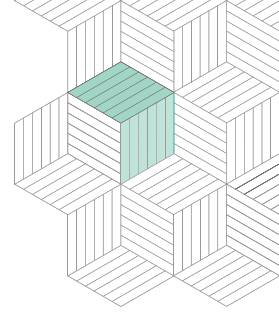


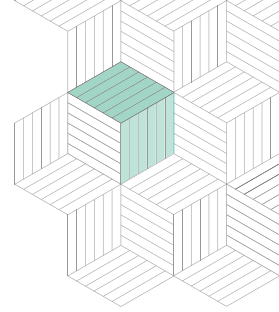
An Introduction to Stellar Lumens





Introduction	3
Brief History	5
Core Technology	8
Key Features	10
Advantages	12
Potential Risks	13
Summary	14





Introduction

- 1
- 2
- 3
- 4
- 5
- 6
- 7

Lumens (XLM) is the native digital currency supported by the Stellar network, an underlying peer-to-peer (P2P) payment network and development platform that allows for near instantaneous transactions across the world. Together, XLM and Stellar strive to achieve greater financial inclusivity by connecting entities ranging from merchants and financial institutions to individual users, especially those without access to traditional banking services. The Stellar network also allows for fast, secure, and low-cost conversions across varying units of value (e.g., commodities, fiat currencies, and other digital assets). It was launched in July 2014 by Jed McCaleb, co-founder of Ripple and creator of Mt. Gox, and Joyce Kim, co-founders of the Stellar Development Foundation (SDF), a nonprofit committed to overseeing the development of the Stellar technology.

The Stellar network was originally derived partially from the codebase of early iterations of XRP Ledger, the underlying P2P payment network of the XRP token that is led by Ripple. Though the two payment networks were designed to be globally scalable and accessible, they were built on fundamentally different principles – XRP Ledger sought to provide liquidity solutions for large-scale institutions under the partial oversight of a for-profit company known as Ripple, while Stellar targeted everyone from organizations to individuals with a focus on global financial inclusion via partial oversight from a nonprofit, SDF. Like XRP Ledger, Stellar utilizes distributed ledger technology to validate transactions, and was implemented with several software modifications, including the Stellar Consensus Protocol (SCP) and a platform that allows developers to execute smart contracts and decentralized payment applications (dApps).

At inception, SDF was backed by a seed investment from [Stripe](#) and has since developed partnerships with Fortune 500 companies like [Franklin Templeton](#) and [IBM](#). Given the egalitarian mission, level of industry support, and growing base of developers at SDF, XLM has risen among many of its counterparts to assume its position as the tenth largest digital asset in the ecosystem by market cap.¹

1. Coin Metrics, CoinMarketCap.com, Messari / OnChainFX. As of November 30, 2019.





- 1
- 2
- 3
- 4
- 5
- 6
- 7

FIGURE 1: STELLAR LUMENS SUMMARY STATISTICS²

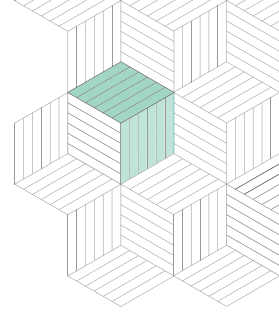
As of October 1, 2021

Asset	Lumens (XLM)
Network	Stellar
Protocol	Stellar Consensus Protocol
Inception of Network	July 2014
Price (USD)	\$0.30
Market Cap (USD)	\$31.6 billion
Circulating Supply (XLM / % of Max Supply)	24.04 billion / 48.1%
Max Supply	Approximately 50 billion ³
Average Transaction Time	2 to 5 seconds
Market Segment	Digital Currency Global Payments

2. Ibid.

3. 100 billion XLM were created at network inception in July 2014, with an annual inflation rate of 1%. On November 4, 2019, 55.44 billion XLM of the 105 billion total supply was "burned." Moreover, the supply of XLM is fixed now because the community of token holders voted to discontinue inflation on October 28, 2019.





Brief History

- 1
- 2
- 3
- 4
- 5
- 6
- 7

Stellar and XLM emerged in 2014 following irreconcilable disagreements between Jed McCaleb and other founding members and key executives of the Ripple team. These differences surrounding the direction of the company, roadmap, and philosophy behind Ripple led to the creation of the Stellar network and SDF, a nonprofit organization founded to support the Stellar network’s development and growth.

Based on its partial derivation from the XRP Ledger codebase, Stellar is often compared to XRP Ledger for similarities in its protocol design. It initially employed the Ripple Protocol Consensus Algorithm (RPCA), which was replaced with the Stellar Consensus Protocol (SCP) as a result of a fork and subsequent upgrade. According to Joyce Kim, there were two shortcomings associated with RPCA: the minimization of transaction safety in favor of system activity and node integrity, and the ability of the algorithm to achieve correctness.⁴

Stellar Development Foundation and Interstellar

SDF, also known as Stellar.org, was formed to manage the technical development of the network. It was founded with a \$3 million loan from Stripe, a payment technology company, which was repaid with 2%, or 2 billion XLM of the 100 billion in supply created at inception.⁵ In addition to this investment, SDF is funded by membership fees from foundation members and its reserve of 5% of the initially created XLM supply. The organization has the ability to sell its reserves in auction or in batches and has set a five-year restriction on the SDF Founders’ and Stripe’s ability to sell their reserves in an effort to ensure price stability.⁶

To complement its nonprofit initiatives, SDF funded the creation of its commercial arm, Interstellar, in September 2018. Interstellar is the result of a merger between Lightyear.io, previously a for-profit entity focused on expanding Stellar’s partnerships with institutional clients, and Chain, known for its enterprise-level product suite. SDF and Interstellar operate independently, but work together to advance Stellar technology and its adoption across commercial enterprises and individuals.

4. Joyce Kim. “Safety, liveness and fault tolerance -- the consensus choices.” *Stellar*. December 5, 2014. https://www.stellar.org/blog/safety_liveness_and_fault_tolerance_consensus_choice/.
 “Stellar” is a trademark of the Stellar Development Foundation. Neither Grayscale nor Grayscale Stellar Lumens Trust are not affiliated with, endorsed by, or supported by the Stellar Development Foundation.
 5. Kim-Mai Cutler. “Stripe Backs Non-Profit Decentralized Payment Network Stellar, From Mt. Gox’s Original Creator.” *TechCrunch*. July 31, 2014. <https://techcrunch.com/2014/07/31/stripe-backs-non-profit-decentralized-payment-network-stellar-from-mt-goxs-original-creator/>.
 6. “Stellar Development Foundation Mandate.” *Stellar*. <https://www.stellar.org/foundation/mandate>





1

2

3

4

5

6

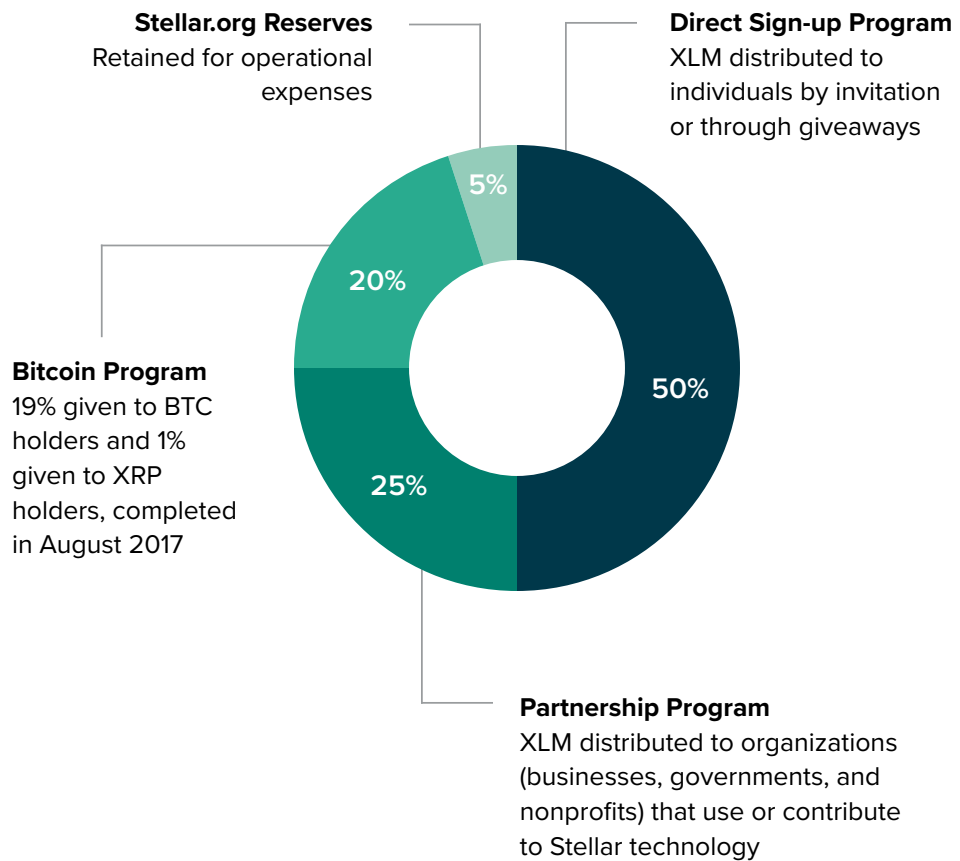
7

XLM Supply & Distribution Schedule

Like XRP, 100 billion XLM were created at the inception of the Stellar network. However, unlike XRP, XLM was incorporated with a 1% annual inflation mechanism to broaden the distribution of token supply. This was also a way to prevent arbitrary creations of money, potentially leading to hyperinflation or manipulation. During this time, the target allocations for distribution of XLM supply were determined to be as follows, per SDF's custodial mandate to oversee the fair distribution of XLM to the world:

FIGURE 2: XLM TOTAL SUPPLY ALLOCATION

Decided at Inception⁷



⁷. Ibid





1

2

3

4

5

6

7

In November 2019, approximately 55 billion XLM controlled by SDF were “burned”, or sent to a wallet address in which access to those XLM is no longer possible. According to SDF, this was determined after realizing that the amount of XLM that they controlled was too large and would be difficult to fairly distribute to the market in accordance with SDF’s mission.⁸

As a result of the burn, there is now a total of approximately 50 billion XLM, of which nearly 30 billion (or 60%) have not been distributed and remain in the control of SDF.⁹

Of those 30 billion XLM, SDF has earmarked allocations for the following activities and initiatives¹⁰:

- **Development Fund:** 12 billion XLM in the direct development fund (formerly called “operations”), to support the organization.
- **Ecosystem Support:** 2 billion XLM remaining (1 billion for currency support, and 1 billion for infrastructure grants).
- **Investments:** 10 billion XLM to make investments (with 2 billion XLM for new products, and 8 billion XLM in SDF’s enterprise fund).
- **User Acquisition:** 6 billion XLM (2 billion for marketing Stellar and 4 billion for in-app promotions).

The total supply of XLM is now fixed at approximately 50 billion and the 1% annual inflation rate was discontinued following a vote by community tokenholders on October 28, 2019.¹¹ More information about the SDF’s future roadmap and funding plans can be found at the following [blog post](#). The remaining disbursement of funds can also be tracked on the [Stellar.org Dashboard](#).

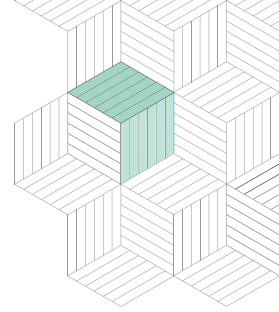
8. Brady Dale. “Stellar’s Foundation Just Destroyed Half the Supply of Its Lumens Cryptocurrency.” *CoinDesk*. November 5, 2019. <https://www.coindesk.com/stellars-foundation-just-destroyed-half-the-supply-of-its-lumens-cryptocurrency>.

9. Stellar.org Dashboard. <https://dashboard.stellar.org/>.

10. Brady Dale. “Stellar’s Foundation Just Destroyed Half the Supply of Its Lumens Cryptocurrency.” *CoinDesk*. November 5, 2019. <https://www.coindesk.com/stellars-foundation-just-destroyed-half-the-supply-of-its-lumens-cryptocurrency>.

11. *Ibid*





Core Technology



- 1
- 2
- 3
- 4
- 5
- 6
- 7

The Stellar network is comprised of four main components: Stellar Core, the Stellar Consensus Protocol (SCP), the Horizon API, and Stellar Smart Contracts (SSCs). These features work simultaneously in pursuit of its main goal – to create a more inclusive, fast, and secure distributed payment network alternative to other digital currencies.

Stellar Core

Stellar Core is the open-source software serving as the basis for network participants to reach consensus. Alternatively, it is used to refer to a network node, and the network is comprised of Stellar Cores. It utilizes the Stellar Consensus Protocol to validate transactions and stores the most recent copy of the ledger containing the entire transaction history of the Stellar network since inception.

Stellar Consensus Protocol (SCP)

The Stellar Consensus Protocol was created by David Mazières, Chief Scientist of Stellar.org and professor at Stanford University, in April 2015. SCP is a distributed ledger that uses cryptography to hold, transfer, and trade assets, including XLM. A decentralized network of participants validate transactions in a process called consensus. The network nodes independently update their version of the ledger and come together to vote on the correct order of transactions. Once a majority of the nodes agree, a new ledger is created and adopted as the correct version.

This consensus algorithm differs from the proof-of-work (PoW) or proof-of-stake (PoS) blockchain protocol used in most other digital currency networks.¹² A PoW or PoS network is built so that participants are competing over rewards for uploading a transaction on to the blockchain. Conversely, in a consensus network, competition amongst participants does not exist, as the primary incentive for honest transaction validation is based on trust and the vested interests of participants in the network.

SCP was the first to be implemented with the Federated Byzantine Agreement (FBA), which was originally conceptualized by the Ripple team. The federated voting procedure outlined in the FBA is based on a quorum, defined as the

¹² Proof-of-work (PoW) is a blockchain protocol in which miners compete to upload blocks of transactions on to a blockchain and receive mining rewards based on the amount of computation resources they have contributed to the network. Proof-of-stake (PoS) is a blockchain protocol in which validators approve of transactions and receive a transaction fee based on the number of coins they own and have staked to the network.





- 1
- 2
- 3
- 4
- 5
- 6
- 7

minimum number of nodes for the system to reach agreement. In FBA, nodes choose which nodes participate in a quorum, as opposed to the Practical Byzantine Fault Tolerance (PBFT) enlisted in most protocols, which do not choose.¹³

For more information, please refer to the Stellar Consensus Protocol [whitepaper](#) or this [summary](#) by SDF.

Horizon API

Horizon is the application programming interface (API) server that allows users to interact with the Stellar network. It is used in conjunction with online payment or trading technologies, including mobile wallets, exchanges, and dApps. It is divided into three segments that split functionality:

1. The Transactions API facilitates payment activity by allowing users to send transactions and validate information, like ledger number, transaction amounts, account balances, and payment confirmations.
2. The History API maintains all historical information dating back to the genesis ledger.
3. The Trading API provides updated order book information and data on completed trades.

For more information on the Horizon API, please refer to this [guide](#) by SDF.

Stellar Smart Contracts (SSCs)

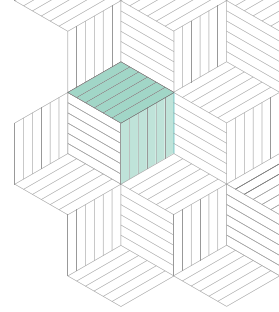
Stellar Smart Contracts (SSCs) are pre-programmed compositions of transactions that are connected and executed based on chosen conditions.¹⁴ The following are some examples of SSC capabilities:

- *Multisignature* is the concept requiring a specified number of signatures of multiple parties to initiate transactions from an account. By assigning signature weights and thresholds, representations of power in signatures can be created.¹⁵
- *Batching* is the concept of including multiple payments to specified parties stemming from a single transaction.
- *Sequence* requires that transactions can only occur based on conditional order. In other words, Transaction B cannot initiate until Transaction A is complete.
- *Time bounds* require that transactions can only occur within a set window of time.

For more information on SSCs, please refer to the [Stellar Smart Contract Guide](#) by SDF.

13. Stellar Development Foundation. "Our Worldwide Consensus." *Medium*. April 8, 2015. <https://medium.com/stellar-development-foundation/on-worldwide-consensus-359e9eb3e949>.
14. Stellar Developers Guides. "Stellar Smart Contracts." github.com/stellar-docs
15. Ibid.





Key Features

Together, XLM and the Stellar network possess the following qualities that make it a unique investment opportunity:

- **Level of Decentralization:** XLM is supported by the P2P Stellar network built on distributed ledger technology. It does not require a central authority to mediate transactions between parties. However, one caveat is that while the supply of XLM has been pre-allocated for specific uses, nearly 60% is still controlled by SDF. This indicates that there is some degree of centralization in the network, even if SDF's approach aims to foster global financial inclusion through benevolent oversight.
- **Semi-permissioned:** Stellar Anchors are trusted validators that are permitted to hold users' deposits and issue credits to exchange fiat or digital currencies, or other assets. Most anchors are organizations like banks, savings institutions, farmers' co-ops, central banks, and remittance companies.¹⁶ This differs from most networks using a PoW or PoS blockchain protocol, where any individual or entity with the financial and/or computational resources can become a network miner or validator.
- **Secure:** The Stellar network consists of users and validators in a system where each validator determines which other validators to trust for an accurate version of the latest ledger. Since validators are identified and selected by other validators based on trust, it is more difficult for new, unknown validators to carry out a malicious attack on the network.
- **Open-source:** The source code for [Stellar Core](#) is available on the Internet, free for anyone to access, contribute to, or fork. Users can introduce [Core Advancement Proposals \(CAPs\)](#), which are changes to Stellar Core, and [Stellar Environment Proposals \(SEPs\)](#), which are changes to the Stellar ecosystem. CAPs and SEPs are designed to improve the network and follow strict technical guidelines.

Stellar Core can continue to exist independent of SDF. This is an important characteristic for building trust and accumulating users.

- **Transparent:** All transactions are recorded and publicly viewable on the Stellar network from anywhere in the world.

¹⁶ Stellar Developers Guides. "Anchor," <https://www.stellar.org/learn/anchor-basics?locale=en>

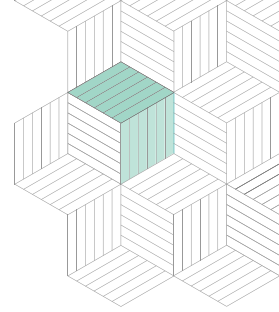




- 1
- 2
- 3
- 4**
- 5
- 6
- 7

- **Pseudonymous:** Public wallet addresses are not directly linked to any identifying personal information. However, in the current state of the network, complete anonymity is difficult to achieve. This is because addresses involved in any XLM transaction are permanently and publicly viewable on the ledger.
- **Finite supply:** The total supply of XLM is now fixed at approximately 50 billion and the 1% annual inflation rate was discontinued following a vote by community token holders on October 28, 2019. An established and transparent monetary supply and issuance schedule is critical for evaluation a digital currency's investability.





Advantages

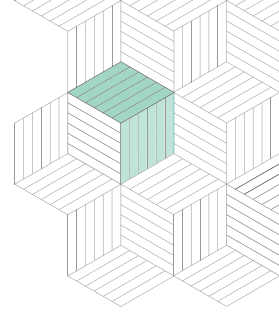
The design of XLM and the Stellar network leads to four potential advantages when compared to traditional financial institutions, payment channels, and other digital asset networks:

- **Fast transaction speeds:** XLM ledgers (or blocks) confirm every 5 seconds compared to Bitcoin's roughly 10 minute block time, making it significantly faster at processing transactions. Stellar transactions occur much faster than the time it takes to process international or domestic transactions sent via traditional payment channels, which is often several days.
- **Low transaction fees:** The average XLM transaction cost is 0.00005. It is among the lowest relative to the top ten digital assets by market cap, along with SOL and ADA.¹⁷ It is far cheaper than the international or domestic wire transfer fees charged for each transaction by banks.
- **Institutional network:** Stellar is now being piloted for institutional financial use cases by Fortune 500 companies, including IBM and Franklin Templeton, who are leveraging the network for cross-border payments and securities tracking and settlement, respectively. While these early stage use cases and experiments center around commercialization of the Stellar network technology rather than XLM specifically, these applications also provide the potential for increased XLM adoption in the future.
- **Smart contract compatibility:** As previously outlined, Stellar features a development platform that is compatible with smart contracts and dApps.

- 1
- 2
- 3
- 4
- 5
- 6
- 7

¹⁷. CoinMetrics. As of November 30, 2019.





Potential Risks

- 1
- 2
- 3
- 4
- 5
- 6
- 7

- **Level of Decentralization:** In May 2019, the Stellar network temporarily went offline due to a network overload from the addition of a large number of new nodes.¹⁸ In research conducted at the Korea Advanced Institute of Science and Technology (KAIST), Kim et al. (2019) alluded to centralization issues, speculating that the removal of two nodes operated by SDF would be enough to stop the network from processing transactions.¹⁹ Mazières (2019) presented his counterargument to these assertions, acknowledging some limitations with the current state of the network, but highlighting its prioritization of security over all else.²⁰ The consequences of these findings are unclear, and therefore, these concerns are a potential risk.
- **Volatility with Smart Contracts:** Since transactions resulting from smart contracts generally cannot be stopped or reversed, any vulnerabilities in the underlying source code can weaken the network. Smart contracts and its accompanying code are an emerging technology and are still in the development stage.
- **Potential for Supply Shocks:** 60% of the total XLM remains in control of SDF and the timing and sizes of distributions are not known with complete precision. Though there are guidelines and in some cases restrictions placed on the distribution and sale of XLM, there are still risks that large and/or sustained periodic sales for funding purposes or otherwise could place pressure on the price of XLM.
- **Regulatory Uncertainty:** The SEC has stated that certain digital assets may be considered “securities” under the federal securities laws. To date, the SEC has only identified two digital assets, Bitcoin and Ethereum, for which it does not intend to take the position that they are securities. As a result, any other digital asset, including XLM, is at risk of being deemed a security, which may have material adverse consequences for such digital asset.

18. Stephen O’Neal. “Stellar’s Blockchain Briefly Goes Offline, Confirming the Project Lacks Decentralization.” *CoinTelegraph*. May 20, 2019. <https://cointelegraph.com/news/stellars-blockchain-briefly-goes-offline-confirming-the-project-lacks-decentralization>.
19. Minjeong Kim, Yujin Kwon, and Yongdae Kim. “Is Stellar As Secure As You Think?” April 2019. <https://arxiv.org/pdf/1904.13302.pdf>.
20. David Mazières. “Safety vs. Liveness in the Stellar Network.” April 2019. <http://www.scs.stanford.edu/~dm/blog/safety-vs-liveness.pdf>.





- 1
- 2
- 3
- 4
- 5
- 6
- 7

Summary

XLM and the Stellar network have the potential to become a preferred currency and payment platform for low-cost, cross-border transactions with widespread adoption. With its mission to significantly reduce financial barriers for individuals and organizations ranging in all sizes, Stellar has earned support from individual users within the digital currency community as well as large-scale financial institutions. As the Stellar network matures with more users and institutional clients it has the potential to be a leading player within the rising digital currency asset class.

Check out our in-depth reports on different digital currencies [here](#).





About Grayscale Investments, LLC



- 1
- 2
- 3
- 4
- 5
- 6
- 7

Founded in 2013, Grayscale Investments is the world's largest digital currency asset manager. Through its family of investment products, Grayscale provides access and exposure to the digital currency asset class in the form of a security without the challenges of buying, storing, and safekeeping digital currencies directly. With a proven track record and unrivaled experience, Grayscale's products operate within existing regulatory frameworks, creating secure and compliant exposure for investors.

Grayscale is headquartered in Stamford, Connecticut. For more information on Grayscale, please visit www.grayscale.com or follow us on Twitter [@Grayscale](https://twitter.com/Grayscale).





Important Disclosures & Other Information

All content is original and has been researched and produced by Grayscale Investments, LLC (“Grayscale”) unless otherwise stated herein. No part of this content may be reproduced in any form, or referred to in any other publication, without the express consent of Grayscale.

This information should not be relied upon as research, investment advice, or a recommendation regarding any products, strategies, or any security in particular. This material is strictly for illustrative, educational, or informational purposes and is subject to change.

This content does not constitute an offer to sell or the solicitation of an offer to sell or buy any security in any jurisdiction where such an offer or solicitation would be illegal. There is not enough information contained in this content to make an investment decision and any information contained herein should not be used as a basis for this purpose. This content does not constitute a recommendation or take into account the particular investment objectives, financial situations, or needs of investors.

Investors are not to construe this content as legal, tax or investment advice, and should consult their own advisors concerning an investment in digital assets. The price and value of assets referred to in this content and the income from them may fluctuate. Past performance is not indicative of the future performance of any assets referred to herein. Fluctuations in exchange rates could have adverse effects on the value or price of, or income derived from, certain investments.

Certain of the statements contained herein may be statements of future expectations and other forward-looking statements that are based on Grayscale’s views and assumptions and involve known and unknown risks and uncertainties that could cause actual results, performance or events to differ materially from those expressed or implied in such statements. In addition to statements that are forward-looking by reason of context, the words “may, will, should, could, can, expects, plans, intends, anticipates, believes, estimates, predicts, potential, projected, or continue” and similar expressions identify forward-looking statements. Grayscale assumes no obligation to update any forward-looking statements contained herein and you should not place undue reliance on such statements, which speak only as of the date hereof. Although Grayscale has taken reasonable care to ensure that the information contained herein is accurate, no representation or warranty (including liability towards third parties), expressed or implied, is made by Grayscale as to its accuracy, reliability or completeness. You should not make any investment decisions based on these estimates and forward-looking statements.

Carefully consider each Product’s investment objectives, risk factors, fees and expenses before investing. This and other information can be found in each Product’s private placement memorandum, which may be obtained from Grayscale and, for each Product that is an SEC reporting company, the SEC’s website, or for each Product that reports under the OTC Markets Alternative Reporting Standards, the OTC Markets website.

Reports prepared in accordance with the OTC Markets Alternative Reporting Standards are not prepared in accordance with SEC requirements and may not contain all information that is useful for an informed investment decision. Read these documents carefully before investing.

Investments in the Products are speculative investments that involve high degrees of risk, including a partial or total loss of invested funds. Grayscale Products are not suitable for any investor that cannot afford loss of the entire investment. The shares of each Product are intended to reflect the price of the digital asset(s) held by such Product (based on digital asset(s) per share), less such Product’s expenses and other liabilities.

Because each Product does not currently operate a redemption program, there can be no assurance that the value of such Product’s shares will reflect the value of the assets held by such Product, less such Product’s expenses and other liabilities, and the shares of such Product, if traded on any secondary market, may trade at a substantial premium over, or a substantial discount to, the value of the assets held by such Product, less such Product’s expenses and other liabilities, and such Product may be unable to meet its investment objective.

The shares of each Product are not registered under the Securities Act of 1933 (the “Securities Act”), the Securities Exchange Act of 1934 (except for Products that are SEC reporting companies), the Investment Company Act of 1940, or any state securities laws. The Products are offered in private placements pursuant to the exemption from registration provided by Rule 506(c) under Regulation D of the Securities Act and are only available to accredited investors. As a result, the shares of each Product are restricted and subject to significant limitations on resales and transfers. Potential investors in any Product should carefully consider the long-term nature of an investment in that Product prior to making an investment decision. The shares of certain Products are also publicly quoted on OTC Markets and shares that have become unrestricted in accordance with the rules and regulations of the SEC may be bought and sold throughout the day through any brokerage account.

The Products are distributed by Genesis Global Trading, Inc. (Member FINRA/SIPC, MSRB Registered).

© 2021 Grayscale Investments, LLC. All rights reserved. The GRAYSCALE and GRAYSCALE INVESTMENTS logos, graphics, icons, trademarks, service marks and headers are registered and unregistered trademarks of Grayscale Investments, LLC in the United States.

- 1
- 2
- 3
- 4
- 5
- 6
- 7





General Inquiries

info@grayscale.com

Address: 262 Harbor Drive, 1st Floor, Stamford, CT 06902

Phone: (212) 668-1427

@Grayscale

grayscale.com