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Building Mutual Funds on Blockchain: A Brave New World for Investment Managers

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Investment managers are increasingly looking to blockchain technology as a means to improve the experience of investors in their investment funds. Blockchain technology can add value for investment managers at both the product level (for example, new products and investor use cases) and the operational level. At the product level, blockchain technology allows for the introduction of a new suite of products, such as investment funds that issue shares natively on a blockchain (often referred to as "tokenized" funds). At the operational level, blockchain technology introduces potential benefits to back- and middle-office infrastructure, data management and transaction settlement and may promote cost efficiencies at scale. While there are many possibilities for blockchain technology that are yet to be realized, in this article we focus on investment companies registered under the Investment Company Act of 1940 (1940 Act), primarily mutual funds, that have integrated blockchain technology into their operations.

Tokenization of a wide array of real-world assets such as real estate, bonds, interests of private funds and other securities is a growing area of interest that is also attracting the attention of investment managers. Blockchain technology has the potential to disrupt the multi-trillion dollar asset management industry. Of course, many of the observations made here can apply generally to the tokenization of other asset classes and financial instruments.

Blockchain-integration and tokenization refer to the ability of a fund to record the ownership of its shares on a blockchain (rather than on a more traditional book-entry system) and issue shares as "digital assets." It is important to note that, while blockchain technology expands potential product offerings and introduces changes to fund infrastructure and operations, it does not entail a change in how a fund is actually managed or its investment strategies. For example, a mutual fund that records the ownership of its shares on a blockchain must continue to comply with all portfolio requirements under the 1940 Act (for example, custody, diversification, liquidity, etc.). It also is important to note that, given other requirements to which mutual funds are subject, for example, shareholder reporting requirements, anti-money laundering (AML) requirements, etc., and the unique role of mutual fund transfer agents, blockchain technology is not likely to replace a mutual fund's transfer agent, at least not anytime soon.

This article begins with a note about blockchain and related terminology and then provides an overview of traditional mutual fund operations with respect to distribution, clearing and settlement, and transfer agent functions. Because the changes necessary to incorporate blockchain infrastructure require an evaluation of a mutual fund's current operational flow, an overview is included before moving on to discuss potential blockchain integrations. The article

next discusses operational and organizational considerations, followed by an overview of the technology (including current benefits and shortcomings) that an investment manager should consider in developing blockchain-integrated infrastructure.

Blockchain and Related Terminology

As a preface to the operational descriptions provided below, the terms frequently used with respect to transactions in digital assets should be clarified. The terms "blockchain" and "distributed ledger" are used in this article interchangeably (a blockchain is in fact only one type of distributed ledger, but it is the most common with respect to digital assets). The term "digital asset" refers to any asset that is issued and transferred using blockchain or distributed ledger technology. Digital assets include "virtual currencies" such as bitcoin. The Securities and Exchange Commission (SEC) and its Staff use the term "digital asset security" to refer to any digital asset that is a security.

Transacting in digital assets requires setting up a "wallet" to store the public and private keys associated with the digital asset. The public and private keys are cryptographically linked together. The public key is used for "sending" and "receiving" the digital assets and the private key is used to authenticate a sending transaction. A wallet, in whatever form, keeps the keys (a string of characters) for the digital asset secure.

While it is common in the digital asset industry to use the term "send" with respect to effecting a transaction (for example, Bob sends Alice one bitcoin), digital assets are not actually sent between participants nor are they actually stored in a participant's wallet. Rather, digital assets only exist on their respective blockchain and are associated with a user's public key. The blockchain maintains a list of all the assets, and against each asset the public key of its owner. When a user "sends" a transaction to the blockchain, the user is actually instructing the blockchain to update the blockchain record such that the digital asset becomes associated with another user's public key. Once the blockchain is updated, the new owner now has its public key listed against that asset and can use its private key in connection with any subsequent transaction. While in theory one might expect this to occur immediately upon submitting a transaction to the blockchain, in reality there may be delays due to transaction processing times and network congestion which vary from blockchain to blockchain.

It is important to recognize that there are different *types* of blockchains and different *ways* to impose controls and other restrictions on transactions that occur on a particular blockchain. For example, on the bitcoin blockchain network, if you lose your private key, you may lose access to your bitcoin.[1] But for some blockchains, "permissioning" controls and other restrictions would provide degrees of control that would enable mutual funds and their transfer agents to, for example, correct unauthorized transactions, block transactions to unauthorized accounts and restore account access if private keys are lost or stolen.

Overview of Traditional Distribution, Clearing, and Transfer Agent Roles for Mutual Funds

Historically, many mutual fund shareholders purchased their shares directly from a mutual fund or through the mutual fund's transfer agent. Today, however, purchases and redemptions are often intermediated through a broker-dealer, investment adviser, or other financial intermediary.[2] Under these arrangements, the intermediary is the shareholder of record on the books of the mutual fund (as maintained by the transfer agent). These "omnibus" accounts are in the name of the intermediary on behalf of the intermediaries' beneficial owner-customers. The intermediary, in turn, performs record-keeping on its own books (subaccounting) and other services for its customers. A mutual fund and its transfer agent typically will not know the identities of the intermediary's customers, who are the underlying beneficial owners of the fund's shares.

The majority of mutual fund transactions occur through two automated utilities provided by the National Securities Clearing Corporation (NSCC): Fund/SERV (for financial transactions) and Networking (for non-financial transactions). However, there are some shareholder transactions that are processed outside of the Fund/SERV and Networking systems, including through the Internet and telephone. The creation and evolution of Fund/SERV and Networking has led to a more efficient, cost-effective trading, settlement, and reconciliation system for intermediaries and mutual fund transfer agents.[3]

Shareholder orders to purchase mutual fund shares are ultimately received by a mutual fund's transfer agent, regardless of whether the shareholder's order is submitted directly to the transfer agent or indirectly through an intermediary (including where the intermediary submits the order through the NSCC's Fund/SERV system). After receiving a purchase order, a transfer agent typically:[4] (i) calculates the number of shares to be purchased; (ii) collects the purchase proceeds for those shares; (iii) deposits the purchase proceeds into the mutual fund's custodial account; (iv) issues on behalf of the mutual fund the shares to be purchased; and (v) records the transaction on the master securityholder file of the mutual fund.[5] Mutual fund transfer agents engage in a comparable process for shareholder redemptions.

In addition to maintaining ownership records and facilitating the issuance of dividends and the purchase and redemption of fund shares, mutual fund transfer agents provide a wide array of other services, including: (i) preparing and/or mailing account statements, shareholder reports, proxy statements and prospectuses; (ii) facilitating compliance with the offering terms set forth in prospectuses (for example, minimum purchase amounts, shareholder eligibility, etc.); (iii) facilitating compliance with the federal securities laws, state securities laws and other applicable laws (for example, "blue sky" notice filings, AML and know-your customer (KYC) requirements, etc.); and (iv) facilitating compliance with certain recordkeeping requirements under the 1940 Act (for example, Rule 31a-1(b)(1), requiring current journals detailing sales and redemptions).

Recording and Transferring Shares on a Blockchain

Blockchain technology provides a novel way to record transactions in a fund's shares. Blockchain integration also allows for additional ways for shareholders to obtain information about and issue instructions regarding their mutual fund shares. However, blockchain technology likely cannot replace a mutual fund's transfer agent and a transfer agent would likely continue to provide some or all of the services discussed above, albeit using blockchain technology instead of a more traditional book-entry system.

Importantly, the blockchain would record all transactions in fund shares that occur "on-chain" (for example, transactions that are effected on the blockchain from one public key address to another); it would not record transactions that may occur on the internal books and records of a broker-dealer or other intermediary holding shares on behalf of their customers. This nuance may be important if omnibus accounts are established with the transfer agent (as discussed below). Further, public key addresses do not inherently contain shareholder personal identifying information. Although information recorded on a public blockchain can be viewed by the public, personal shareholder identifying information should not be exposed on the public blockchain. However, in order to permit the mutual fund to maintain records of its beneficial owns and to permit its transfer agent to continue to perform the services discussed above (for example, AML and KYC compliance), a transfer agent could "link" shareholder personal identifying information maintained "off-chain" in a more traditional book-entry system to each public key address. By doing so, a mutual fund's transfer agent would maintain ownership records that are comparable to those records maintained by transfer agents that do not integrate blockchain technology.

As with traditional recordkeeping methods, all fund and shareholder records in a blockchain-integrated system should be under the full and complete control of a registered transfer agent. For example, if an error or unauthorized purchase or redemption occurs, the fund's transfer agent should have full and complete control to correct the share ownership records on the public blockchain. Moreover, if the SEC Staff (or law enforcement or other regulatory agencies) requests information about share ownership, the transfer agent should be able to readily produce written records that officially list the identities of shareholders and the number of shares they hold. These records would be sourced directly from both the transfer agent's internal system and the public blockchain. The blockchain integration with the transfer agent's internal system allows a transfer agent to link the digital identity of a shareholder or prospective shareholder to all purchases and sales of fund shares, whether purchased directly through the fund platform or otherwise.

Operation of Blockchain-Integrated Shares

Below are a few scenarios for potential fund operations, which are illustrative only and will be influenced by a number of factors including: functionality of the issuing/recording platform; features of the underlying blockchain protocols; operational capabilities of fund service providers; evolving market standards; and ongoing feedback from regulators.

Shareholder Interaction with the Shares

One approach for blockchain-integrated mutual fund shares is that the shares remain in customer wallets on the fund's platform (or in an affiliated platform). An alternative approach would be "self-custody," which would allow investors to "hold" the tokenized shares in their personal digital asset wallets, similar to how one would hold bitcoin or ether.

A fund platform may choose to abstract the experience of using a digital asset wallet, such that the operation is similar to that of a traditional fund platform, with the blockchain-integration working behind the scenes. Another may choose to make the experience similar to other transactions in the digital asset ecosystem—providing a wallet interface that may include, for instance, bitcoin and other digital assets alongside tokenized mutual fund shares—as interest in decentralized finance (or DeFi) grows, particularly among younger investors.

However, the direct use by investors of wallets through self-custody may create new and unfamiliar problems for mutual funds and their transfer agents. Using a digital asset wallet is an unfamiliar process to many and can be cumbersome. For instance, sending transactions to an incorrect blockchain address (or sending an asset to the correct address in an incorrect amount) cannot generally be undone without the cooperation of the receiving party. A shareholder (or an intermediary) that loses their private keys could lose access to their shares (and, thus, the ability to redeem those shares). However, the transfer agent or its technology service provider can build in restrictions and permissions to the smart contracts that underly the blockchain-integrated shares for the protection of shareholders in these situations. Further, the transfer agent can also build processes to reverse erroneous transactions by, for example, sending an offsetting transaction to the network, because the transfer agent would retain ultimate control of shareholder records. The transfer agent will need to create recovery procedures to "freeze" and reissue shares on the blockchain and to correct any errors in share recording, on account of the requirement that a shareholder must be able to redeem his or her shares from a registered fund and receive the redemption proceeds within seven calendar days, consistent with Section 22(e) of the 1940 Act.

Example of Transfer Agent Control: Freezing Shares in the Event of Loss or for Sanctions Purposes

In the event a fund shareholder loses access to his or her wallet, the transfer agent will need to establish procedures for cancelling the "lost" shares and reissuing the "replacement" shares. While procedures vary,

generally a transfer agent may examine the shareholder's blockchain address and internal records system to confirm that the shareholder has not transferred the shares. The transfer agent may then restrict the shares in the shareholder's account from being transferred or redeemed or, alternatively, have the capability to destroy the shares. For a fund where the shares are held in a shareholder's personal digital asset wallet, the transfer agent would then request another public key address from the shareholder for which the shareholder maintains control of the corresponding private key and issue "new" shares to that address. The blockchain would be updated accordingly. The "lost" shares would either be destroyed (depending on the technical implementation used by the transfer agent) or continue to exist on the blockchain; however, the transfer agent would record on its internal ledger that those shares are effectively cancelled. This is just one of many ways in which this function could be executed; fund technology service providers have alternative means to achieve this end, which will vary based on the underlying blockchain protocol and the particular platform's capabilities.

The transfer agent could also implement a similar process of freezing a shareholder's shares in the event it learned that a shareholder was, for example, on the US Department of the Treasury's Specially Designated Nationals and Blocked Persons List (SDN List). In such event, the transfer agent may freeze the shareholder's shares. If the freeze was unnecessarily put in place, the transfer agent could unfreeze or reissue the shares.

Direct Purchases and Redemptions with the Fund's Transfer Agent

If shareholders purchase and redeem fund shares directly with the fund's transfer agent, the role of the transfer agent would likely be quite similar to traditional mutual fund offerings. In one possible scenario, prospective investors could submit the required onboarding information to the transfer agent (for example, personal identifying information for AML/KYC purposes, funding information and receiving blockchain address (to the extent self-custody is permitted)) through the fund's issuing platform. After this onboarding and funding process is complete and a shareholder places an order, the transfer agent would calculate the number of shares to be purchased and deposit the purchase proceeds into the fund's custodial account. Depending on whether the transfer agent uses blockchain as the primary or secondary recording source (as further discussed below), the transfer agent may then, among other alternatives: (1) issue on behalf of the fund the corresponding number of shares natively as blockchain-integrated shares; or (2) issue the shares on the fund's traditional recording system and then credit the shares to the shareholder's blockchain address. In each case, the distributed ledger would be updated following each issuance.

When the shareholder wants to redeem their shares, the shareholder would contact the transfer agent and convey their intent to redeem. The transfer agent would either: (1) provide a receiving blockchain address and the shareholder would send the shares to that address (again, to the extent self-custody is permissible); or (2) deduct the shares from the shareholder's digital asset wallet on the issuing platform. The blockchain would automatically reflect a decrease in the number of the shares owned by that shareholder and a decrease in outstanding fund shares once the redemption is complete. The transfer agent would then credit the shareholder's account with the sale proceeds or wire money to the shareholder, whichever the shareholder elects. For a more fully automated settlement procedure, transfer agents may in the future consider integrating "stablecoins" or central bank digital currencies (CBDCs) to the fund issuance and redemption process.

Additional Considerations for the Implementation of Blockchain-Integrated Shares

Technology

Among other considerations, an investment manager must decide the appropriate technology to

use. Technology considerations include not only the underlying blockchain(s) on which the shares will be recorded, but also the fund issuance platform and blockchain integration approach for shareholder records.

Each blockchain protocol has inherent advantages and disadvantages that influence suitability for a particular purpose or application. For instance, blockchains are generally constrained by a certain number of transactions per second (TPS). To limit network congestion, blockchains typically charge fees per transaction that generally increase with network activity (the concept of "surge pricing" is a helpful analogy). Ethereum's base layer (layer 1), the Ethereum virtual machine (EVM), is currently the blockchain with the greatest number of developers, which has made it attractive for the deployment of projects on account of the network effects of public tooling and usage. However, on account of this popularity, transaction costs have increased such that simple transactions (send/receive) may become more expensive if used for a high volume of fund transactions.

In response to this network congestion, alternative layer 1 projects such as Solana have gained popularity but have been subject to network stoppages. EVM-compatible blockchains such as Avalanche and Ethereum "side chains" such as Polygon have gained adoption on account of their lower fees relative to Ethereum layer 1. And more recently, so-called layer 2 protocols on Ethereum are now attracting meaningful usage and developer share. Layer 2 protocols are able to rely on the security of Ethereum layer 1 with significantly lower transaction costs. Examples include Arbitrum and Optimum. These networks integrate with Ethereum and enable users to benefit from the growing interoperable ecosystem. An investment manager's decision with respect to technology should weigh these considerations of uptime/stability, fees, security and network effects as a starting point. Fund service providers should have a clear understanding as to how each network would be used for a fund recordkeeping system.

Fund Formation: Where to Domicile?

Mutual funds are most commonly domiciled in Delaware, Maryland, or Massachusetts. Accordingly, mutual funds should carefully review the laws of the jurisdiction in which they are organized or incorporated as well as their charter documents to confirm that records may be maintained using blockchain technology. As a helpful point of clarity, the Delaware Statutory Trust Act (DSTA) now expressly permits beneficial ownership of interests in a Delaware statutory trust to be "determined and evidenced" by registration in the form of an electronic network or database, including "one or more distributed electronic networks or databases."[6] Investment managers should consider any issues relating to blockchain transferability of fund shares under the DSTA and the preparation of the formation documents (for example, the declaration of trust). Further, investment managers should consider engaging board members (or potential board members, in the case of a new trust or corporation) with knowledge of blockchain technology and digital assets.

Intermediated Distribution

As discussed above, intermediated distribution models have become the favored channel to distribute mutual funds because of the lower transfer agent and shareholder servicing costs. However, the ability for a broker-dealer to take on shareholder servicing and sub-transfer agent functions largely depends on the ability of the broker-dealer to establish omnibus accounts in its name on the shareholder records maintained by the transfer agent. Under this model, the broker-dealer would be deemed to be carrying its customers' securities, which implicates the customer protection rule under Section 15 of the Exchange Act – Rule 15c3-3.

Specifically, Rule 15c3-3 requires a broker-dealer to take physical possession or control of all fully-paid and excess margin securities carried by the broker-dealer for the accounts of its customers. A broker-dealer is deemed to have control over its customers'

securities if the securities are held in certain "good control locations," which generally means a bank, clearing house or other broker-dealer. Notably, the books and records of a mutual fund and its transfer agent are not listed in the rule as a good control location.[7] However, broker-dealers have relied on SEC Staff no-action guidance (and SEC statements) that permit a broker-dealer to deem a mutual fund's transfer agent as a good control location provided certain conditions are met.[8]

However, in a July 2019 statement, the SEC Staff and the Financial Industry Regulatory Authority (FINRA) appeared to take the view that broker-dealers could not rely on this prior guidance for uncertificated mutual fund shares that are "digital asset securities" to establish a good control location for purposes of Rule 15c3-3.[9] Unfortunately, the lack of clear guidance calls into question whether broker-dealers are able to carry customer accounts that include tokenized mutual fund shares, irrespective of whether the mutual fund's transfer agent maintains the same degree of control as more traditional mutual fund transfer agents, which are deemed to be a good control location. This position would effectively block any attempt by a tokenized mutual fund to distribute its shares through an intermediated broker distribution model.

Conclusions

The full extent to which blockchain technology will impact the asset management industry is still an open question, but the early implementations are very promising. Blockchain-integrated funds can reach new investors, fulfill early demand in a growing ecosystem and perhaps even integrate with decentralized finance in a way that confers the well-tested investor protections of the 1940 Act.

Investment managers and fund service providers today have a great amount of choice for implementation and integration of blockchain technology. This flexibility allows for those early to market to build a suite of products that may eventually emerge as the industry standard.

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NOTES

1 *See* "Lost Passwords Lock Millionaires Out of Their Bitcoin Fortunes," *New York Times* (Jan. 12, 2021).

2 *See generally* Transfer Agent Regulations, Securities and Exchange Commission, 80 FR 81949, 81991 (Dec. 31, 2015) (TA Concept Release). The TA Concept Release sought public comment on the SEC's transfer agent rules, which were first adopted in 1977 and have "remain[ed] essentially unchanged." The TA Concept Release also described the role and evolution of mutual fund transfer agents.

3 *See generally* Navigating Intermediary Relationships, Investment Company Institute (Dec. 2022), available at *https://www.ici.org/system/files/2022-12/22-ppr-navigating-intermediary-relationships.pdf*.

4 Registered transfer agents are subject to extensive rules adopted under the Securities Exchange Act of 1934 (Exchange Act), which are beyond the scope of this article. *See generally* Transfer Agents, Securities and Exchange Commission, available at *https://www.sec.gov/divisions/marketreg/mrtransfer* (last accessed Sept. 23, 2023).

5 *See generally* TA Concept Release, *supra* n.2. The "master securityholder file" is the "official list of individual securityholder accounts." *See* Exchange Act Rule 17Ad-9. For investment companies registered under the 1940 Act that issue uncertificated shares (which applies to most mutual funds), the master securityholder file "may consist of multiple, but linked, automated files." *See id.*

6 *See* Section 3801(a) of the DSTA; *see also* Section 3819(d) of the DSTA ("A statutory trust may maintain its books, records and other documents in other than paper form, including on, by means of, or in the form of any information storage device, method, or 1 or more electronic networks or databases (including

1 or more distributed electronic networks or databases), if such form is capable of conversion into paper form within a reasonable time.").

7 In contrast, Rule 206(4)-2 under the Investment Advisers Act of 1940 (the custody rule) permits a registered investment adviser to "use the mutual fund's transfer agent in lieu of a qualified custodian."

8 *See, for example,* Broker-Dealer Reports, Securities and Exchange Commission, 78 FR 51910, 51951 (Aug. 21, 2013) (noting the SEC's prior statements that mutual fund shares may be held at the fund or the fund's transfer agent as a good control location under Rule 15c3-3); NYSE, Inc., SEC No-Action Letter (pub. avail. Mar. 3, 1986) (permitting broker-dealers to deem mutual funds or their transfer agents as good control locations under Rule 15c3-3 under certain conditions); and Form Custody for Broker-Dealers (form includes a field for broker-dealers to indicate customer mutual fund shares are custodied at the mutual fund or its transfer agent).

9 *See* Joint Staff Statement on Broker-Dealer Custody of Digital Asset Securities (July 8, 2019), available at *https://www.sec.gov/news/public-statement/joint-staff-statement-broker-dealer-custody-digital-asset-securities*.