



GBBC
Global Blockchain
Business Council

TOKENIZATION & CUSTODY REPORT

GLOBAL STANDARDS MAPPING INITIATIVE 6.0

TOKENIZATION OF OFF-CHAIN ASSETS:
OPPORTUNITIES FOR THE FUTURE OF FINANCE



GBBCGSMI 6.0

ACKNOWLEDGEMENTS

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WHAT IS TOKENIZATION?

Tokenization refers to the process of tracking the ownership of traditional assets like treasuries, stocks, and bonds on a blockchain. This may also convert rights to an asset into a digital token on a blockchain. It is a widely used concept, relevant for many contexts in the blockchain and digital assets space. While there is still a need for greater harmonization toward a common taxonomy and understanding, below are a few broadly recognized definitions of tokenization:

“The process by which real-world assets are turned into something of digital value called a token, often subsequently able to offer ownership of parts of this asset to different owners.” International Capital Market Association (ICMA)¹

“Tokenisation of assets involve[es] the digital representation of real assets on distributed ledgers (digital twins) or the issuance of traditional asset classes in tokenised form (native tokens), excluding crypto-assets.” Organisation for Economic Cooperation and Development (OECD)²

“Asset-referenced tokens (ARTs): crypto-assets that purport to maintain a stable value by referencing another value or right or a combination thereof (e.g. official currency, commodities, other assets). You can redeem ART at the market value of the asset(s) it references.” European Securities and Markets Authority (ESMA)³

“Tokenization refers to the practice of using blockchain technology to record ownership of an asset. These assets can take the form of traditional financial assets, such as money market fund shares or bank deposits, or non-financial assets, such as trade receivables or interests in rare items such as art or collectibles.” (US President’s Working Group Report on Digital Asset Markets Report)⁴

In addition, the CFTC’s GMAC-DAMS Digital Assets Classification Approach & Taxonomy⁵ defines and categorizes digital assets, including tokenized forms of digital assets, based on their specific features. This taxonomy approach is recognized for the purpose of facilitating a way for stakeholders – particularly regulators – to evaluate these types of assets, with a use case driven approach.

As taxonomies continue to evolve, the concept of tokens may include those that are native to the blockchain, which exist and trade only on-chain (e.g., cryptocurrencies), and tokenized assets that may represent other off-chain assets or, including cars, paintings, homes, and intellectual property. The latter is the focus of this paper.

Asset tokenization digitally represents real-world assets, both physical and intangible, or services on a blockchain or distributed ledger technology (DLT) that establishes consensus among diverse participants. This digital form is referred to as a “token.” While this paper centers on asset tokenization, many observations also extend to other token types.

FEATURES OF TOKENIZATION

While definitions of tokenization provide a structure for understanding the concept, the essential components of tokenization point to the key features and benefits for real applications and use cases. It is these components, listed below, that allow for a deeper, and more empirically based, understanding of the meaning of tokenization in different contexts and fields.

Representation: On-chain representation of something that exists off-chain (e.g., digital twin), or something that exists inherently on-chain (e.g., DLT native). For DLT native assets, tokenization may be the only legally acceptable means to record them.

Memory Aid: Tokens can serve as digital memory aids, functioning as ledger-based equivalents of contracts and records. In this sense, they can become ledger equivalents of contracts and records, memory aids can serve social and economic functions. Tokens have been used as memory aids since prehistoric eras throughout the history of humanity, starting with physical tokens such as clay or stone artifacts used for counting and accounting⁶ that represent the measurement of goods. These tokens evolved into counting technologies, writing mechanisms, and various forms of accounting for trade and economic activity.

Ownership Records: Verification of ownership and provenance are enabled by registration mechanisms that allow for the right to ownership (e.g., real estate records). Settlement finality is an important component to verify when assets are legally considered to have changed hands.

Fractionalization: Assets can be divided into smaller, tradeable units, allowing economic exchanges at a more granular level (e.g., smaller portions of currency units, trading portions of high-value assets like real estate or private equity) and facilitating secondary trading at a larger scale.

Liquidity: Increasing, and even unlocking liquidity, is facilitated by the ability to list and trade fractionalized tokens in secondary markets. This can unlock otherwise trapped capital to improve market efficiency, especially for assets that have been traditionally illiquid.

Authentication: Digital identifiers attached to tokenized assets allow verifications of key features (e.g., authenticity, digital identity) that may be required for certain products and services. Real value is confirmed by provenance, which is especially important for sectors like supply chain, art, and medical devices.

OPPORTUNITIES OF TOKENIZATION

As the digital economy evolves and expands across emerging technologies, tokenization – of both money and assets – presents an opportunity to form a new backbone for transactions, setting much of the structure for financial market innovation. As digital finance evolves from dematerialization to tokenization, payment and investment rails can be better connected, and players can maximize opportunities from fractionalization and greater efficiencies. The digital asset space fuels innovation with tokenized assets in an evolution that broadens markets and redefines asset classes, exemplified by the rise of asset tokenization in financial markets that marks the next generation of value exchange.⁷ Tokenization is also becoming a key component to bridge traditional finance (TradFi) and decentralized finance (DeFi).

Market Size: Tokenization presents a new universe of opportunity with the exchange of any asset represented on a blockchain. As traditional networks and blockchain based networks converge, financial market infrastructures, alongside the assets and currencies to be traded on them, are expected to rely on tokenization. Indicating the magnitude of the tokenization opportunity ahead, the fixed income market globally spans \$150 trillion, of which \$17 billion consist in digital bonds (not tokenized)⁸. Here it is important to distinguish between “total issued” and “outstanding” amounts. The figure of \$17 billion refers to the total issued amount, which includes those that have been repaid or redeemed. Arguably, the whole fixed income market can be tokenized. Illustrating how much of the market remains to be tokenized, estimates point to only 0.01% of the total value of global fixed income and equity securities combined being currently tokenized.⁹ As the evolving digital ecosystem integrates with existing legacy systems, the need for more efficient solutions and infrastructure rises.

Broad Opportunity: Tokenizing assets, products, or services by creating tokens linked to real assets through smart contracts can dramatically increase transaction speed, security, and reduce costs. While many token projects remain experimental, the technology is rapidly advancing. Common tokenized asset classes include:

- Securities (stocks, bonds)
- Commodities (gold)
- Real assets (real estate)



Removing Frictions & Intermediaries: With improved transparency, efficiency, and liquidity in financial systems, tokenization also allows users to bypass legacy intermediaries. Tokenized assets (e.g., gold, stablecoins, real estate, and even intellectual property) can coexist and trade on the same blockchain without traditional intermediaries. This lowers costs, speeds transactions, and unlocks fractional ownership, democratizing access to previously illiquid or exclusive markets. Open-source blockchain protocols built on global standards (e.g., ISO 27001) ensure seamless cross-platform interoperability and foster innovation.

Operational Efficiencies & Smart Contracts: Tokenization solves many operational challenges. With traditional financial infrastructure, assets stored in different jurisdictions and by different companies are cordoned off into silos that reduce liquidity and make them difficult to reconcile. On distributed, shared ledgers, assets can be automatically reconciled. For instance, smart contracts can nearly instantly conduct complex trades, greatly reducing the need for slow and expensive compliance checks and audits.



Key benefits include automation, faster clearing and settlement, enhanced transparency, and improved liquidity. Tokenization uses blockchain and smart contracts to revolutionize asset issuance, transfer, and management. By enabling programmable, self-executing transactions, it delivers near-instant settlement, cuts counterparty risk, and guarantees immutability and transparency via decentralized ledgers. This automation removes many inefficiencies of traditional finance while giving regulators real-time asset traceability and compliance insight. These features boost efficiency, prevent fraud, and simplify complex processes like trade settlement and bankruptcy resolution.

Efficient Ledger-based Infrastructure: Adopting blockchain-based ledgers delivers substantial advantages, including stronger risk management and improved operational efficiency, driven by their decentralized, immutable, and transparent transaction records. Blockchain also boosts transaction efficiency by cutting intermediaries, lowering costs, and speeding up processes like cross-border payments and trade finance.

24/7 Markets: Operating 24/7 market operations beyond traditional market hours, tokenized systems offer greater cost efficiency by replacing legacy infrastructure, cutting intermediaries, and automating with smart contracts. Yet fully unlocking this potential depends on regulatory developments to support decentralized protocols, new asset classes, and embedded compliance.

Velocity of Money: Moreover, tokenizing traditional financial instruments like securities can improve the velocity of money, allowing funds to move through the system more quickly, while reducing fragmentation and enhancing liquidity (not to be confused with creating liquidity) across digital markets.

Democratization & Accessibility: While the traditional financial system has restricted certain activities (e.g., liquidity provision, portfolio management) to entities like brokers, tokenization allows all network participants to perform those activities, allowing investors more autonomy over their instruments and customized solutions. For instance, DeFi protocols can facilitate the use of tokenized securities as collateral, open opportunities for monetization by placing funds in pools and automated market makers that pay fees, and enable more efficient movement of portfolios across platforms.

Tokenization can also extend financial access globally by making them available anywhere there's an internet connection, while preserving trust and oversight by embedding the assets with jurisdictional requirements. By enabling fractional ownership, tokenization contributes to lowering investment barriers and broadening retail access to traditionally illiquid markets. Digital assets and blockchain drive financial inclusion by removing traditional barriers. They empower underserved populations in remote or economically challenged regions to access services like digital wallets, remittances, and lending, advancing global financial access. Decentralized Finance (DeFi) platforms further democratize finance by eliminating intermediaries, reducing costs, and lowering entry barriers, especially in areas lacking banking infrastructure. Tokenization supports

Security: Tokenization's growing role in data protection and payment security is crucial. Well designed smart contracts automate complex agreements, reducing human error and fraud risk. By leveraging distributed, decentralized ledgers, tokenization safeguards sensitive digital assets from unauthorized access. Beyond financial gains, blockchain's traceability and transparency restore trust in opaque processes. Tokenization protects privacy while strengthening efforts to prevent money laundering and the financing of criminal or terrorist activities.

PURPOSES OF TOKENIZATION: PAYMENT & ASSET

Tokenization implementations in digital asset markets can be broadly categorized based on two main purposes:

- **Payments: Tokenization of generally stable assets to serve as currency for transactions on the blockchain**
- **Tokenizing off-chain assets: Representation of assets that fluctuate based on market prices, to be traded through on chain transactions**

Tokenized cash (stablecoins) & tokenized assets (RWA) can be the foundation of on-chain capital markets. While tokenization can span across use cases for payment solutions, it can also span digital twins for any form of asset. Each of these two "sides" of tokenization is meant to provide solutions to different needs and create different forms of value, involving a collection of activities that often interact with each other. The first category provides a currency to facilitate transactions, while the second category provides an asset to be traded in tokenized format. Specific definitions would vary depending on the asset class involved.

PAYMENTS – FASTER, CHEAPER, AUTOMATED



Tokenization for payments may include both digitally native tokens, such as network-specific tokens utilized by specific protocols for various transactions¹⁰, on-chain representations of off-chain fiat funds (e.g. stablecoins, tokenized deposits), and central bank digital currencies (CBDCs).¹¹ Tokenized currencies operate on blockchain infrastructure that offers several benefits – notably greater transparency, near-instant clearing and settlement, disintermediation, security, and lower costs – where every transaction is traceable and verifiable on a ledger record. Tokenized money enables atomic (instant and final) settlement for transactions – both for delivery versus payment (DvP) and payment versus payment (PvP) – minimizing frictions and risks arising from settlement delays and counterparty exposure.

Beyond delivering speed and efficiency to transactions, the on-chain currency also allows programmability features that would not be available in traditional systems. Programmable tokenized money, which points to the integration of money and code, enables rules and logic embedded into payment behaviors (e.g., automatic interest, dividends, tax payments, or other fees). Tokenized money is also integrated into smart contracts, supporting automated workflows and conditional payments (e.g., payments upon delivery of goods, payments for approved goods or services) and even granular customization and controls based on token property definitions and permissions. This can also enable compliance-by-design, where regulatory and governance rules can be coded into token logic and transaction validation (e.g., whitelisting wallet addresses, automated compliance reporting, jurisdictional controls).

As such, tokenized currencies are inherently integrated to the digital asset ecosystem, providing the settlement layer for tokenized assets, securities, and DeFi applications. Tokenized money can support the growing ecosystems of tokenized securities, commodities, and derivatives, improving access to markets at a global level by supporting seamless cross-border transactions. Tokenized currency on a blockchain is key for successful end to end tokenization.

Moreover, because tokenized currency can be accessed through digital wallets, this bypasses the need for traditional bank accounts. This can lead to greater financial inclusion and access to financial services for unbanked and underbanked communities, with reduced onboarding and servicing costs especially for small scale users.

TOKENIZING OFF-CHAIN ASSETS – INNOVATIVE FINANCIAL PRODUCTS

Asset tokenization refers to the process of issuing a digital on-chain representation of an asset that exists off-chain, such as a real-world asset (RWA -e.g., art, real estate) -specifically a financial asset (e.g., securities, commodities, debt) - and even data and concepts (e.g., intellectual property, ratings).

RWA tokens represent pre-existing real assets that both exist and trade off-chain and on-chain through digital twins and are backed by the real, tangible assets off-chain. The tokenization process creates digital twins that can be issued, recorded, traded, and traced on a blockchain, such that off-chain activities are still recorded on-chain. This provides a bridge between traditional finance and on-chain finance, where assets like real-world money, securities, and credit can be represented on a blockchain. The efficiencies and benefits of tokenization can streamline issuance, governance, and lifecycle management of tokenized assets, where asset rights are digitally represented on the blockchain.

For instance, tokenized securities and security tokens can be traded in global markets operating on a blockchain, under requirements as securities in traditional markets. Tokenized real-world assets (RWA) encompass an even broader range of tangible and intangible assets that have traditionally existed off-chain – unlike cryptocurrencies and related activities which are digitally native. As RWAs hold value in the physical world and have traditionally operated within centralized systems subject to frictions from various intermediaries, lengthy settlement processes, and limited accessibility, tokenization provides opportunities to benefit from greater efficiencies offered by blockchain infrastructure.

Tokenized assets enable innovative financial products and new ways to own, transfer, and trade them over blockchain infrastructure. In recent years, tokenization is spanning the entire spectrum of capital markets products, with tokenization platforms facilitating issuance under regulated conditions as regulatory developments unfold.

Notably, the business value behind tokenization points to new products and markets, operational efficiencies in transactions and dealings (e.g., automation for compliance and corporate actions), and wider investor participation alongside greater liquidity.

Tokenized RWA growth trends

- **Increasing tokenized value**, with tokenized RWA market surpassing \$30B in on-chain value in 2025 (tokenized US treasuries account for over \$8B with players like BlackRock, Franklin Templeton, Ondo Finance, Maple Finance)
- **Fast growth** with projected \$1-3T in RWA tokenization by 2030, as banks and asset managers are expected to tokenize additional securities
- **High yields and safety** (e.g., US Treasury backed RWA) can lead to stable returns and straightforward processes for tokenization
- **Efficiency** with faster settlement, 24/7 trading, disintermediation
- **Liquidity enhancement** with fractional ownership and trading, providing investors access to larger or illiquid assets
- **Transparency** where blockchain shows holdings and transactions in real time
- **DeFi integration**, where RWA tokens can be used as collateral and in liquidity pools

Examples of tokenized assets issued on a blockchain include:

Debt Instruments

Type	Issuer	Blockchain	Key Facts
Sovereign Bond	World Bank (bond-i)	Ethereum	1st blockchain-issued bond in 2018, raising AUD 110M, built as a private network on Ethereum
Sovereign Bond	European Investment Bank (EIB)	Ethereum	Raised 100M Euros, issued in partnership with Goldman Sachs and Société Générale, HSBC Orion as tokenization platform
Corporate Bond	Siemens Digital	Polygon	1st German corporate bond on a blockchain, Issued 60M Euros in 2023
Corporate Bond	Santander	Ethereum	Tokenized bond for internal treasury, issued \$ 20M in 2019
Municipal Bond	City of Lugano, Switzerland	Polygon	Purpose to fund city infrastructure, accessible to retail and institutional investors
Private Credit	WisdomTree	Ethereum; Stellar	WisdomTree Private Credit and Alternative Income Digital Fund (CRDT) – Diversified portfolio of private credit assets in tokenized form, with a low minimum investment.
Private Credit	Figure Technologies	Provenance Blockchain	Over \$10 billion in home equity lines of credit, consumer loans, and mortgage-backed assets tokenized in a marketplace to streamline loan origination, servicing, and trading through smart contracts

Money Market Instruments

Type	Issuer	Blockchain	Key Facts
Money Market Fund Tokens	Franklin Templeton	Stellar/ Polygon	OnChain U.S. Government Money Fund (FOBXX) – SEC-registered fund, 1st of its kind, represented as blockchain tokens, allowing direct digital shareholder recordkeeping
Money Market Fund Token Pilot	WisdomTree	Stellar/ Ethereum	WisdomTree Prime Digital Funds – Tokenized money market treasury funds
Treasury-Backed Stable Instruments	Ondo Finance	Ethereum/ Solana	OUSG & USDY – tokenized notes backed by US Treasuries, providing yield-bearing stable instruments

Equities & Fund Instruments

Type	Issuer	Blockchain	Key Facts
Private Equity Shares	KKR	Avalanche	KKR Health Care Strategic Growth Fund II - 1st tokenized representation of major private equity fund, using Securitize as tokenization platform
Mutual Funds & ETFs	Hamilton Lane	Polygon	Hamilton Lane Equity Opportunities Fund V – Tokenized feeder fund for broader investor access, using Securitize as tokenization platform
Synthetic Digital ETFs	Mirror Protocol/ Synthetix Assets	Ethereum/ Terra	Synthetic token representations of US equities for trading on DeFi platforms

Real Estate & Infrastructure

Type	Issuer	Blockchain	Key Facts
Real Estate – Equity Tokens	RealT	Ethereum/ Gnosis	Fractional ownership for US rental properties, where investors receive rent in the form of stablecoins
Real Estate – Debt Tokens	Lofty.ai	Algorand	Property-backed loans with investor voting rights
Commercial Real Estate Pilot	UBS & Swiss Real Estate Tokens	Ethereum	Institutional grade real estate for investment at a fractional level

Commodities & Alternative Assets

Type	Issuer	Blockchain	Key Facts
Gold	Paxos	Ethereum	Pax Gold (PAXG) – Tokens backed 1:1 by a fine troy ounce of allocated gold, regulated by the New York Department of Financial Services (NYDFS)
Gold	Tether	Ethereum/ Tron	Tether Gold (XAUT) – Tokenized representation of gold ownership stored in Swiss vaults
Carbon Credits	Toucan Protocol, KlimaDAO	Polygon	Tokenized carbon credits allowing transparent trading, offsetting, and verifications
Wine, Art & Collectibles	VNX Commodities, Artrade, Masterworks	Ethereum/ Avalanche	Tokenized alternative assets enabling fractional investments
Art	6529 Capital	Decentralized public blockchains (various)	Investing in NFTs with NFT-native user wallets, toward a decentralized and tokenized approach

Structured & Hybrid Instruments

Type	Issuer	Blockchain	Key Facts
Structured Notes	Société Générale – Forge	Ethereum	Tokenized covered bonds and structured products, under France’s AMF Framework
Repo/ Collateral Tokens	HQLAx	Corda	Tokenized collateral mobility platform for securities lending and repo markets
Digital Commercial Paper	Mitsubishi UFJ Trust and Banking Corporation	Proprietary DLT	Programat Platform – for tokenized short term debt instruments, integrated with Japanese market infrastructure

Other Industry Use Cases

Type	Issuer	Blockchain	Key Facts
Education	Learning Tokens	Hyperledger	Tokens represent knowledge transfer and skills acquired. Milestones achieved in the educational process are tokenized, facilitating talent upskilling, reskilling, and authenticating skills for job and future training opportunities.
Biotech Patents/ IP	VitaDAO & Molecule	Ethereum/ Ocean Protocol	Tokenized ownership and licensing rights in biomedical research IP
Authentication for Supply Chains	Birina Handmade	Algorand	Authentication of traditional Asamese Indian woven Gamosa's provenance to trace its origins directly from artisan to customer
Enabling interoperability between ratings data and digital finance ecosystem	Moody's Ratings	Solana / Alphasledger and Polygon via Untangled. Finance Oracle Solution	Developed proof-of-concept solution that enable seamless integration with digital finance ecosystems, allowing ratings data to be efficiently ingested and disseminated

CASE OF COLLATERAL MANAGEMENT

Collateral management refers to the underlying assets used for backing, and often pledged as security to reduce credit risk in financial transactions. Both the payment and asset representation roles of tokenization feed into collateral management, providing several benefits.

Efficiency & automation for collateral movement: Holding value on a blockchain facilitates collateral movement and placement – including global collateral movement without the added complexities of legacy custodians or clearing systems. For instance, stablecoins can facilitate the transactions to achieve these purposes. Tokenized assets and blockchain infrastructure can enable programmatic collateral mobility, with increased efficiencies and security measures, while reducing costs.

Inventory management: For tokenized assets, inventory is generally held in digital wallets. While moving large volumes of assets between custodians in traditional finance takes time and money, inventory held in digital wallets directly under the user's control can be moved much more quickly on blockchain rails. Both speed and inventory are major benefits, in addition to pricing and liquidity considerations.

DeFi opportunities for collateral and interest: In the DeFi space, liquidity pools challenge the model of operations of typical banking rails. Pools consisting of tokenized RWA can allow users to deposit tokens as collateral and earn interest in the form of stablecoins, which can be used to reinvest. While traditional finance wouldn't envision the concept of interest bearing stablecoins, DeFi utilizes stablecoins to serve as collateral and generate income, such that they function as payment currencies and tokenized RWA (e.g., tokenized treasury bills) that earn interest.

Capital Optimization: Fractionalization can broaden the pool of eligible collateral, while easier collateral movement can enhance liquidity utilization and instant capital re-pledging. Moreover, certain token standards not only improve interoperability but also allow the use of the same collateral across different platforms, markets, and protocols.

Inclusion & Market Access: Smaller investors and organizations can access tokenized assets, whereas they may have been traditionally limited by factors like size, geography, or operational frictions.

Transparency, Compliance & Risk Management: Tokenization provides real-time visibility and facilitates auditability, where collateral positions can be monitored on-chain in ways that improve regulatory reporting accuracy, provide proof of reserves, and reduce counterparty risks. On-chain escrow accounts and programmable settlement also reduce reliance on third party intermediaries. Tokenized assets can integrate with embedded regulatory logic for automatic enforcement of compliance rules, and collateral management can be made dynamic, with parameters (e.g., haircuts, eligibility) updated automatically based on regulatory updates and latest market feeds.



REQUIREMENTS FOR SCALE & CHALLENGES – WHAT WILL IT TAKE TO SCALE?

While the market has recognized promising use cases of tokenization (e.g., stablecoins, RWAs) – especially where demand and liquidity for them would exist - there still remain challenges to provide broader access. These gaps range from operational challenges to lack of broader access, to gaps and lack of clarity in regulations and standards. Scale, therefore, may pose additional costs.

1) OPERATIONAL CHALLENGES

While banks and other financial institutions have been increasingly interested in tokenizing assets, significant challenges remain when it comes to operational efficiency.

- **Fragmented liquidity** where RWA tokens trade on isolated platforms, leading to limited secondary markets
- **Custody challenges**, requiring reliable custodians and transparency of backing
- **On & Off-chain integration**, where link to off-chain assets requires ensuring token matches real world asset's status
- **Primary Markets:** Lack of streamlined avenues from asset tokenization to issuance and access to banks, institutions, etc.
- **Settlement:** Lack of stable settlement asset, especially leading to fragmentation when transactions have to come off chain
- **Secondary Markets:** Distribution challenges for asset managers and investors, limiting access. For instance, a web2 wrapper may be needed to access a web3 ecosystem where tokenized assets operate.
- **Fragmentation of Participants:** From primary markets, to secondary markets, and settlement processes, participants in the tokenization value chain don't necessarily communicate with each other.

2) CHALLENGES TO BOARDER ACCESS

Both payment tokens and tokenized assets have specific requirements in order for users to access them. The table below highlights such requirements, as well as the existing gaps and frictions that can deter widespread access. For instance, while certain major stablecoins may represent the lion's share of how acquire these tokenized assets, as the space evolves, we expect broader opportunities for market integration and interoperability across greater touchpoints.

	How to access & pay for it	Gaps/Frictions
Payment Tokens	- Requires fiat currency to exchange for it and an on/off ramp between fiat rails and blockchain rails, especially if later conversion back into traditional fiat is envisioned. - Fiat funds may be required to transfer to a centralized exchange or other form of distributor of tokens, or if there is a direct relationship with the issuer, funds can also be transferred directly to the issuer.	- Fiat rails are not always easily connected to blockchain based rails to facilitate widespread exchange. - Access to wallets for investors to hold tokens they purchase is a necessary part of distribution following token issuance on a blockchain
Tokenized Assets	- Fiat funds or payment tokens may be required to transfer to a centralized exchange or other form of distributor of tokens, or if there is a direct relationship with the issuer, funds can also be transferred directly to the issuer. - In the DeFi space, swaps can bypass the need for stablecoins, allowing swapping one asset directly for another, and even creating pools of tokenized assets without stablecoins.	- There currently exists no equivalent to seamless web3 services to make access to many tokenized assets easily and widely available (e.g., access to tokenized bonds over an app). - Access to wallets for investors to hold tokens they purchase is a necessary part of distribution following token issuance on a blockchain

3) GAPS IN STANDARDS & FRAMEWORKS

We emphasize the importance of common rules as a necessary condition for interoperability – especially when it comes to creating robust secondary markets for tokenized assets. Commonly agreed upon rules set expectations that ensure compatibility, enabling tokenization to meet its purpose of seamlessly moving assets across markets and platforms. Regulatory developments also play a role toward harmonizing requirements.

Regulatory uncertainty, where legal classification varies in different jurisdictions, and most RWA tokens treated as securities

- **Regulatory Gaps for Stablecoins:** Regulatory treatment of stablecoins globally is still unclear, so they should not be considered equivalent to cash
- **Regulatory Gaps for Tokenized Assets:** Lack of regulatory clarity for secondary markets, if any at all
- **Contractual Frameworks for New Infrastructure:** The shift to tokenized systems requires new contractual agreements to define custody, ownership, and control of digital representations of assets. Existing legal frameworks often lack provisions for storing claims on distributed or blockchain-based infrastructure.
- **Absence of Recognized Third-Party Custodians:** In many tokenization models, traditional third-party custodians may not exist or be clearly defined, creating uncertainty about who is responsible for asset safekeeping and fiduciary duties.
- **Complexity of Securities Classifications:** Securities are not uniform in nature, and tokenization introduces additional complexity regarding their classification, treatment, and regulatory oversight. This makes consistent supervision across asset types difficult.
- **Gaps in Activity-Based Regulatory Approaches:** While activity-based regulation can theoretically cover most tokenization activities, it depends on a clear equivalence between on-chain and off-chain economic functions. Regulators have yet to map how tokenization might create new economic behaviors or structures that do not align neatly with traditional financial activities.
- **Lack of Economic Function Mapping for Tokenization:** There is a need for clearer regulatory analysis of the unique economic activities enabled by tokenization technology—such as programmable ownership, fractionalization, and automated settlement—to ensure appropriate oversight and investor protections.
- **Cybersecurity and Operational Risk:** Moving large amounts of value across blockchain networks exposes custodians to heightened cybersecurity threats, operational risks, and potential systemic vulnerabilities that existing financial regulation may not fully address.

Lack of harmonized standards across platforms limit interoperability

Lack of regulations and standards for novel issues

- For instance, there is a need for standards for cross-chain interoperability, integrations with the DeFi ecosystem for tokenized assets (especially where TradFi and DeFi exchanges are involved), governance, and overall token structure

Novel issues posed by tokenization may signify a lack of standards and regulations, and therefore major gaps, for certain important issues. For instance, while some jurisdictions have frameworks providing legal wrappers for DAOs (e.g., BVI, Cayman Islands, Abu Dhabi), there is still no clarity on liability (e.g., *pari passu* defining who gets paid first when something goes wrong) or standardized requirements for different cases. Ultimately, lack of clarity makes it difficult to hold a license in different places where requirements may vary, such that it remains unclear who is responsible when an undesired event occurs. In the institutional space, on the other hand, traditional structures are still kept in place, even when digital finance is implemented. This may also lead to a high concentration risk.

TOKENIZATION VALUE CHAIN

This section provides a landscape of the end-to-end value chain of tokenization, evaluating each step involved – from primary markets, to settlement, and secondary markets. The table below lays out the steps involved in the process of tokenizing any asset and issuing it using distributed ledger technology (DLT)/blockchain infrastructure. For each step in the process, we provide an overview that includes actions taken (what happens), key stakeholders involved (who), and considerations for business value (why). We also identify relevant rules, standards, and guidance to inform the decision-making process for each step.

These rules are grouped generally based on the degree of compulsion (Annex 1 also includes a glossary of these publications which will provide links directly to the relevant documentation):

- **Official regulations**
- **Standards and recommendations for traditional finance**
- **Globally recognized standards (e.g., ISO) for blockchain and digital assets**
- **Other standards and guidance for blockchain and digital assets, including Ethereum Requests for Comments (ERCs) as widely adopted sets of common rules**

Considerations for Selecting Standards:

- Interoperability is key for wider adoption, such that standards that are more widely used can facilitate greater interoperability
- Consistent data fields improve interoperability across different assets, with greater comparability in data
- How proscriptive is a given standard

Those interested in tokenizing assets can use this table as a reference for the tokenization process and to identify relevant guidance to help ensure that they are compliant with relevant requirements. This landscape also serves to better clarify the role of key stakeholders (e.g., exchanges, banks, DeFi players) with respect to tokenization. It provides a view of how tokenization is disrupting traditional roles and participants, while reinventing their role (e.g., clearinghouses, transfer agents, etc.). We hope it can become a tool for increased collaboration, dialogue, and synergies.

DOWNLOAD THE TOKENIZATION LIFECYCLE TABLE

DEEP DIVE - CONSIDERATIONS FOR CUSTODY

An end to end value chain assessment for tokenization must go hand in hand with custody considerations. Given that tokenization is expected to be a massive market in numbers, involving several chains and tokens, the need for effective custody solutions to support the scale, volume, and breadth of assets is fundamental. While some risks and liabilities may shift across custodians in primary and secondary markets, and across self-custody models and 3rd party or institutional models, the general concepts remain the same across the value chain.

Custody for tokenized assets, from stablecoins, to tokenized securities, and other real-world assets, combines traditional principles of asset safekeeping with the new security and governance demands of blockchain-based systems. In this context, custody can refer to several layers: the custody of the underlying real-world asset (such as real estate, commodities, or reserves), the custody of the digital token that represents ownership of that asset, and the custody of the private keys that grant control over the token on-chain. Understanding how these layers interact is essential to determining who has legal ownership, operational control, fiduciary responsibility, and overall best practices (e.g., segregated account, use of omnibus accounts, reporting requirements, concentration of volume/ value held).

First, from a legal and regulatory standpoint, the classification of the token — whether as a security, commodity, or payment instrument — determines the type of entity permitted to act as custodian and the compliance requirements they must follow. Regulators set rules for custody, often depending on whether a given regulator has approved a tokenized digital asset in question. Regulated entities generally are required to uphold custody requirements (whether with a 3rd party custodian or self-custody), which may depend on the underlying asset.



For instance, the EU allows passporting to be able to operate in the region's 27 member states. To be a licensed custodian, an entity needs a license in a jurisdiction (subject to an application, approval process, and license granting), to hold certain types of digital assets in that jurisdiction. Licenses allow certain assets and are specific to asset classes. Non-regulated and non-compliant entities do not hold such registrations or licensing (e.g., USDT remains non-compliant in the EU based on MiCA requirements).

Custodians must ensure proper segregation of client assets both on-chain and off-chain to prevent commingling, while jurisdictional differences can complicate compliance in cross-border arrangements. Regulators around the world, such as the SEC in the U.S., the EU under MiCA, and the Monetary Authority of Singapore, are developing frameworks that increasingly recognize digital asset custodians and set standards for their operations. In parallel, a growing number of regulated entities, such as Zodia Custody, have pursued key registrations and authorizations across multiple jurisdictions (UK, Ireland, Luxembourg, Hong Kong), signaling it operational as a “qualified digital asset custody” provider for institutional clients. In other jurisdictions, entities (e.g., Anchorage, BitGo, and Hex Trust), are securing banking or trust licenses to provide qualified digital asset custody services.

Investor protection remains central to any custody framework. Custodians have fiduciary duties to ensure clear ownership rights, transparent audit trails, and alignment with applicable trust or securities laws. These protections help build confidence in the tokenized asset ecosystem and ensure compliance with evolving standards.

Second, from a technology and security perspective, the method of private key management defines much of the custody model's risk profile. Hot custody solutions store keys online for faster transactions but increase cyber exposure, while cold custody keeps keys offline for higher security. More advanced solutions, such as multi-party computation (MPC) and hardware security modules (HSMs), are gaining traction among institutions for their balance of safety and accessibility. Best practices include multi-signature authorization, strict access controls, continuous monitoring, and insurance coverage against theft or loss.

For tokenized real-world assets, effective custody also requires reconciliation between the on-chain tokens and the underlying physical or financial assets. Safe custody solutions are important for tokenized assets, especially tokenized RWA. For assets that exist off chain, tokenized representations prove the record exists and belongs to someone who holds it in a wallet. In the event an investor wants to redeem, collateral has to be available. Custodians or trustees must verify that the real assets exist, are unencumbered, and correspond to the number of tokens in circulation. Periodic audits and real-time attestations—sometimes through blockchain oracles—help maintain this alignment, and clear redemption procedures must be in place to allow token holders to convert tokens back into the underlying asset when desired.



Third, operational and governance considerations are fundamental. Recent hacks have challenged the initial view of security for digital asset custody. The default position that cold storage/offline storage is the safer option is shifting with increasing awareness on the role of governance and conduct to ensure safety of assets (e.g., if a custodian does not employ good conduct and governance practices, assets can be unsafe even if held in cold storage). For instance, custodians must review the smart contracts underlying tokenized assets to ensure proper administrative controls, upgrade mechanisms, and recovery processes. They should also manage counterparty risk by conducting due diligence on issuers and other service providers, while maintaining robust business continuity and disaster recovery plans to safeguard client assets in the event of system failures.

Finally, standards and best practices are key, such as ISO 24165 for digital token identifiers, ISO 20022 for standardized messaging, and the codes of conduct from industry groups. These sets of common rules and understandings are helping establish consistent practices for custody, governance, and interoperability. As these standards mature, they are expected to bridge the gap between traditional financial custody models and the emerging infrastructure for tokenized assets.

CONCLUSION: SHAPING THE FUTURE OF FINANCE

Tokenization has major implications for the future digital economy and its underlying infrastructure. This report outlines key lessons learned, principles to keep in mind, and a set of recommendations designed to help tokenization deliver real business value. Central to this discussion is the importance of building a robust ecosystem: one capable of supporting the trillion-dollar opportunity that many expect tokenization to unlock. As the digital economy continues to evolve, further infrastructure development is essential, especially given that the institutional tokenized market in capital markets remains largely untapped due to persistent challenges around interoperability and the absence of unified standards. Although various regulations and frameworks are emerging or awaiting approval, fragmentation remains a major barrier; siloed regulatory approaches hinder the efficiencies that tokenization promises, such as truly continuous, 24/7 markets. The recommendations that follow aim to address these gaps, beginning with defining what is required for tokenized funds to move seamlessly across platforms and jurisdictions.

The evolving digital financial landscape presents a powerful paradox: tremendous opportunities for innovation, efficiency, and inclusion, alongside complex challenges in ensuring stability, security, and fairness. As traditional finance merges with digital finance, regulatory, security, and market complexities intensify, creating a connected ecosystem that aims to combine legacy banking's reliability with the speed and flexibility of digital assets. Success depends on regulators adapting frameworks to prioritize safety while enabling financial institutions to embrace digital innovation.

Two pillars — soundness and innovation — are crucial for this transition. Technologies must be secure, resilient, and flexible. Close collaboration between regulators and financial institutions will build trust, ensure compliance, and promote the seamless integration of digital assets into existing systems. When established players adopt these changes, consumer confidence grows, accelerating broader market acceptance.

OPEN QUESTIONS TO BE ADDRESSED

How can harmonized regulations evolve? Currently, there is no unified legislation on tokenization. Countries vary in their approach based on market maturity—some apply existing financial laws to tokenized assets, while others create or adapt regulations for Distributed Ledger Technology (DLT). The rapid growth of decentralized finance (DeFi) and token markets exposes gaps, risks, and innovation potential. It is essential that token users receive protections equal to those offered for traditional assets.

What will be the tax treatment? A fair tax environment is also critical. Tokenized and traditional forms of the same asset should face identical taxation. Since DLT transactions are often cross-border, the OECD developed the Crypto-Assets Reporting Framework (CARF) in 2022 through international cooperation. CARF builds on existing standards like the OECD's Common Reporting Standard and FATF guidelines to improve tax transparency and KYC procedures for crypto assets. At the EU level, the proposed DAC8 directive aims to harmonize tax treatment of cryptocurrencies based on MiCAR definitions, fostering legal certainty to support the EU's digital market growth.

How do we address consolidation challenges that arise? Mergers and acquisitions (M&A) in DeFi face unique challenges due to token-based governance and complex securities laws. Decentralized protocols resist traditional centralized ownership models, complicating integration and valuation. M&A in crypto demands creative governance and compliance solutions to blend decentralized finance innovation with regulatory realities. As the industry matures, consolidation is expected, yielding fewer but stronger, better-regulated platforms serving retail and institutional investors. Hybrid regulatory frameworks and evolving M&A approaches will shape this transition, balancing innovation with practical compliance.

RECOMMENDATIONS TO ADVANCE TOKENIZATION

1. Establish & Adopt Common Standards

- Develop shared standards for token minting to ensure payment tokens can be easily integrated into wallets, platforms, and payment systems.
- Promote interoperability across networks and service providers to enable seamless token transfers and use in different ecosystems.

2. Strengthen Compliance and Risk Management

Implement consistent KYC and AML practices both at the point of token issuance and throughout secondary market activity.

Address operational and financial risks related to token redemption and conversion back into fiat, ensuring consumer protection and liquidity safeguards.

3. Set Collateral Requirements for Algorithmic Stablecoins

- Although not yet a primary regulatory focus, algorithmic stablecoins should require sufficient collateral—such as cryptocurrencies or tokenized real-world assets—to support stability and reduce systemic risk.

4. Accelerate Strategic Execution and Ecosystem Development

- Launch strategic tokenization initiatives that create measurable business value and accelerate time to market.
- Recognize that meaningful value emerges from an ecosystem approach, requiring collaboration across institutions and infrastructure providers.

5. Drive Organizational Commitment and Leadership Engagement

- Make tokenization a C-suite priority, allocating dedicated leadership, governance, and resources.
- Develop a clear tokenization strategy aligned with long-term business objectives, customer needs, and regulatory compliance goals.

OPEN QUESTIONS THAT NEED TO BE ADDRESSED

1. MARKET STRUCTURE & RISK

- How should risk be assessed and mitigated in secondary or retail token markets, where investors may not interact directly with issuers?
 - What are the implications of tokenized post-trade processes—how do clearing, settlement, and custody differ from traditional systems?
 - What constitutes finality in atomic settlement when one tokenized asset is exchanged for another (e.g., a stablecoin for a tokenized RWA)?
 - How can regulators ensure control and security over permissions—who is allowed to alter books and records, and under what conditions?
 - Should self-custody be a protected right? If so, under what safeguards or limitations?
 - Should qualified investors have flexibility in choosing custody models, while retail investors are required to use regulated custodians?
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2. STRATEGIC & CONCEPTUAL QUESTIONS

- How do money and assets differ in the context of digital economies, and what does that mean for tokenized financial systems?
 - Should the “power to the people” concept—self-custody and disintermediation—be embraced or limited to maintain systemic stability?
 - How can tokenization become a tool for collaboration and shared innovation, rather than a repetition of siloed initiatives?
 - What role should financial market infrastructures (FMIs) play in the tokenized era, and how will traditional and digital networks coexist?
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3. REGULATORY FRAMEWORKS & POLICY ALIGNMENT

- Do we need special rules for tokenized securities, or can existing securities laws adapt effectively?
 - How should MiCA, MiFID II, and the DLT Pilot Regime interact to provide clarity for tokenized instruments in the EU? Is the EU at risk of an overregulated approach?
 - How should stablecoins and CBDCs be regulated consistently given their role in settlement and payments?
 - Should AML/KYC controls extend beyond on- and off-ramps to cover transactions within tokenized ecosystems or “walled gardens”?
 - How can regulators enforce controls and ensure investor protection as value and collateral become tokenized?
 - What should standards for good governance and third-party risk management look like in a tokenized environment?
 - Most tokenized offerings may fall under exempt securities regimes—what does this imply for disclosure and investor protection requirements?
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4. ECONOMIC DESIGN & MARKET EFFICIENCY

- How can the return on equity (ROE) or measurable business value of tokenization projects be determined when use cases remain isolated and infrastructure is incomplete?
 - To what extent must the broader ecosystem participate to unlock real network effects and scale?
 - How can cost and scalability challenges (the “chicken-and-egg” problem) in token issuance and operations be overcome?
 - Is cost efficiency actually realized at each step of digital asset issuance, transfer, and redemption?
 - To what extent is tokenization hampered by the lack of digital money or interoperable payment rails?
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5. INFRASTRUCTURE, INTEROPERABILITY, & OWNERSHIP

- Who will own the payment rails of the future—banks, fintechs, or public-sector infrastructures?
 - How can interoperability between digital and traditional systems be achieved (e.g., API-based access to digital assets via conventional apps and banking channels)?
 - What role should consortium or cross-industry models play in building scalable tokenization infrastructure?
 - What does the absence of trusted infrastructure mean for market readiness, and how can it be addressed through regulation or collaboration?
 - How should post-trade and settlement standards evolve to ensure on-chain transactions meet legal and operational requirements?
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6. INSTITUTIONAL READINESS & GOVERNANCE

- How can traditional financial institutions adapt their strategies as tokenization blurs the line between traditional and crypto markets?
 - How do we ensure trust and collaboration between incumbents and new entrants, rather than fragmentation or redundancy?
 - What level of education and digital literacy is needed among regulators, control functions, and institutional staff to manage tokenized finance responsibly?
 - How can change management be structured so tokenization initiatives aren’t siloed within small innovation teams but embraced organization-wide?
 - What governance models will ensure control functions (risk, compliance, audit) mature alongside tokenization technology?
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7. GLOBAL COORDINATION & REGIONAL DYNAMICS

- How should global standards and interoperability frameworks be developed to avoid regulatory fragmentation?
 - How do regional differences—such as MiCA in the EU, stablecoin bills in the U.S., or Brazil’s digital asset framework—affect competitiveness and cross-border token operations?
 - How is progress in any given jurisdiction (e.g., Latin America - Brazil, Argentina, Paraguay) shaping regulatory momentum, and what lessons can global policymakers draw from it?
 - Will the rise of sovereign or multilateral organization-sponsored blockchains (e.g., World Bank, IDB) create regional ecosystems that fragment or enhance global connectivity?
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ENDNOTES

TOKENIZATION & CUSTODY

- 1 <https://www.icmagroup.org/fintech-and-digitalisation/fintech-resources/fintech-jargon/>
- 2 https://www.oecd.org/content/dam/oecd/en/publications/reports/2025/01/tokenisation-of-assets-and-distributed-ledger-technologies-in-financial-markets_be149012/40e7f217-en.pdf
- 3 https://www.esma.europa.eu/sites/default/files/2025-10/Joint_ESAs_Factsheet_on_crypto-assets.pdf
- 4 <https://www.whitehouse.gov/wp-content/uploads/2025/07/Digital-Assets-Report-EO14178.pdf>
- 5 https://www.cftc.gov/media/10321/CFTC_GMAC_DAM_Classification_Approach_and_Taxonomy_for_Digital_Assets_030624/download
- 6 <https://old.maa.org/press/periodicals/convergence/mathematical-treasure-mesopotamian-accounting-tokens>
- 7 <https://www.sec.gov/files/ctf-written-antonio-lanotte-global-blockchain-business-council-051425.pdf>
- 8 <https://www.sifma.org/research/statistics/fact-book>
- 9 <https://research.grayscale.com/reports/the-link-between-worlds>
- 10 This designation can include tokens designated as network or protocol tokens by the White House report “Strengthening American Leadership in Digital Financial Technology,” as digitally native tokens that are intrinsically connected to the operation of a network or protocol, which includes payment transactions within the network. Examples include Bitcoin and ether.
- 11 While stablecoins might not be settled until they are redeemed for the “real” money in custody elsewhere, CBDCs are the asset in their own right and don’t need to be redeemed.



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