ZEN PRICES WILL INCREASE. ZEN has historically experienced significant intraday and long-term price swings. Past performance is not necessarily indicative of future results and the financial projections set forth herein are subject to great uncertainty. There can be no assurance that the projected hypothetical prices will be achieved. Actual future prices will depend on numerous factors, including the future liquidity of ZEN, all of which may differ from the assumptions on which the hypothetical prices contained herein are based. NO REPRESENTATION IS BEING MADE THAT ANY RESULTS WILL OR ARE LIKELY TO ACHIEVE PRICES SIMILAR TO THOSE SHOWN.
32. Source: Bloomberg, TradeBlock, Inc. As of October 31, 2018.
33. Source: OnChainFX.com. Based on a weighted average inflation-adjusted market value estimate for the Privacy and General-Purpose Platform ("GPP") network sectors in January 2025. According to OnChainFX.com, the "Privacy" sector consists of privacy-focused decentralized currencies that incorporate technology designed to make it difficult or impossible for third parties to track the flow of coins from one transactor to the next. The "GPP" sector consists of general-purpose decentralized compute platforms and their associated digital currencies and/or assets. General-Purpose Platforms operate as a global computer, capable of executing arbitrary code – called smart contracts or 'dapps' (i.e., decentralized applications).

FIGURE 17: **HYPOTHETICAL SIMULATED PRICE OF ZEN AS % OF PRIVACY AND GENERAL-PURPOSE PLATFORM NETWORKS IN 2025**[34]




Through a sensitivity analysis, we can assess what the impact might be on ZEN prices if Horizen were to capture a portion of these sectors. For example, if ZEN were to account for just 5% of the combined value of Privacy and GPP networks by the year 2025, its price could hypothetically reach $150, more than 11X its current price of $13.20.[35] Moreover, if ZEN were to capture 20% of these markets, its price could hypothetically reach $600 per ZEN.

**Key Risks**

At this point, it is important to call out some of the major risks to Horizen's success. These include, but are not limited to, contentious hard forks diluting or destroying the network, failure of the Horizen team to execute on the development roadmap, failure to achieve sufficient adoption to become a utility platform, and competition from other Privacy and GPP digital currency networks, such as Monero, Zcash, and Ethereum with zk-SNARKs. Each of these may be viewed as direct competitors to Horizen and it remains to be seen whether privacy, decentralized applications, smart contract functionality, or other use cases may be better served on one versus the others. It is also possible that these networks fail collectively, or that some combination of them succeed alongside one another due to competitive market forces. This is why we continuously reinforce the importance of diversification.

34. Source: TradeBlock, Inc. OnChainFX.com. "Current ZEN Price" is based on the TradeBlock ZEN Composite 24-hour VWAP as of October 31, 2018. Simulated price estimates are based on an estimated ZEN supply of 15.9 million and a weighted average inflation-adjusted market value estimate for the Privacy and General-Purpose Platform ("GPP") network sectors in January 2025. THE FUTURE ZEN PRICES SHOWN ARE PURELY HYPOTHETICAL AND SPECIFICALLY ASSUME THAT ZEN PRICES WILL INCREASE. ZEN has historically experienced significant intraday and long-term price swings. Past performance is not necessarily indicative of future results and the financial projections set forth herein are subject to great uncertainty. There can be no assurance that the projected hypothetical prices will be achieved. Actual future prices will depend on numerous factors, including the future liquidity of ZEN, all of which may differ from the assumptions on which the hypothetical prices contained herein are based. NO REPRESENTATION IS BEING MADE THAT ANY RESULTS WILL OR ARE LIKELY TO ACHIEVE PRICES SIMILAR TO THOSE SHOWN.
35. Source: TradeBlock, Inc. As of October 31, 2018.

## ZEN in Portfolio Construction

In *A New Frontier*, we explored the role that digital assets can play in a strategic asset allocation, and outlined why we believe they may help investors build portfolios with higher risk-adjusted returns. While that research was primarily focused on the 'asset-allocation' decision (i.e., what asset classes should I include in my portfolio and in what weightings?), investors must also make 'asset-selection' decisions (i.e., which individual assets should comprise each allocation?). With respect to ZEN, we are focused on the latter and understanding how it might impact the return-to-risk profile of the digital asset allocation first explored in *A New Frontier* (the "Digital Asset Mix"[36]).

Whether an investor is focused on asset-allocation or -selection, he or she should begin by asking the following two questions:

1. Does the asset [class] have a positive expected return over the duration of my investment horizon?

2. Is the asset [class] lowly, or ideally uncorrelated with other positions in my portfolio such that it can provide a diversification benefit?

If the answers to these questions are 'yes', then it is likely that the asset [class] is worth including. That is because these are the basic ingredients for building balanced portfolios with higher risk-adjusted returns.

In the earlier parts of this paper, we addressed question one, laying out why we believe ZEN has a positive expected return over the medium- to long-term. Next, we'll evaluate ZEN in the context of question two to determine if it warrants inclusion within a strategic digital asset allocation.

Looking at Figure 18, we can see that ZEN's correlation to traditional assets and currencies ranges from slightly negative to slightly positive, with an average of almost zero. This provides evidence that ZEN can be considered a diversifying component within multi-asset class portfolios. Moreover, ZEN is imperfectly correlated to other digital assets, which means it may even enhance the diversification of a digital asset allocation.

36. "Digital Asset Mix" consists of an equal-weighted mix of Bitcoin (14.3%), Bitcoin Cash (14.3%), Ethereum (14.3%), Ethereum Classic (14.3%), Litecoin (14.3%), XRP (14.3%), and Zcash (14.3%).

FIGURE 18: **MULTI-ASSET CORRELATION MATRIX**[37]
June 1, 2017 through October 31, 2018 Based on Rolling One-Month Returns

| ASSET | ZEN |
|---|---|
| S&P 500 Index | 0.13 |
| Nasdaq Composite | 0.08 |
| MSCI World Price Index | 0.19 |
| MSCI EAFE Price Index | 0.26 |
| MSCI Emerging Markets Price Index | 0.20 |
| Bloomberg Commodity Index | 0.21 |
| Barclays Capital Bond Index | 0.04 |
| COMEX Gold Index | 0.20 |
| DJCME Spot FX Index | (0.12) |
| Swiss Franc (CHF) | (0.23) |
| Canadian Dollar (CAD) | (0.08) |
| British Pound (GBP) | (0.17) |
| Euro (EUR) | (0.05) |
| Japanese Yen (JPY) | (0.08) |
| Chinese Renminbi (RMB) | 0.09 |
| Russian Ruble (RUB) | 0.02 |
| Argentine Peso (ARS) | 0.31 |
| Thai Baht (THB) | 0.01 |
| Singapore Dollar (SGD) | 0.00 |
| Brazilian Real (BRL) | (0.10) |
| Bitcoin (BTC) | 0.56 |
| Ethereum (ETH) | 0.50 |
| XRP (XRP) | 0.23 |
| Bitcoin Cash (BCH) | 0.51 |
| Litecoin (LTC) | 0.28 |
| Ethereum Classic (ETC) | 0.42 |
| Zcash (ZEC) | 0.54 |

Maximum: 0.31
Minimum: -0.23
Average: 0.04

Maximum: 0.56
Minimum: 0.23
Average: 0.43

To gain a deeper understanding of the diversification benefits that ZEN can offer, we conducted a series of portfolio simulations to see how it might impact the return-to-risk profile of the *Digital Asset Mix*. Note that there are a number of different weighting mechanisms one can use when evaluating a digital asset allocation (e.g., market cap-, equal-, risk-weighted, etc.). For the purpose of this analysis, we opted for simplicity, and a weighting scheme that does not bias (i.e., overweight or underweight) any digital asset relative to another.

37. Source: Bloomberg, CoinMarketCap.com. Based on one-month rolling returns from June 1, 2017 (the inception of ZEN's observable trading history) through October 31, 2018. We selected this timeframe for our analysis because we believe it broadly constitutes the most complete historical dataset for the digital assets that we have chosen to analyze. For the sake of consistency and for comparison purposes, we will use this timeframe throughout the paper. The digital assets shown above have historically experienced significant intraday and long-term price swings. As the period during which digital assets have been available for trading is limited, the correlations may not be meaningful when considering longer periods. Past performance is not indicative of future results.

FIGURE 19: **HYPOTHETICAL SIMULATED PORTFOLIO ALLOCATIONS**[38]

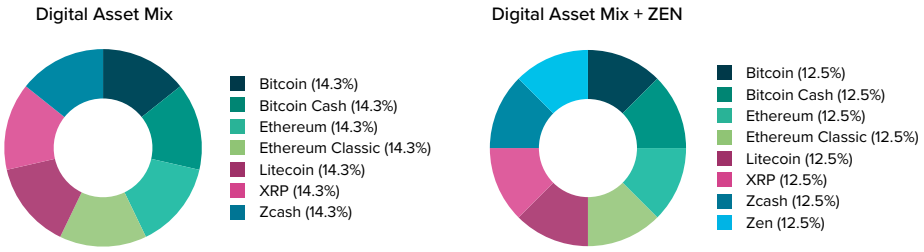



FIGURE 20: **HYPOTHETICAL SIMULATED PORTFOLIO PERFORMANCE**[39]
June 1, 2017 through October 31, 2018

| PORTFOLIO | Digital Asset Mix | Digital Asset Mix + ZEN |
|---|---|---|
| Total Return (Cumulative) | 75.5% | 118.4% |
| Total Return (Annualized) | 48.6% | 73.3% |
| Risk (Annualized Std Dev) | 98.1% | 101.1% |
| Sharpe Ratio | 0.48 | 0.72 |
| **Ratio Improvement** | **--** | **49%** |


38. "Digital Asset Mix" consists of an equal-weighted mix of Bitcoin (14.3%), Bitcoin Cash (14.3%), Ethereum (14.3%), Ethereum Classic (14.3%), Litecoin (14.3%), XRP (14.3%), and Zcash (14.3%). "Digital Asset Mix + ZEN" consists of an equal-weighted mix of Bitcoin (12.5%), Bitcoin Cash (12.5%), Ethereum (12.5%), Ethereum Classic (12.5%), Litecoin (12.5%), XRP (12.5%), Zcash (12.5%), and Zen (12.5%).

39. HYPOTHETICAL SIMULATED PERFORMANCE RESULTS HAVE CERTAIN INHERENT LIMITATIONS. There is no guarantee that the market conditions during the past period will be present in the future. Rather, it is most likely that the future market conditions will differ significantly from those of this past period, which could have a materially adverse impact on future returns. Unlike an actual performance record, simulated results do not represent actual trading or the costs of managing the portfolio. Also, since the trades have not actually been executed, the results may have under or over compensated for the impact, if any, of certain market factors, such as lack of liquidity. Simulated trading programs in general are also subject to the fact that they are designed with the benefit of hindsight. NO REPRESENTATION IS BEING MADE THAT ANY ACCOUNT WILL OR IS LIKELY TO ACHIEVE PROFITS OR LOSSES SIMILAR TO THOSE SHOWN. PAST PERFORMANCE IS NOT INDICATIVE OF FUTURE RESULTS.
Source: Bloomberg, CoinMarketCap.com. Performance is shown from June 1, 2017 (the inception of ZEN's observable trading history) through October 31, 2018. We selected this timeframe for our analysis because we believe it broadly constitutes the most complete historical dataset for the digital assets that we have chosen to analyze. For the sake of consistency and for comparison purposes, we will use this timeframe throughout the paper. Annualized figures are based on 252 trading days. "Digital Asset Mix" consists of an equal-weighted mix of Bitcoin (14.3%), Bitcoin Cash (14.3%), Ethereum (14.3%), Ethereum Classic (14.3%), Litecoin (14.3%), XRP (14.3%), and Zcash (14.3%). "Digital Asset Mix + ZEN" consists of an equal-weighted mix of Bitcoin (12.5%), Bitcoin Cash (12.5%), Ethereum (12.5%), Ethereum Classic (12.5%), Litecoin (12.5%), XRP (12.5%), Zcash (12.5%), and Zen (12.5%). THE "DIGITAL ASSET MIX" AND "DIGITAL ASSET MIX + ZEN" RESULTS ARE HYPOTHETICAL AND ARE NOT BASED ON ACTUAL RETURNS OR HISTORICAL PERFORMANCE. DIGITAL ASSETS HAVE HISTORICALLY EXPERIENCED SIGNFICANT INTRADAY AND LONG-TERM PRICE SWINGS AND PAST PERFORMANCE IS NOT NECESSARILY INDICATIVE OF FUTURE RESULTS. Component asset weights are held constant over the period. The Sharpe Ratio is calculated as the annualized excess return of the portfolio over the 3-month US T-Bill divided by the standard deviation of excess returns. Ratio Improvement is calculated by taking the Sharpe Ratio of the "Digital Asset Mix + ZEN" portfolio and dividing it by the Sharpe Ratio of the "Digital Asset Mix" portfolio, minus one.

Based on the results, it appears that the *Digital Asset Mix + ZEN* performed even better than the original *Digital Asset Mix*, on both an absolute and risk-adjusted basis. For example:

- Adding a 12.5% ZEN allocation to the *Digital Asset Mix* increased the hypothetical simulated cumulative return by nearly 43%, without materially increasing volatility, to improve risk-adjusted returns by 49%.

Given what we know about portfolio theory, this is not that surprising. Since ZEN is imperfectly correlated with other components of the *Digital Asset Mix*, they can be combined to build portfolios with higher risk-adjusted returns, all else equal.

## Conclusion

It remains difficult to value digital currency networks, which is why we've avoided putting out explicit price targets. Instead, we employ a fundamental and systematic approach to uncover valuable assets in a noisy market, without needing to be overly precise.[40] This starts by identifying digital currency projects with big visions, sound structures, and strong distributed teams (fundamental). It is further enhanced by (i) analyzing factors that contribute to a logical view that network effects are underway; (ii) sizing market opportunities to evaluate the asymmetry of potential payoffs; and (iii) applying discount factors based on an internal set of risk assumptions (systematic). This allows us to determine broad dislocations between an asset's price and what we perceive to be true network value.

There are obviously several risk factors to consider when investing in digital assets that can cause extreme deviations in the outcomes. However, as investors, we are not loss averse to the point where we would avoid putting capital into something with the right supporting fundamentals and return-to-risk profile, especially as part of a diversified portfolio. For the outlined reasons, we believe there is a strong case to consider ZEN as a single alpha within a diversified alpha portfolio, or a core component within a strategic beta allocation to the digital asset class.

40. Source: Token Daily. False Precision, Arianna Simpson. August 2018. https://www.tokendaily.co/blog/false-precision.

## About Grayscale Investments

Grayscale Investments, LLC (“Grayscale”) is the world’s largest digital currency asset manager, with a proven track record and unrivaled experience. We give investors the tools to make informed investing decisions in a burgeoning asset class. As part of Digital Currency Group, Grayscale accesses the world’s biggest network of digital currency intelligence to build better investment products. We have removed the barrier to entry so that institutions and investors can benefit from exposure to digital currencies. Now, forward-thinking investors can embrace a digital future within an institutional grade investment.

Grayscale is headquartered in New York City. For more information on Grayscale, please visit, please visit www.grayscale.co or follow us on Twitter @GrayscaleInvest.



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**Note On Hypothetical Simulated Performance Results**

HYPOTHETICAL SIMULATED PERFORMANCE RESULTS HAVE CERTAIN INHERENT LIMITATIONS. There is no guarantee that the market conditions during the past period will be present in the future. Rather, it is most likely that the future market conditions will differ significantly from those of this past period, which could have a materially adverse impact on future returns. Unlike an actual performance record, simulated results do not represent actual trading or the costs of managing the portfolio. Also, since the trades have not actually been executed, the results may have under or over compensated for the impact, if any, of certain market factors, such as lack of liquidity. Simulated trading programs in general are also subject to the fact that they are designed with the benefit of hindsight. NO REPRESENTATION IS BEING MADE THAT ANY ACCOUNT WILL OR IS LIKELY TO ACHIEVE PROFITS OR LOSSES SIMILAR TO THOSE SHOWN. PAST PERFORMANCE IS NOT INDICATIVE OF FUTURE RESULTS.

The hypothetical simulated performance results are based on a model that used inputs that are based on assumptions about a variety of conditions and events and provides hypothetical not actual results. As with all mathematical models, results may vary significantly depending upon the value of the inputs given, so that a relatively minor modification of any assumption may have a significant impact on the result. Among other things, the hypothetical simulated performance calculations do not take into account all aspects of the applicable asset's characteristics under certain conditions, including characteristics that can have a significant impact on the results. Further, in evaluating the hypothetical simulated performance results herein, each prospective investor should understand that not all of the hypothetical assumptions used in the model are described herein, and conditions and events that are not accounted for by the model may have a significant adverse effect on the performance of the assets described herein. Prospective investors should consider whether the behavior of these assets should be tested based on different and/or additional assumptions from those included in the information herein.

IN ADDITION TO OTHER DIFFERENCES, PROSPECTIVE INVESTORS IN A VEHICLE SHOULD NOTE THE FOLLOWING POTENTIALLY SIGNIFICANT DIFFERENCES BETWEEN THE ASSUMPTIONS MADE IN THE HYPOTHETICAL SIMULATED PERFORMANCE RESULTS INCLUDED HEREIN AND THE CONDITIONS UNDER WHICH A VEHICLE WILL PERFORM, WHICH COULD CAUSE THE ACTUAL RETURN OF SUCH VEHICLE TO DIFFER CONSIDERABLY FROM RETURNS SET FORTH BY THE HYPOTHETICAL SIMULATED PERFORMANCE, TO BE MATERIALLY LOWER THAN THE RETURNS AND TO RESULT IN LOSSES OF SOME OR ALL OF THE INVESTMENT BY PROSPECTIVE INVESTORS:

FOR EXAMPLE, EACH TRUST WILL HOLD ONLY ONE DIGITAL ASSET, WHEREAS THE HYPOTHETICAL SIMULATED PERFORMANCE RESULTS ARE INTENDED TO SHOW HYPOTHETICAL PERFORMANCE OF AN INVESTMENT MULTIPLE DIGITAL ASSETS. IN ADDITION, THE GENERAL MARKET DATA USED IN THE HYPOTHETICAL SIMULATED PERFORMANCE RESULTS DO NOT REFLECT ACTUAL TRADING ACTIVITY AND COULD NOT BE REPLICATED BY A VEHICLE IN ITS ACTUAL TRANSACTIONS. If actual trading activity was executed at levels that differed significantly from the general market data used in the hypothetical simulated performance, the actual returns achieved would have varied considerably from the results of the hypothetical simulated performances and could have been substantially lower and could result in significant losses.

IN ADDITION, THE HYPOTHETICAL SIMULATED PERFORMANCE RESULTS DO NOT ASSUME ANY GAINS OR LOSSES FROM TRADING AND THEREFORE DO NOT REFLECT THE POTENTIAL LOSSES, COSTS AND RISKS POSED BY TRADING AND HOLDING ACTUAL ASSETS.

The hypothetical simulated performance results do not reflect the impact the market conditions may have had upon a Vehicle were it in existence during the historical period selected. The hypothetical simulated performance results do not reflect any fees incurred by a Vehicle. If such amounts had been included in the hypothetical simulated performance, the results would have been lowered.

AS A RESULT OF THESE AND OTHER DIFFERENCES, THE ACTUAL RETURNS OF A VEHICLE MAY BE HIGHER OR LOWER THAN THE RETURNS SET FORTH IN THE HYPOTHETICAL SIMULATED PERFORMANCE RESULTS, WHICH ARE HYPOTHETICAL AND MAY NEVER BE ACHIEVED. Reasons for a deviation may also include, but are by no means limited to, changes in regulatory and/or tax law, generally unfavorable market conditions and the Risk Factors set forth below.

### Certain Risk Factors

Each Vehicle is a private, unregistered investment vehicle and not subject to the same regulatory requirements as exchange traded funds or mutual funds, including the requirement to provide certain periodic and standardized pricing and valuation information to investors. There are substantial risks in investing in a Vehicle, including but not limited to:

- **PRICE VOLATILITY**
  Digital assets have historically experienced significant intraday and long-term price swings. In addition, none of the Vehicles currently operates a redemption program and may halt creations from time to time. There can be no assurance that the value of the common units of fractional undivided beneficial interest ("Shares") of any Vehicle will approximate the value of the digital assets held by such Vehicle and such Shares may trade at a substantial premium over or discount to the value of the digital assets held by such Vehicle. At this time, none of the Vehicles is operating a redemption program and therefore Shares are not redeemable by any Vehicle. Subject to receipt of regulatory approval from the SEC and approval by the Sponsor or Manager, as applicable, in its sole discretion, any Vehicle may in the future operate a redemption program. Because none of the Vehicles believes that the SEC would, at this time, entertain an application for the waiver of rules needed in order to operate an ongoing redemption program, none of the Vehicles currently has any intention of seeking regulatory approval from the SEC to operate an ongoing redemption program.

- **MARKET ADOPTION**
  It is possible that digital assets generally or any digital asset in particular will never be broadly adopted by either the retail or commercial marketplace, in which case, one or more digital assets may lose most, if not all, of its value.

- **GOVERNMENT REGULATION**
  The regulatory framework of digital assets remains unclear and application of existing regulations and/or future restrictions by federal and state authorities may have a significant impact on the value of digital assets.

- **SECURITY**
  While each Vehicle has implemented security measures for the safe storage of its digital assets, there have been significant incidents of digital asset theft and digital assets remains a potential target for hackers. Digital assets that are lost or stolen cannot be replaced, as transactions are irrevocable.

- **TAX TREATMENT OF VIRTUAL CURRENCY**
  *For U.S. federal income tax purposes, Digital Large Cap Fund will be a passive foreign investment company (a "PFIC") and, in certain circumstances, may be a controlled foreign corporation (a "CFC"). Digital Large Cap Fund will make available a PFIC Annual Information Statement that will include information required to permit each eligible shareholder to make a "qualified electing fund" election (a "QEF Election") with respect to Digital Large Cap Fund.
  Each of the other Vehicles intends to take the position that it is a grantor trust for U.S. federal income tax purposes. Assuming that a Vehicle is properly treated as a grantor trust, Shareholders of that Vehicle generally will be treated as if they directly owned their respective pro rata shares of the underlying assets held in the Vehicle, directly received their respective pro rata shares of the Vehicle's income and directly incurred their respective pro rata shares of the Vehicle's expenses. Most state and local tax authorities follow U.S. income tax rules in this regard.
  Prospective investors should discuss the tax consequences of an investment in a Vehicle with their tax advisors.

- **NO SHAREHOLDER CONTROL**
  Grayscale, as sponsor of each Trust and the manager of the Fund, has total authority over the Trusts and the Fund and shareholders' rights are extremely limited.

- **LACK OF LIQUIDITY AND TRANSFER RESTRICTIONS**
  An investment in a Vehicle will be illiquid and there will be significant restrictions on transferring interests in such Vehicle. The Vehicles are not registered with the SEC, any state securities laws, or the U.S. Investment Company Act of 1940, as amended, and the Shares

of each Vehicle are being offered in a private placement pursuant to Rule 506(c) under Regulation D of the Securities Act of 1933, as amended (the "Securities Act"). As a result, the Shares of each Vehicle are restricted Shares and are subject to a one-year holding period in accordance with Rule 144 under the Securities Act. In addition, none of the Vehicles currently operates a redemption program. Because of the one-year holding period and the lack of an ongoing redemption program, Shares should not be purchased by any investor who is not willing and able to bear the risk of investment and lack of liquidity for at least one year. No assurances are given that after the one year holding period, there will be any market for the resale of Shares of any Vehicle, or, if there is such a market, as to the price at such Shares may be sold into such a market.

- **POTENTIAL RELIANCE ON THIRD-PARTY MANAGEMENT; CONFLICTS OF INTEREST**
  The Vehicles and their sponsors or managers and advisors may rely on the trading expertise and experience of third-party sponsors, managers or advisors, the identity of which may not be fully disclosed to investors. The Vehicles and their sponsors or managers and advisors and agents may be subject to various conflicts of interest.

- **FEES AND EXPENSES**
  Each Vehicle's fees and expenses (which may be substantial regardless of any returns on investment) will offset each Vehicle's trading profits.

### Additional General Disclosures

Investors must have the financial ability, sophistication/experience and willingness to bear the risks of an investment. Any offering or solicitation will be made only to qualified accredited investors as defined under Rule 501(a) of Regulation D pursuant to a formal offering with additional documentation, all of which should be read in their entirety and contain material information not contained herein. Any offer or solicitation of an investment in a Vehicle may be made only by delivery of its confidential offering documents to qualified accredited investors. You should rely solely on such offering documents in making any investment decision. An investment in Grayscale's Vehicles are not suitable for all investors.

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The above summary is not a complete list of the risks and other important disclosures involved in investing in the Vehicles and is subject to the more complete disclosures contained in each Vehicle's Offering Documents, which must be reviewed carefully.

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