Deep Dives | Assessing Select Examples of Scaled Adoption

Capital markets use case activity reflects key trends across asset class, geography, and capability type across three specific areas: (1) Collateral Management, (2) Fixed Income Issuance; and (3) Tokenization of Funds. These use cases showcase real-world decisions that financial institutions have made around technology, risk, and governance. It also provides practical evidence of benefits enabled by DLT.[1]

EMERGING DLT-BASED CAPITAL MARKETS USE CASE OVERVIEW

The deployment of DLT in capital markets is entering a new phase. Since the last publication of this report, activity has shifted from limited-scale experimentation to live production. Major institutions are now transacting on tokenized platforms, embedding DLT into funding, settlement, and asset servicing workflows. This momentum reflects not only technological readiness but also growing alignment among infrastructure providers, regulatory pilots, and investor demand.

As highlighted in *Approaching the Tokenization Tipping Point* (Ripple and Boston Consulting Group, April 2025), institutional tokenization volumes are accelerating, particularly in fixed income, money markets, and real-world assets. This progress is supported by enhanced infrastructure and clearer regulatory frameworks in jurisdictions such as the European Union, United Kingdom, and Singapore. These developments indicate that tokenization is no longer a peripheral innovation track. It is increasingly viewed as a core strategy for modernizing capital markets.

At the same time, joint trades and members remain pragmatic. Discussions across jurisdictions reveal both optimism and caution. Institutions widely recognize the long-term value of tokenization, but adoption is still shaped by near-term challenges. These include regulatory divergence, limited interoperability, inconsistent definitions, and operational complexity. Many market participants emphasize that legal certainty and supervisory alignment are just as critical as technical innovation.

- Adoption is concentrated in asset classes with the clearest incentives. These include intraday liquidity, repo financing, and digitally native bonds.
- Market structure remains fragmented. Many platforms are isolated or proprietary and lack integration with wider capital markets infrastructure.
- Product development is outpacing regulatory standardization. This is especially true for fund structures and fixed income instruments, where there is demand for clearer guidance on classification, usage, and risk treatment.
- Use case viability increasingly depends on jurisdiction-specific legal form, infrastructure maturity, and the credibility of the settlement mechanism.

1. GFMA, “Why Basel Should Not Apply A Blanket Infrastructure Risk Add-On For Group 1 Cryptoassets”, 2022.

Three categories where adoption is most advanced:

Repo and Collateral: DLT is helping institutions modernize how they manage collateral and liquidity. Real-time settlement, reduced processing friction, and better visibility into asset mobility are allowing firms to unlock trapped capital and reduce operational risk in repo and derivatives markets. Post-settlement of collateral processing, such as corporate actions, coupons, and dividends, as mentioned above, can all be streamlined with DLT. And, with improved post-settlement collateral processing, current operational challenges to the market would be mitigated, allowing more types of collateral to be used and further reducing cost of funding and decreased investment performance to end users.

Fixed Income Issuance: Tokenized bond issuance is showing measurable gains in cost efficiency, speed, and transparency. Issuers are testing how legal instruments can be combined with programmable infrastructure for improved servicing and investor access.

Tokenization of Funds: Digital fund structures, including tokenized money market funds, are enabling near-instant settlement, improved redemption and collateral management processing, and lower distribution costs. These developments also raise important questions around fund classification, regulatory treatment, and eligibility for collateral use.

Each use case is evaluated using a consistent framework:

Overview of Use Case: A detailed description of the operational and strategic considerations for a use case is paramount to aiding industry and regulatory understanding. In the following chapter we will describe how each use case works in as much detail as required to provide a true operational understanding of how these use cases work.

Credibility of the Settlement Asset Used: The nature of the settlement asset is a foundational consideration. Whether the transaction uses tokenized deposits, fiat-backed stablecoins, or wholesale tokenized central bank money, this choice influences risk exposure, legal enforceability, and compliance requirements. Settlement mechanisms that are issued by regulated financial institutions and tied to fiat currency have emerged as preferred models, though approaches vary across regions and platforms.

Interoperability across Networks: The ability to connect across DLT systems and integrate with traditional capital market infrastructure is essential for achieving scale and liquidity. Platforms that operate in isolation may deliver localized efficiencies, but they are often unable to support market-wide adoption. Interoperability solutions, including bridges, custodial models, and shared messaging standards, are critical for expanding utility and reducing fragmentation.

Distinguishes between two primary layers of DLT deployment

Infrastructure-Layer Use Cases: These focus on the foundational elements of DLT systems. They include network design, consensus protocols, data privacy architecture, and integration with existing financial infrastructure. Institutions in this category are often developing new distributed ledgers or adapting core systems for regulated use.

Key examples include:

- **Canton Network:** A privacy-preserving blockchain network built for financial institutions, with support from Goldman Sachs, Microsoft, and Deloitte. It connects participants through a common infrastructure while allowing transaction privacy and regulatory compliance.
- **Hyperledger Fabric:** A modular, enterprise-grade DLT framework developed by the Linux Foundation. It enables permissioned environments and is widely used for building scalable enterprise blockchain applications.
- **Euroclear's D-FMI:** Euroclear's Digital Financial Market Infrastructure supports issuance and settlement of digital-native securities and has been used in partnership with the World Bank.

Application-Layer Use Cases: These are built on top of existing DLT networks and focus on user-facing functionalities, such as asset issuance, investor onboarding, compliance automation, and lifecycle servicing. Application-layer innovations tend to abstract the underlying technology and instead emphasize product structuring, legal compliance, and user experience.

Key examples include:

- **Securitize:** A platform that allows compliant issuance and management of digital securities, including tokenized equity and fund shares. It supports both primary and secondary transactions.
- **HQLAX:** A solution that enables high-quality liquid asset ("HQLA") transfers via a digital collateral registry. It improves settlement timing and collateral reuse without moving the underlying assets.
- **Paxos Settlement Service:** A DLT-based platform for settling U.S. equities. It allows for same-day settlement and is integrated with traditional broker-dealer infrastructure.

Many institutional platforms span both layers. For example, a tokenized bond may rely on infrastructure-level decisions for settlement, while simultaneously embedding features such as automated income distribution, investor whitelisting, or smart contract governance. Understanding the layered structure of DLT deployment is essential for assessing technical viability, legal compatibility, and market fit. The sections that follow will apply this framework to the three primary categories of use cases. Each example offers insight into what is working today, what remains unresolved, and where further coordination between industry and regulators will be necessary to scale adoption.

DEEP DIVE #1: COLLATERAL MANAGEMENT

Collateral management, and repurchase agreements (repos), and are both **fundamental mechanisms in capital markets**. Collateral management refers to the processes that ensure exposures under various financial transactions (repos, derivatives, securities loans, etc.) are **secured with assets**, thereby mitigating counterparty credit. Repos allow financial institutions to **finance holdings or raise short-term liquidity by borrowing against high-quality securities**, while enabling cash investors to earn secured returns.[2] In essence, a repo is a sale of securities coupled with an agreement to repurchase them later (often the next day) at a set price – **effectively a collateralized loan**.[3] Together, robust collateral and repo functions support **market liquidity and stability** – for example, repos provide market-makers with the cash and securities needed to buffer imbalances in trading, helping keep bond markets liquid and reducing financing costs for issuers while collateral management mitigates counterparty risk.[4]

Role, Objectives, and Key Stakeholders

Strategic Objective: The core goal of repo and collateral management is to efficiently allocate liquidity within the financial system while controlling risks. Repos enable institutions to manage short-term funding securely, supporting critical market functions such as dealer inventory financing, leveraged investing, and safe cash investment by asset managers.[5] Institutions can extend their counterparty exposure further with the guardrails of prudent collateral management.

Operational Objective: Repos allow firms to optimize liquidity with operational ease, and collateral management ensures the timely delivery of appropriate assets to meet obligations, such as repo transactions or derivatives margins.

Key Stakeholders: The repo and collateral ecosystem includes sell-side banks and dealers who intermediate funding, buy-side participants (asset managers, pension funds, hedge funds, insurers), market infrastructure providers (triparty agents, custodians, CCPs), central banks utilizing repo operations, technology providers, and regulators overseeing systemic stability. Improvements in repo and collateral management practices thus have broad implications for capital market efficiency and stability.[6]

Market Scale and Activity in 2024: Repos and collateralized financing markets operate at **enormous scale globally**, underpinning trillions of dollars in daily transactions. In 2024, repo activity continued to expand, reflecting high demand for secured financing. **Global repo outstanding volumes are to the order of tens of trillions: for example, in Europe the repo market reached a record €11.1 trillion in outstanding contracts as of June 2024** (measured by a semi-annual survey covering 61 institutions).[7] This European figure – up about 7% year-on-year – marks the *minimum* size, since it does not capture all firms.[8] In the United States, repos are likewise a critical funding channel. As of mid-2024, total repo borrowing stood at about **$6.2 trillion outstanding**, of which roughly $5.1 trillion was private-sector (the remainder being Federal Reserve reverse repo balances).[9] The U.S. repo market has grown significantly in recent years – primary dealers' repo volumes rose from around $5 trillion a few years ago to over **$7 trillion by 2024**, according to industry estimates.[10]

Such figures underscore that repo markets are **comparable in size to or even larger than underlying cash markets**. For perspective, in Canada the annual repo trading volume of government bonds was nearly 3 times the volume of cash bond trading.[11] Major electronic trading platforms have reported surging repo volumes as well. For instance, Tradeweb (a global trading venue) saw **average daily repo trading of $623 billion in 2024**, a jump of almost 30% from the prior year.[12] By December 2024, daily volumes on that platform were exceeding $680 billion, reflecting a year-end surge in activity.[13] This growth has been driven by factors such as central banks unwinding asset purchases (thus increasing the supply of securities available for repo) and a shift of cash out of central bank facilities back into private markets.[14]

2. Philippe Muller, Maksym Padalko, "The New Repo Tri-Party Canadian Collateral Management Service: Benefits to the Financial System and to the Bank of Canada", February 2025.
3. Financial Stability Oversight Council Annual Report 2024, Accessed 2025.
4. Securities Industry and Financial Markets Association, 2025.
5. Philippe Muller, Maksym Padalko, "The New Repo Tri-Party Canadian Collateral Management Service: Benefits to the Financial System and to the Bank of Canada", February 2025.
6. Financial Stability Oversight Council Annual Report 2024, Accessed 2025.
7. "47th ICMA ERCC European Repo Market Survey", November 2024.
8. Ibid.
9. Financial Stability Oversight Council Annual Report 2024, Accessed 2025.
10. Josh Galper, "Collateral Market Tops €25 trillion, expanding the argument for DLT solutions", August 2024.
11. Philippe Muller, Maksym Padalko, "The New Repo Tri-Party Canadian Collateral Management Service: Benefits to the Financial System and to the Bank of Canada", February 2025.
12. Daniel Tison, "Tradeweb Reports 29.8% YoY Rise in Repo ADV for 2024", January 2025.
13. Ibid.
14. Ibid.

In addition, the collateral impact of the industry is extreme, with the total value of global outstanding collateral exceeding $25.5 trillion EYR in Q1 2024.[15] This includes repo, which is the majority at 82%, securities lending at 10%, OTC derivatives at 5%, and 3% with CCPs.

Just in derivatives, ISDA reports that leading derivatives market participants subject to the margin rules collected $1.5 trillion in IM and VM at year-end 2024, up by 6.4% versus the previous year.[16] This included $431.2 billion of IM and $1.0 trillion of VM. In addition, the survey finds that $389.8 billion of required IM was posted by all market participants to major CCPs for their cleared IRD and CDS transactions at the end of 2024.

Inefficiencies and Pain Points in the Current Model

Despite its critical role, the traditional repo and collateral management model suffers from **several inefficiencies and pain points** that market participants increasingly view as targets for transformation. Many of these issues stem from the operational complexity of moving collateral through a web of different systems, intermediaries, and jurisdictions.

Several **specific pain points** arise from this legacy model:

- **Latency in Settlement:** Traditional repo settlements (often T+0 or T+1) frequently rely on batch processes and intraday cut-offs, creating delays. This restricts firms from swiftly reusing collateral or addressing margin calls, forcing them to maintain excess liquidity buffers. Cross-border time zone constraints also impact the efficient mobility of collateral in the global market, requiring pre-funding that is costly and operationally intensive.[17]
- **Operational Fragmentation and Reconciliation:** Repo and collateral transfers involve multiple ledgers (buyers, sellers, custodians, triparty agents), leading to daily reconciliation challenges. Manual processes, common at many institutions, increase operational risk and cost due to frequent discrepancies and errors.
- **Counterparty Risk and "Give-Up" Exposure:** The current repo system often involves "give before you get" practices, creating brief periods of over-collateralized credit exposure, which impacts cost of funding. Timing mismatches in collateral substitutions and fragmented settlement platforms compound these risks, despite mitigants such as haircuts and credit lines.[18]
- **Liquidity Fragmentation:** Collateral held across different custodians leads to fragmented liquidity pools, complicating asset mobilization. Firms may struggle to efficiently allocate collateral, causing unnecessary borrowing and liquidity traps where assets become effectively immobilized. Also, firms that do not have holistic collateral management practices or suffer from multiple systems to source collateral internally could benefit from interoperability with both external and internal partners. In times of market volatility, the liquidity fragmentation, even if only fueled by data inconsistencies, can further increase the cost of funding and need to over-collateralize, and in turn, increasing counterparty risk.
- **Regulatory and Reporting Burdens:** Complex post-crisis regulations (e.g., Securities Financing Transactions Regulation ("SFTR")) require detailed repo transaction reporting. Aggregating data from legacy systems is burdensome and costly, reducing regulators' transparency. Regulatory constraints such as balance-sheet impacts and eligible collateral limitations further restrict efficient collateral management.
- **Operational Costs:** Fragmentation, manual interventions, redundant reconciliation, and outdated systems significantly raise direct and indirect operational costs. These inefficiencies increasingly appear unsustainable compared to faster, simpler settlement practices emerging in other capital market areas.

Given these pain points, it is no surprise that both industry and regulators have been exploring improvements. **Targets for transformation** include achieving real or near-real-time settlement of repo trades, **automating collateral allocation and substitutions**, creating unified views of collateral across silos, and reducing the need for duplicative reconciliation. In recent years, attention has turned to new technologies – in particular, **DLT and tokenization** – as potential enablers of these improvements.

15. Refer to the Collateral Management use case in Chapter 3. Collateral market tops €25 trillion, expanding the argument for DLT solutions – Finadium.
16. ISDA 2024 Margin Survey: **https://www.isda.org/a/EyfgE/ISDA-Margin-Survey-Year-end-2024.pdf**.
17. "Transforming Collateral Management with DLT", September 2024.
18. Ibid.

Applying DLT and Tokenization: Use Cases and Benefits

DLT offers a novel approach to addressing many of the inefficiencies outlined above. In essence, DLT can serve as a **single**, **shared source of truth** for transaction records and asset ownership, accessible simultaneously by multiple parties. Tokenization is the process of representing traditional assets (such as securities or cash balances) as **digital tokens on such a ledger**, enabling them to be transferred with cryptographic security and near-instant finality. In the context of repo and collateral management, DLT and tokenization have moved from theory to practice through a number of **live use cases and pilot projects**, which demonstrate tangible benefits:

- **Near Instant Settlement:** DLT significantly accelerates repo settlements from traditional batch processes (T+0 or T+1) to near real-time completion within minutes or seconds. For instance, J.P. Morgan's DLT-based platform has already processed billions in trades, enabling same-day or intraday repo settlements and enhancing liquidity management.[19]
- **Delivery-vs-Payment and Atomic Exchange:** DLT enables simultaneous ("atomic") swaps of cash and securities or collateral-to-collateral exchanges, eliminating intraday "give before get" risks.[20] Platforms such as HQLA allow instant transfers of asset ownership without physically moving securities, greatly reducing operational steps, settlement fails, and intraday exposures.[21]
- **24/7 Availability and Flexibility:** Unlike traditional systems limited to business days and set hours, DLT networks operate continuously, enabling collateral transfers at any time. This allows real-time margin calls and corporate actions, improving liquidity management and reducing idle collateral buffers.
- **Improved Transparency and Tracking:** A shared distributed ledger offers participants and regulators near-real-time visibility of transactions and collateral positions, simplifying compliance and reporting. Programmable tokens with embedded eligibility criteria further enhance transparency, reducing operational risks related to collateral allocation.
- **Operational Efficiency and Automation:** Smart contracts driven by industry-wide data standards like the CDM automate key repo and collateral management tasks such as maturity execution, interest calculation, and margin calls, significantly reducing manual errors and reconciliation efforts. DLT's shared ledger eliminates redundant reconciliation steps by providing a unified, trusted data source for all parties. Golden records can contain pertinent information, such as transfer agent, custodian, pledgor, and receiver for money market funds, expanding the use of the eligible collateral type beyond a cash sweep vehicle.
- **Collateral Mobilization and Optimization:** Tokenization enables previously illiquid assets (e.g., money market fund shares) to be instantly mobilized as collateral. Platforms facilitating tokenized collateral networks allow firms to swiftly redeploy idle collateral across asset classes, enhancing overall market liquidity and reducing unnecessary asset buffers.[22] The CDM can also provide benefits to eligible collateral representation in a standardized digital format, thus reducing collateral-related disputes and streamlining cross-product operational processing with decreased data-related friction.

These examples underscore that DLT and tokenization are no longer just theoretical in capital markets – they are being **applied in live environments by major institutions**. Broadridge Financial Solutions, a global FinTech firm, has launched a DLR platform that is now used by a network of banks and buy-side firms. By late 2024, Broadridge reported its DLR platform was facilitating about **$1 trillion in average monthly volume** of repo transactions[23], indicating growing acceptance. Market infrastructure entities such as **Deutsche Börse and Eurex** have invested in digital collateral initiatives (e.g. the HQLA platform is a partnership involving Deutsche Börse), and central securities depositories such as **Euroclear** have trialed tokenized collateral mobility solutions.[24] These initiatives have shown quantifiable benefits such as **reduced settlement times (from hours to seconds), lower operational loss incidents**, and **more effective balance sheet usage** for participants. Crucially, these improvements have been achieved *without* compromising the core risk management objectives of repo and collateral management – if anything, features such as atomic settlement and better transparency **enhance risk control**.

19. Tom Phillips, Paul Pirie, "Collateral Management Guide 2023: The evolution of DLT", October 2022.
20. Ibid.
21. "Transforming Collateral Management with DLT", September 2024.
22. Tom Phillips, Paul Pirie, "Collateral Management Guide 2023: The evolution of DLT", October 2022.
23. "Broadridge Announces First High-Quality Liquidity Asset Use Case for its Distributed ledger Repo Platform", September 2024.
24. Ledger Insights, "Euroclear Launches Tokenized Collateral Initiative with Digital Asset", February 2025.

Challenges and Considerations for DLT Adoption

While the potential benefits of DLT in repo and collateral management are compelling, it is equally important to acknowledge the **challenges and limitations** that have emerged. Transforming such a large, systemically important market does not happen overnight, and there are significant **practical and regulatory hurdles** to broad adoption of distributed ledgers in this context:

- **Regulatory and Legal Uncertainty:** Existing legal frameworks were not designed for tokenized assets, creating uncertainty around legal finality and enforceability across jurisdictions. Institutions currently use parallel traditional processes or third-party custodians to mitigate risks. Regulatory clarity is evolving (e.g., the E.U. Pilot Regime, the UK's Digital Securities Sandbox (DSS) and U.S. commercial code amendments), but until frameworks mature, legal ambiguity remains a significant barrier. Regulatory updates regarding eligible collateral with CCPs and per ncleared margin rules for derivatives need to be updated on a global view. Also, eligible collateral disharmonization (money market funds in the US vs. EU) needs to be resolved for widespread use of tokenized MMFs.[25]

- **Interoperability with Legacy Systems:** Integrating new DLT platforms with legacy systems (trading, risk, custody) poses significant complexity. Achieving real-time synchronization and developing standards for interoperability are ongoing challenges. Industry efforts, such as linking DLT platforms to payment systems (e.g., Broadridge with Fnality), show promise, but without broad interoperability, new liquidity silos could emerge.[26]

- **Scalability and Performance:** DLT systems have shown promising early results in handling repo market volumes but haven't been fully stress-tested at global scale. High transaction volumes and low-latency requirements remain a key concern. Permissioned networks, using faster consensus mechanisms, address some issues, but market participants and regulators still need clear evidence of robustness under extreme market conditions.[27]

- **Adoption and Network Effects:** DLT's benefits depend on broad adoption, creating a coordination challenge as firms hesitate to join without existing wide participation. Initial DLT solutions have been limited or closed-loop, while broader adoption requires overcoming inertia, transitional costs, and clarifying governance. Hybrid models, with traditional and DLT-based processes coexisting, are likely until the industry fully transitions.

- **Cybersecurity and Operational Risks:** DLT introduces new cyber and operational risks, such as vulnerabilities in smart contracts and complexities in key management. Safeguarding digital tokens requires specialized custodial services and robust operational protocols. Ensuring network resilience and continuity demands new expertise and thorough testing, creating additional operational risk management considerations.

- **Lack of Adoption of Industry-Wide Data Standards:** The industry must contribute to the development of and adopt the Common Domain Model to ensure that data is universally interoperable and improvements in one area of the repo and collateral management process are not diminished because of transmission and data mapping challenges. Data standards spanning legacy and new DLT platforms will be critical in the short-term, especially with digitized documents (pre-smart contracts) and eligible collateral representation. Adopting the CDM, which has been built by ICMA, ISLA, and ISDA and is governed under FINOS, the Common Domain Model should be more widely adopted either via translation mapping with proprietary data models or used natively.

In summary, the application of DLT and tokenization to repo and collateral management is a promising development, with real gains demonstrated in live projects such as faster settlement, reduced risk, and efficiency improvements. These benefits align closely with the strategic goals of the repo market – namely, to lower friction in moving liquidity and collateral while safeguarding the system. However, the transition must be managed carefully. Regulators are supportive but cautious, ensuring that resilience and integrity are maintained. Industry stakeholders must collaborate to address interoperability and agree on standards. It is likely that, in the coming years, we will continue to see a *hybrid approach*: incremental adoption of DLT for specific use cases (such as intraday repos, cross-custodian collateral swaps, or central bank digital collateral trials) alongside the traditional architecture. As challenges are ironed out – with clear regulatory frameworks, proven scalability, and demonstrated interoperability – DLT could gradually become an integral part of the plumbing of global repo markets. The introduction of these technologies in such a foundational domain of finance is being handled with appropriate caution, but the direction is set real-world use cases to date have shown that a more efficient, tokenized repo and collateral ecosystem is achievable, bringing the prospect of a faster, safer, and more transparent market for all participants.[28,29]

25. "How Can Collateral Management Benefit from DLT?", January 2020.
26. Clelia Frondaroli, "Broadridge Partners with Fnality", April 2025.
27. "How Can Collateral Management Benefit from DLT?", January 2020.
28. Josh Galper, "Collateral Market Tops €25 trillion, expanding the argument for DLT solutions", August 2024.
29. Tom Phillips, Paul Pirie, "Collateral Management Guide 2023: The evolution of DLT", October 2022.

Collateral Use Case #1: J.P. Morgan Kinexys Digital Financing for Intraday Repo

EXHIBIT DD.1

Case study: JP Morgan Kinexys Intra-day Repos – Fully on-chain collateral and cash exchange for repo transactions

Overview

- Web-based application provides access to secured financing, enabling financial institutions and corporations to settle repo transactions within minutes
- Uses J. P. Morgan's private, permissioned blockchain

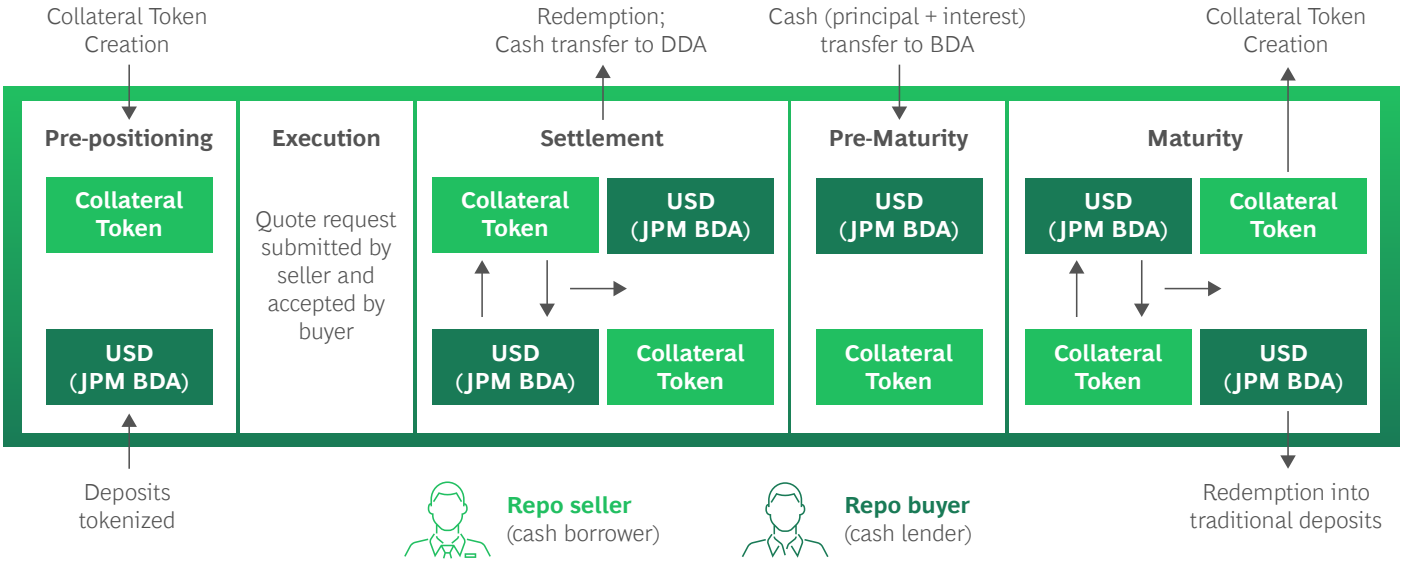
Key benefits

- Increased precision of settlement and maturity times (intra-day vs overnight)
- Settlement efficiency
- Improved counterparty credit risk

Market traction

- Increased precision of settlement and maturity times (intra-day vs overnight)
- Settlement efficiency
- Improved counterparty credit risk

How it works



Source: JP Morgan and BCG, "The Future of Distributed Ledger Technology in Capital Markets"; GFMA member inputs; BCG analysis.

Overview of Use Case

Digital Financing on Kinexys is J.P. Morgan's distributed-ledger solution for intraday repurchase agreements (repos) – short-term, secured financing transactions completed within the same day. Launched in 2020 (rebranded as **Kinexys Digital Assets** by 2024), this platform enables borrowers and lenders to **exchange cash for tokenized collateral** and settle repo trades in minutes or hours rather than the traditional overnight or multi-day cycle.[30,31] The key innovation is **programmable, on-chain settlement** of both legs of the repo: the cash lender's funds (the balances of which are recorded on the blockchain) and the borrower's collateral (in the form of a digital token representing a security entitlement) are delivered near-simultaneously on the ledger at a pre-agreed time, specific to the minute. Recording the trade agreement in a smart contract and settling on a programmable ledger reduces the operational stresses of uncertain asset movements.[32] This allows a bank

30. Ledger Insights, "JP Morgan using blockchain for repos, but it's not the first", December 2020.
31. Businesswire, "J.P. Morgan Executes Intraday Repo Transaction Using Blockchain", December 2020.
32. Ibid.

needing short-term liquidity to **borrow cash intraday** by temporarily selling high-quality securities, and automatically repurchase them a few hours later – a process difficult to arrange in legacy systems but now streamlined via blockchain.[33] This results in a new, low-cost liquidity tool for treasury departments to add to their tool kit.

Workflow and Participants: In a typical Digital Financing transaction, a **cash provider** (repo buyer) and a **collateral provider (repo seller)** transfer assets using the blockchain ecosystem. The borrower's collateral is tokenized on the platform by being transferred to an account in the name of the collateral token agent as a securities intermediary for the benefit of applicable Digital Financing participants at a traditional triparty agent. Once the collateral and its value are confirmed as being held at such an account, a collateral balance is minted on-chain. The lender's cash is provided in the form of cash held in a **J.P. Morgan blockchain deposit account**. Next, both parties agree on the terms (collateral type, amount, interest, and an intraday maturity time. At the agreed start time, a smart contract or programmed instruction settles the first leg of the repo – the lender receives the collateral, and the borrower receives the cash balances – **settling the repo within minutes**.[34] Because this is done on a shared ledger, both parties have an immediate, synchronized record of the exchange. The repo then unwinds at the pre-set maturity (often just a few hours later): the contract automatically returns the collateral to the original owner and the cash (with interest calculated to-the-minute) back to the lender.[35,36] For example, in January 2025 Santander executed two **programmable intraday repos** on Kinexys – one for $50 million and one for €50 million – each scheduled to execute and then **redeem 3 hours later**, demonstrating how such repos can be timed and automated precisely.[37] These transactions involved Santander as the repo seller (posting collateral) and J.P. Morgan as the buyer, and notably included a euro-denominated repo – the **first intraday euro repo** done by a non-J.P. Morgan entity on the platform.[38]

Platform Operations and Technology: The intraday repo application runs on a **permissioned DLT network** developed by J.P. Morgan (called Kinexys Digital Assets). It is built on an **enterprise Ethereum-based ledger**, adapted for privacy and performance.[39] All participants are permissioned financial institutions (initially mostly J.P. Morgan and its clients). J.P. Morgan acts as the network operator and provider of the **blockchain deposit accounts** used for settlement. Crucially, the platform integrates with traditional market infrastructure for custody and record-keeping. For instance, in early pilot trades J.P. Morgan enlisted **BNY as the triparty collateral agent**, meaning BNY held the underlying securities and ensured that on-chain token transfers corresponded to legal changes in collateral ownership.[40] This approach mirrors a traditional tri-party repo arrangement, but with the **repo, settlement and return all handled by self-executing code** on the shared ledger. The use of a single, shared source of truth for cash and collateral eliminates settlement mismatches and delays – in the words of J.P. Morgan's developers, it "supports unique functionality like atomic trade settlement" to **unlock trapped intraday liquidity** and reduce operational frictions.[41]

Participants access the platform through secure nodes or interfaces provided by J.P. Morgan, and they remain subject to full KYC/whitelist requirements.

Adoption, Volume, and Milestones: J.P. Morgan first **deployed the intraday repo platform in late 2020**, conducting an initial live trade between its broker-dealer and banking arm using blockchain deposit accounts for the cash leg.[42] After proving out the concept internally, the bank opened the platform to select external counterparties in early 2021. Several milestones illustrate the platform's growth since then:

- *2020 (Launch):* **Kinexys Digital Assets** intraday repo goes live in pilot. First trades between J.P. Morgan affiliates settle in **hours instead of days**, using **blockchain deposit accounts** to achieve instantaneous DvP.[43,44] Simulations are run with Goldman Sachs and others, with BNY participating as triparty agent.
- *Mid-2021:* Rollout to a limited number of U.S. market participants begins. J.P. Morgan's platform is one of the first live DLT repo applications, although initial usage is cautious and often involves J.P. Morgan on one side of the trade as principal.
- *May 2022:* **BNP Paribas** becomes the **first European bank** to execute an intraday repo on the platform, joining as a participant on Kinexys Digital Assets.[45] By this point, the intraday repo application had processed over **$300 billion** in cumulative repo transactions since launch.[46]

33. ICMA, "Tracker of New FinTech Applications in Bond Markets", Accessed 2025.
34. Businesswire, "J.P. Morgan Executes Intraday Repo Transaction Using Blockchain", December 2020.
35. ICMA, "Tracker of New FinTech Applications in Bond Markets", Accessed 2025.
36. Finadium, "Santander executes intraday repo on J.P. Morgan's Kinexys", January 2025.
37. Ibid.
38. Ibid.
39. ICMA, "Tracker of New FinTech Applications in Bond Markets", Accessed 2025.
40. Businesswire, "J.P. Morgan Executes Intraday Repo Transaction Using Blockchain", December 2020.
41. Ibid.
42. Ibid.
43. Ibid.
44. Ledger Insights, "JP Morgan using blockchain for repos, but it's not the first", December 2020.
45. ICMA, "Tracker of New FinTech Applications in Bond Markets", Accessed 2025.
46. Ibid.

- *Late 2022 – 2023:* J.P. Morgan expands the range of collateral and integration with other tokenization initiatives. It launches a **Tokenized Collateral Network** (with BlackRock and Barclays as participants) to extend the platform's use to tokenized money market fund shares and other assets for collateral purposes.[47] The Kinexys platform also begins handling **multi-currency** transactions; a euro-denominated blockchain deposit account is introduced (and later GBP denominated blockchain deposit accounts), setting the stage for intraday repos in EUR and GBP

- *Mid 2024:* The platform reaches scale: J.P. Morgan reveals that its blockchain network has processed **over $1 trillion** in notional transactions across applications since launch.[48] On average it was handling about **$2 billion in transactions per day** by 2024. To encourage broader use, J.P. Morgan announces plans to **open the network to third-party developers** so that other firms can build on it and tokenize assets using the platform.[49] OCBC partners with JPMorgan on the first intraday repo showcasing the ability for 3rd parties to act as Repo Buyers (cash lenders).

- *Early 2025:* The intraday repo product is operating in USD and EUR, with global banks as users. **Santander CIB's intraday repo in January 2025** (50 million in USD and €50 million in EUR) marks the first euro intraday repo with a non-J.P. Morgan counterparty.[50]

Usage and Reach: The platform's **user base** remains select and institutional. Aside from J.P. Morgan's own treasury and broker-dealer units, known participants have included **Goldman Sachs** (in early trials), **BNP Paribas**, **Santander**, and **BlackRock/Barclays** (the latter via the collateral tokenization project).[51,52] Geographically, activity has centered on the U.S. and Europe: U.S. dollar repos (often with US Treasuries as collateral) were first, followed by euro transactions in Europe, and now the groundwork is in place for sterling and other currencies. The platform is **permissioned and private**, so adoption is measured in terms of volume and key client participation rather than number of retail users. Even with a modest number of participants, the high-value nature of repo trades means volumes are significant.

In summary, Digital Financing via Kinexys represents a **pioneering use of DLT in fixed-income collateral management**, delivering intraday liquidity optimization. It leverages J.P. Morgan's role as a trusted intermediary to combine **traditional repo market practices with blockchain speed and automation**. By drastically shortening settlement times and enabling fine-grained control (such as hour-by-hour borrowing with interest calculated per minute), it addresses a real inefficiency in capital markets.[53] This use case is often cited as a tangible example of how enterprise blockchain can solve "plumbing" issues in finance – freeing up intraday liquidity and reducing risk – rather than just experimenting for its own sake.[54]

Settlement Asset

Legal Finality and Protections: Settlement finality on the platform is achieved through a combination of technological design and legal agreements. Technically, the blockchain uses a permissioned consensus mechanism (J.P. Morgan's network is built on Ethereum's architecture with a private, fast consensus protocol) that ensures once a transaction is confirmed on the ledger, it is irreversible and final within seconds.[55] There is no concept of probabilistic settlement or lengthy clearing. Atomic DvP settlement provides that either both sides of the repo settle or nothing does (reducing "leg risk" where one party delivers but the other fails).[56] From a legal standpoint, J.P. Morgan has put in place a robust contractual framework to ensure that an on-chain transfer equals a legally binding transfer of ownership (for collateral) or funds (with respect to blockchain deposit accounts). Participants in Kinexys sign agreements (or repo contract appendices) stipulating that the digital ledger records are the authoritative evidence of entitlement. In other words, moving a token on the Kinexys ledger is given the same legal effect as, say, transferring a security entitlement through a traditional securities settlement system. Achieving this required significant legal engineering. In fact, industry experts noted that intraday DLT repos became viable at scale only after extensive legal work by the world's largest banks to adapt master repo agreements and custody arrangements to digital tokens.[57]

Type of Asset and Rights: The cash leg in Kinexys intraday repos is settled using blockchain deposit accounts. Blockchain deposits accounts are just like traditional demand deposit accounts, except the recordkeeping is done using blockchain rather than traditional ledger systems. In practice, a participant must hold a demand deposit account with J.P. Morgan to fund a blockchain deposit account; once the demand deposit account is funded, the bank then transfers the funds to the relevant blockchain deposit account. Blockchain deposit accounts were first denominated in US dollars, and by 2022–2024

47. Ledger Insights, "BlackRock, Barclays join JP Morgan's Tokenized Collateral Network", October 2023.
48. Ledger Insights, "JP Morgan to Open Up Onyx Digital Assets to third party application", May 2024.
49. Ibid.
50. Finadium, "Santander Executes Intraday Repo on JP Morgan's Kinexys", January 2025.
51. ICMA, "Tracker of New FinTech Applications in Bond Markets", Accessed 2025.
52. Ledger Insights, "JP Morgan using blockchain for repos, but it's not the first", December 2020.
53. ICMA, "Tracker of New FinTech Applications in Bond Markets", Accessed 2025.
54. Risk.net, "Real-time repo needed for non-stop trading – DRW's Wilson", May 2023.
55. ICMA, "Tracker of New FinTech Applications in Bond Markets", Accessed 2025.
56. Businesswire, "J.P. Morgan Executes Intraday Repo Transaction Using Blockchain", December 2020.
57. Securities Finance Times, "Santander CIB programmable intraday repo trade with JP Morgan", January 2025.

J.P. Morgan extended the denominations to multiple currencies. For example, it launched a Euro-denominated blockchain deposit account (used in the Santander EUR repo) and a Sterling-denominated blockchain deposit account. No separate asset is created when funds are transferred into a blockchain deposit account, nor does J.P. Morgan custody or segregate special reserve assets in relation to a blockchain deposit account or engage in any stabilization activity. From the perspective of a client, a balance in its blockchain deposit account, like a balance in its traditional deposit account, is simply considered to be cash due from J.P. Morgan, and from the perspective of J.P. Morgan, a balance in the blockchain deposit account of a client is simply considered to be a general liability of J.P. Morgan to the client.

On the collateral side, the tokens represent the security entitlements in securities (such as Treasury bonds or other fixed-income instruments) for the duration of the repo. Typically, the actual securities remain in custody (for example, at BNY or another custodian/triparty agent) and are not physically delivered to the cash lender. Instead, the collateral token agent, acting as securities intermediary, treats the token-holder as the security entitlement holder. Transfer of that token is recognized as transfer of the security entitlement to the security. Thus, settlement finality for the collateral leg is buttressed by conventional commercial law – the repo buyer's interest in the collateral is protected just as in a normal repo (with the added benefit that the DLT record is immediate and transparent to both sides). In case of a default (e.g. if the repo seller fails to repurchase), the legal remedies would mirror those in standard repo agreements: the buyer (cash lender) would have the right to liquidate the collateral held and net proceeds applied per the contract.

In summary, settlement finality is provided for both technically and legally: the DLT platform provides for atomic exchange on a tamper-proof ledger, while the legal structure provides that those ledger entries are enforceable and equivalent to traditional settlement. Participants have strong protections: each party either gets exactly what was agreed (cash vs collateral) at the time of settlement, or the trade does not execute – there is no exposure to intraday settlement risk. The rights attached to the cash are those of a bank depositor, and the rights to collateral are those of a repo buyer under GMRA (with legal title to securities during the repo). Notably, achieving this required close coordination with legal regimes; as one industry source observed, these intraday DLT repos have only become possible "due to the development of underlying blockchain technology and extensive legal work done by the world's largest banks" to reconcile DLT with law.[58]

Interoperability and Network Architecture

Network Model: Kinexys Digital Assets operates on a **permissioned blockchain-based platform** owned and operated by J.P. Morgan. The underlying blockchain-based platform is built on an **Ethereum-based distributed ledger** but is not public – only authorized institutions (nodes) can participate.[59] In its current form, the network's governance is **bank-led**: J.P. Morgan developed and runs the infrastructure, acting as the central node provider and service operator. In 2024, J.P. Morgan indicated plans to **open the network to third parties** so that other firms can host applications or even tokenize assets on this blockchain.[60] This suggests a future where multiple financial institutions could operate nodes or contribute to governance, increasing decentralization within a controlled framework. Even so, the network is **not open to the all participants** – it's a closed loop of known participants (banks, corporates, custodians) who are vetted and bound by network rules.

Interoperability with Traditional Systems: Rather than existing in isolation, Kinexys is deliberately integrated with the **traditional capital market infrastructure**. One aspect of this is connectivity to **banks' internal systems** – for example, a participant's treasury management system or collateral management system can be linked via API to the Kinexys platform, feeding it instructions to initiate a repo or update balances. J.P. Morgan has built gateways so that when blockchain deposit account balances recorded on the blockchain are updated, the equivalent ledger entry in the core banking system is updated in near real time. Moreover, the platform supports **DvP settlement** in a way that can plug into existing workflows. A trade executed on a trading platform (or even negotiated by phone) can be settled on Kinexys by sending settlement instructions to the blockchain, similar to how one would send instructions to DTCC or a triparty agent – except here the instruction triggers a smart contract.

Interoperability with Other DLT Networks: Recognizing that the future may hold multiple blockchain networks in finance, J.P. Morgan has worked on cross-platform interoperability. A prime example is the integration with **Broadridge's DLR platform**. Broadridge's DLR (another permissioned blockchain used by many dealers for overnight and term repo) historically used traditional payment rails for the cash leg, which created delays.[61] In 2024, Broadridge and J.P. Morgan announced that **blockchain deposit accounts would be used on Broadridge's DLT** to enable fully atomic on-chain settlement on that platform.[62] Essentially, **J.P. Morgan's blockchain deposit accounts can now interoperate with a**

58. Securities Finance Times, "Santander CIB Executes Programmable Intraday Repo Trade with JP Morgan", January 2025.
59. ICMA, "Tracker of New FinTech Applications in Bond Markets", Accessed 2025.
60. Ledger Insights, "JP Morgan to Open Up Onxy Digital Assets to Third Party Applications", May 2024.
61. Markets Media Group, "Broadridge, JP Morgan Accelerate Repo Settlement", May 2024.
62. Ibid.

third-party repo network, meaning a dealer on Broadridge can settle in funds recorded on a blockchain ledger without leaving the DLT environment. This is a significant step: it suggests a future where **multiple blockchain networks link up**, using cash that is record on a blockchain ledger as a bridge. Horacio Barakat of Broadridge noted that bringing blockchain deposit accounts onto DLR allows repo settlement cycles "as short as [counterparties] want, down to a minute," improving flexibility and liquidity management.[63] He also predicted that this **interoperability between DLR and blockchain deposit accounts will spur further development of the intraday repo market**.[64]

At present, **Kinexys resembles traditional market structure in many ways** – it has known participants, roles for custodians, and a hub (JPM) that ensures trust – but it delivers the **transactions in a digitally native form**. In effect, it's an overlay network that digitizes current processes. The **infrastructure mirrors the existing repo market**: bilateral (or tri-party) repos, governed by the same legal agreements, and involving the same asset types. However, it introduces *digitally native capabilities* such as smart contract automation and 24/7 connectivity. One could say it's **evolutionary rather than revolutionary** in market design. It does not replace central counterparties or trading venues; instead, it upgrades the **post-trade settlement layer** to be near real-time and programmable. J.P. Morgan's approach thus far has been to **integrate with the grain of the financial system**. For instance, the platform can facilitate **DVP for intraday repos without altering how securities are issued or how payment systems work** – it simply synchronizes a blockchain-based ledger entries of those elements. In time, as more assets become tokenized on various platforms (from government bonds to money market instruments), Kinexys is positioned to tie into those as well. Indeed, the platform's **Tokenized Collateral Network** already demonstrated using **tokenized money market fund shares as collateral** on-chain, hinting that it can support a broader set of digital assets beyond just Treasury tokens.[65]

In summary, Kinexys's architecture is a **private, enterprise blockchain network** marrying the strengths of DLT (real-time, shared truth, smart contracts) with the **structures of traditional finance** (known intermediaries, legal contracts, central governance). It is interoperating with other systems gradually – both other DLT networks (Broadridge DLR, possibly others) and the existing banking infrastructure (custody accounts, payment networks for on/off-ramps) – rather than existing in a vacuum. This approach helps with adoption, since participants do not have to abandon their current processes entirely; instead, they interface with a new settlement network that runs in parallel and delivers new capabilities. In effect, **Kinexys acts as a bridge between legacy finance and the emerging tokenized financial ecosystem.**

Conclusion

Digital Financing on Kinexys thus stands as a leading example of DLT in mainstream finance: it operates under the radar of end-users but delivers tangible improvements in speed, efficiency, and flexibility, all while fitting into the current regulatory and market landscape. As the technology and legal frameworks continue to mature, one can expect intraday DLT repo to move from a niche pilot to a standard tool in liquidity management, contributing to safer and more efficient capital markets.[66,67]

63. Ibid.
64. Ibid.
65. Markets Media Group, "Broadridge, JP Morgan Accelerate Repo Settlement", May 2024.
66. Securities Finance Times, "Repo panel", January 2025.
67. Risk.net, "Real-time repo needed for non-stop trading – DRW's Wilson", May 2023.

Collateral Use Case #2: Broadridge Distributed Ledger Repo

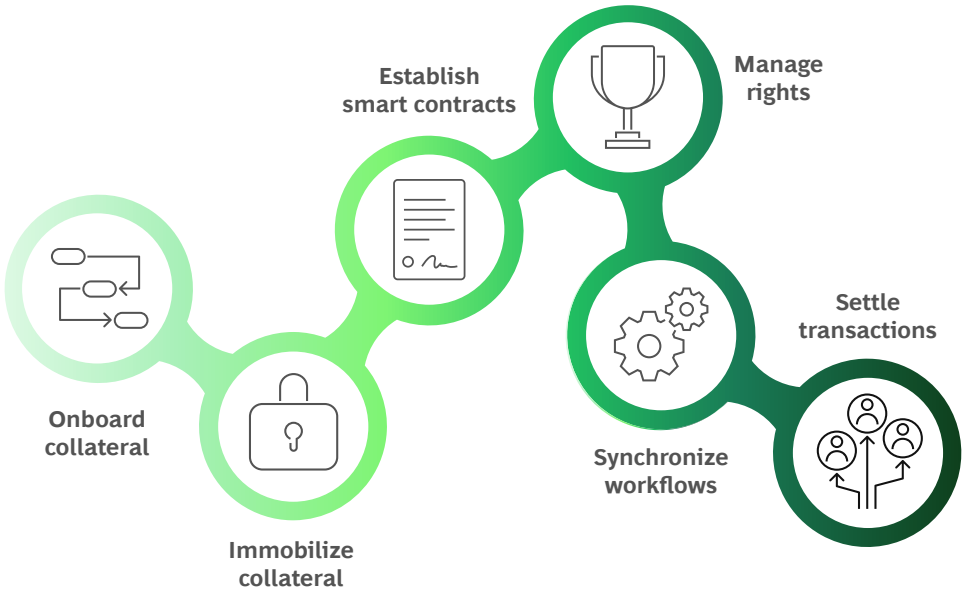
Overview of Use Case

Broadridge's **DLR** platform is a live application of blockchain in the repo market, designed to make repo transactions faster, safer, and more efficient. In essence, DLR provides a single **shared ledger** where market participants can **agree on trade terms, execute the repo contract, and settle both legs of the repo** transaction. This addresses longstanding pain points in the $10+ trillion global repo market – a market historically plagued by manual processes, fragmented records, and settlement failures.[68] For example, U.S. Treasury settlement fails averaged ~$40 billion *per day* over 12 months (as of April 2023), incurring millions in penalties. By creating one **"golden record"** of the trade lifecycle accessible to all parties, DLR eliminates asynchronous processes and reduces these costly fails. Major institutions have taken notice: **20 of the 24 primary dealer banks in the U.S.** are using Broadridge's DLR to process their repo trades.[69] Notable early adopters include UBS (which joined in 2021) and Société Générale (joined in 2022), among other leading global banks.[70] The platform is operated by Broadridge (a financial technology provider), but its stakeholders span the sell-side (broker-dealers/primary dealers) and increasingly the buy-side institutions that engage in repo financing.

When two parties agree to a repo trade (say, Party A needs cash and offers Treasury bonds as collateral to Party B), they can enter the trade details directly into the DLR system. The platform uses **smart contracts** to encode the repo agreement – including the collateral details, repo rate, term (overnight, intraday, or term), and repayment amount.[71] **Collateral is "on-boarded" and immobilized**: the underlying securities (e.g. Treasury bonds) are placed in a custody account or otherwise **locked** in the traditional infrastructure, and a **tokenized representation** of those securities is created on the ledger.[72] This token effectively confers ownership rights of the collateral. **Cash remains off-chain** in the current live implementation – the actual cash leg is still paid through conventional means (such as Fedwire or bank transfer).[73] However, the DLR platform coordinates the **simultaneous exchange** (DvP) by ensuring that the collateral token only transfers to the cash provider when the cash payment is confirmed, and vice versa for return leg. At the repo's maturity, the process is reversed: Party A repays the cash plus interest, and the tokenized collateral is returned to A (and eventually "un-immobilized" from the custody account back to A's direct control). Throughout the repo's life, both parties see a **synchronized, real-time view** of the trade's status and any lifecycle events (such as rate adjustments or early termination) are automatically managed by the smart contract.[74] This shared ledger approach obviates the need for each party to reconcile separate records, greatly reducing operational risk.

EXHIBIT DD.2

Workflow of Broadridge's DLT Repo Platform



Source: Digital Asset, "Customer Story: Broadridge", June 2024.

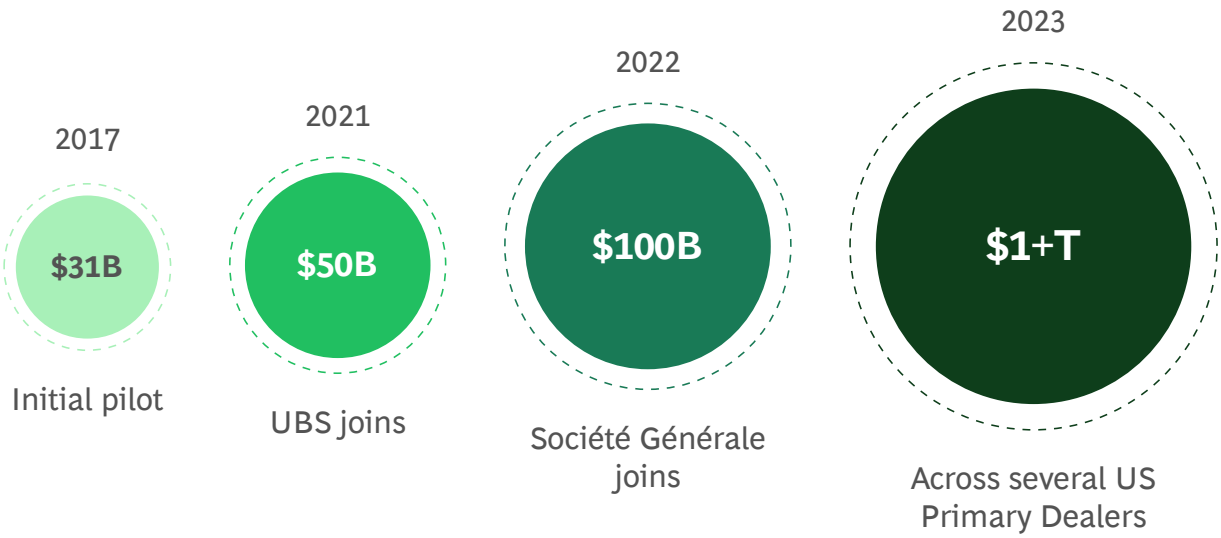
68. Digital Asset, "Customer Story: Broadridge", June 2024.
69. Ibid.
70. Ledger Insights, "SocGen joins Broadridge blockchain Repo platform", June 2022.
71. Ibid.
72. Ibid.
73. Ibid.
74. Digital Asset, "Customer Story: Broadridge", June 2024.

The **technology stack** underpinning DLR is built on **Digital Asset's Daml smart contract language and the Canton DLT platform**.[75] Canton is a privacy-centric, permissioned blockchain. It allows each bank to host a node that only shares relevant data with counterparties of a trade, while a central coordination ensures consistency. All **market rules and legal terms are embedded in the smart contracts**, meaning the platform can automatically enforce collateral eligibility, haircuts, margining, and other repo parameters without manual intervention.[76] According to Broadridge, the DLR smart contracts clearly define all **roles, rights, and obligations** of the counterparties, and every step is auditable. In other words, the system doesn't just track who owes what – it also embeds the repo's legal agreement into the code, ensuring that (for example) the repo buyer's right to liquidate collateral in event of default is preserved ("secured parties remain secured").[77] The platform was designed to integrate with **existing infrastructure** (it "couples DLT with existing operational account structure"), so it works in concert with custodian banks, tri-party agents, and payment systems rather than replacing them.[78] This eases deployment because banks can use DLR alongside their current repo processing frameworks.

Adoption and scale. Broadridge began piloting DLR in 2017 with a small group of banks (Société Générale and Natixis were involved in the first pilot).[79] After years of development, DLR **went live in June 2021** for bilateral repo transactions.[80] UBS was among the first to use the live platform in 2021, and by mid-2022 Société Générale and others had joined. Usage has grown **exponentially** as more participants onboarded. Just a year later (by August 2022), daily volumes had surged to **$35+ billion**.[81] By 2023, with **several U.S. primary dealers live, the platform was processing over $1 trillion of repo transactions per month** (roughly $50–60 billion per day on average).[82] As of late 2024, Broadridge reported monthly volumes around **$1.5 trillion**, reflecting continued growth and new use cases.[83]

EXHIBIT DD.3

Exponential growth in average daily volumes and market participation



Source: Digital Asset, "Customer Story: Broadridge", June 2024.

It's important to note that DLR's **user base spans regions and is expanding**. Initially, activity centered on U.S. **Treasury repos** (USD cash against U.S. government bonds), given Broadridge's strong U.S. client base and the USD repo market's size. But the platform is not limited by geography or collateral type – Broadridge deliberately built DLR to be **asset-agnostic and global** in reach.[84] Indeed, there have been cross-border repo transactions on DLR (e.g. in 2023 UBS and an Asian bank executed the first **cross-border intraday repo** via DLR, swapping USD cash and non-U.S. collateral within the same day).[85]

75. Ibid.
76. Ibid.
77. Ibid.
78. Securities Finance Times, "Distributed Ledger Technology: New designs for securities finance", Accessed 2025.
79. Ledger Insights, "SocGen joins Broadridge blockchain Repo platform", June 2022.
80. Ibid.
81. Ibid.
82. Securities Finance Times, "UBS executes first cross-border repo trade on Broadridge's DLR platform", April 2023.
83. Ledger Insights, "ICMA updates repo agreement for digital assets", August 2024.
84. Digital Asset, "Customer Story: Broadridge", June 2024.
85. Securities Finance Times, "UBS executes first cross-border repo trade on Broadridge's DLR platform", April 2023.

In 2024, a **tier-1 Canadian bank** became the first to use DLR for a high-quality liquid asset (HQLA) management use case, essentially extending the platform beyond traditional repo into straight **collateral mobility** (the bank can lock assets such as government bonds and transfer them between its entities or to other parties via the ledger).[86] Broadridge cites this as an example of DLR's flexibility – one client even used it for **outright sales of securities for cash**, not just repos. Moreover, Broadridge is encouraging **buy-side firms** (such as asset managers and hedge funds) to join the network, often via **sponsored repo** arrangements (where a dealer sponsors a client into a cleared repo).[87] The vision is a broad ecosystem of dealers, clients, and perhaps clearing agents interconnected on the ledger, which creates a network effect: the more participants on DLR, the more beneficial it is (since any two can directly transact and benefit from instant settlement).[88] Broadridge executives have described DLR as **"transforming repo market infrastructure"**, not only for bilateral deals but potentially to streamline intracompany (internal treasury) movements and other financing workflows.[89]

Key benefits realized: Early results indicate significant efficiency gains. By synchronizing the cash and securities movements, DLR achieves true **delivery-versus-payment** (albeit with cash via existing rails) and nearly **eliminates settlement fails**, which in turn saves participants money on avoidable penalty fees. Banks report that using DLR for intraday repos or other short-term funding has cut down their need to tap emergency funding late in the day (avoiding punitive rates of 100+ basis points for last-minute borrowing).[90] **Overdraft charges** from failed settlements – which could cost up to 300 bps in fees – are largely avoided thanks to DLR's settlement certainty.[91] Additionally, the ability to **reuse and mobilize collateral quickly** means firms don't have to hold as large a buffer of idle assets, thus reducing **over-collateralization** and improving balance sheet usage. Broadridge estimates clients see around a **25% reduction in clearing and settlement costs** when using the platform, due to these efficiencies. These are meaningful savings in the context of razor-thin repo lending spreads.[92] Beyond cost, there's a **risk reduction** element that's hard to quantify: with an automated, real-time ledger, the **operational risk** of manual errors or disputes is minimized, and **counterparty risk** is reduced by instantaneous settlement (no overnight credit exposure if doing intraday repos, for instance).[93] All of this contributes to a safer plumbing for the financial system – aligning with regulators' post-crisis goals for more resilient market infrastructure.

Settlement Asset

Settlement asset (cash and collateral): In the live DLR implementation, the **cash leg is settled in fiat currency via traditional payment systems**.[94] There is no native "cash token" on the platform (at least not yet in production).[95] Instead, when two parties execute a repo on DLR, they will pay and receive the cash through normal channels – typically bank wire transfers or central bank payment systems such as Fedwire for USD.[96] The platform records the obligation and can mark it as paid once confirmation is received, but the cash itself "remains off chain".[97] **On the collateral side**, DLR tokenizes the securities being used as collateral. Participants **immobilize the collateral** in a custodian or clearing system account – meaning the bonds or other securities are parked in a controlled account and cannot be transferred through conventional means during the repo's term.[98] Against that immobilized asset, a **digital token or digital record is created on the DLT** to represent the security. This token can then be instantly transferred between the repo counterparty addresses on the ledger, reflecting a change in beneficial ownership of the collateral. In practical terms, if Party A sells bonds to Party B for the repo, the **DLR token representing those bonds moves to Party B's side** at the repo's start (while the bonds stay in the custodian, earmarked for B).[99] When the repo is unwound, the token goes back to A (and A's right to withdraw those bonds is restored). Because of this design, **settlement finality** on DLR is achieved by the simultaneous updating of token ownership and the off-chain cash payment – a delivery-versus-payment where one leg is on-chain and the other off-chain, coordinated by the platform. The DLR smart contract will only execute the token transfer at the repo start once the cash payer has fulfilled their obligation (which may be verified by an outside system or a manual confirmation), ensuring that neither party is exposed.[100] Likewise, at repo maturity, the return of collateral is contingent on the repayment of cash and accrued interest. This conditional logic is automated. The result is that **legal ownership of the collateral is transferred at the same moment that cash changes hands**, meeting the definition of DvP settlement finality – even if the cash leg's finality technically occurs in Fedwire or TARGET2, etc., the platform links the two events.

86. Ledger Insights, "Broadridge expands DLT repo solution for HQLA workflow with Canadian Tier 1 bank", September 2024.
87. Ledger Insights, "Analysis: Broadridge demos intraday repo settled with tokenized cash via Fnality", April 2025.
88. Securities Finance Times, "UBS executes first cross-border repo trade on Broadridge's DLR platform", April 2023.
89. Securities Finance Times, "Distributed Ledger Technology: New designs for securities finance", Accessed 2025.
90. Digital Asset, "Customer Story: Broadridge", June 2024.
91. Ibid.
92. Digital Asset, "Broadridge Distributed Ledger Repo Case Study", April 2023.
93. Ibid.
94. Ibid.
95. Ibid.
96. Ledger Insights, "SocGen joins Broadridge blockchain Repo platform", June 2022.
97. Digital Asset, "Broadridge Distributed Ledger Repo Case Study", April 2023.
98. Ibid.
99. Ibid.
100. Ibid.

It is worth noting that Broadridge is actively working to bring the cash leg onto the platform in the future using regulated digital cash. In April 2025, Broadridge demonstrated an integration of DLR with **Fnality's** Payment System, which is a platform for tokenized central bank deposits.[101] In that demonstration, they showed an **intraday repo settled with a tokenized version of central bank money**, so that both the cash and collateral were exchanged on ledgers atomically.[102] This points toward a future state where DLR could use **DLT-based Payment Instruments** for instant settlement. For now, however, live trades use conventional cash settlement with the ledger providing a synchronized workflow around it.

Legal mechanisms and finality: From a legal perspective, a repo executed on DLR is still a **repo** – the fundamental legal nature of the transaction has not changed, even though the record-keeping is on a DLT. In a standard repo (under frameworks such as **GMRA** or equivalent), one party sells securities to another with a commitment to repurchase later; legally, title to the collateral actually transfers to the cash provider during the repo term. DLR preserves this concept: when the collateral token transfers on the ledger, it is intended to represent an actual **transfer of title/ownership** of the underlying security from the seller to the buyer.[103] To make this robust, all DLR participants enter into contractual agreements that recognize the DLR ledger records as the authoritative evidence of ownership and obligations. In other words, the participating banks sign an addendum or a rulebook for the platform stating that, for any repo transacted through DLR, the token movements carry the same legal effect as moving securities in, say, DTCC or Euroclear. If a dispute arises, the ledger's record should be admissible to confirm who owns what at any given time.

One key legal concern is **settlement finality and insolvency protection**. In traditional systems, once a transfer is final (e.g. securities delivered vs payment received), that transfer is irrevocable and protected even if a party defaults immediately after. DLR aims to give the same assurance. Technically, Canton (the DLT) provides immediate finality of transactions (no probabilistic confirmation or lengthy block times – once the nodes confirm the transaction, it is final). Legally, because the participants agree that a token transfer is equivalent to the ownership transfer of the underlying asset, the moment the ledger updates, the buyer of the collateral has a legally enforceable right to that collateral. If the seller were to go bankrupt immediately afterwards, the buyer's ownership claim to the collateral should be honored (the asset should not be pulled into the seller's estate, because of repo safe harbor provisions and the fact that title passed before bankruptcy). **Repo safe harbors** under U.S. law (which exempt repo transfers from bankruptcy stay and allow immediate liquidation) are intended to apply equally to DLR-facilitated repos, as long as the repo is documented under a valid master agreement. The DLR system also **ensures the secured party's interest is maintained** – for instance, if Party B holds the collateral token, Party A cannot somehow reuse or move the underlying collateral elsewhere until B is paid back. This was emphasized by Broadridge: "secured parties remain secured" throughout the trade.[104] That suggests the platform has mechanisms to prevent double-pledging or unauthorized transfers of collateral tokens, and that it manages substitutions or corporate actions on the collateral in a controlled way, so the lender's rights are never compromised by the digital format.

In summary, **DLR's legal structure** marries traditional repo law with new technology: participants use standard agreements (with new annexes/clauses as needed) to ensure a **token is equivalent to the asset it represents**, and that ledger movements are the equivalent of final transfers of ownership. Settlement finality is achieved through both the technology (Canton DLT's finality) and legal acknowledgment that once the ledger records receipt of the asset or cash, is it then that party's with no possibility of clawback. The platform itself does not introduce new legal entities or tokens of ambiguous status – it deals with **real-world assets (cash and bonds) in a digitally recorded manner**, which has helped it avoid legal uncertainty.

Interoperability and Network Architecture

Network type and architecture: Broadridge DLR is set up as a **private, permissioned distributed ledger network** – essentially a consortium-style blockchain rather than a public one. Only authorized participants (approved financial institutions and relevant service providers) can run nodes or access the network. Broadridge itself serves as the network operator and technology provider. The underlying ledger is built on the **Canton blockchain** developed by Digital Asset, which is tailored for institutional use.[105] Canton's architecture is unique in that it enables **interoperability among multiple applications and maintains privacy**: data is shared on a need-to-know basis between counterparties, and a central coordination service (often called the **"Global Synchronizer"** in Canton) ensures that all nodes agree on the set of transactions (thereby preventing double-spending or inconsistent states). This means, for example, Bank A's node and Bank B's node might record a repo between them, but other bank nodes won't see the details of that trade – they might only see

101. Broadridge, "Broadridge Collaborates with Fnality to Enable Real-Time Settlement for Intraday Repo Transactions", April 2025.
102. Ledger Insights, "Analysis: Broadridge demos intraday repo settled with tokenized cash via Fnality", April 2025.
103. Ledger Insights, "SocGen joins Broadridge blockchain Repo platform", June 2022.
104. Digital Asset, "Customer Story: Broadridge", June 2024.
105. Digital Asset, "Broadridge Distributed Ledger Repo Case Study", April 2023.

aggregate state if needed or nothing at all. Such a design is crucial in finance where confidentiality is important. Broadridge has leveraged this so that each participant essentially has their own ledger view of trades they are involved in, but the **smart contracts synchronize** across both parties' nodes.[106]

The **consensus mechanism** in a network such as DLR (using Canton) does not rely on mining or proof-of-work consensus. Instead, it likely uses a form of **Byzantine Fault Tolerant ("BFT") consensus or trusted nodes** to order transactions. In practical terms, since Broadridge is the operator, it may run certain validator or coordinator nodes that order the blocks of transactions. Each repo transaction is cryptographically signed by the parties and then confirmed by the network. Once confirmed, it's final – there is no concept of chain reorganization or probabilistic finality. This immediate finality is important for a settlement system (all parties want certainty once a trade is purportedly "done"). The **scalability** of DLR has been demonstrated by its volume growth – handling up to ~$1.5 trillion a month without issues implies the network can process a very large number of transactions and updates.[107] The **Canton/Daml combination** is known to be quite scalable because it does not broadcast all information to every participant; it is more akin to a series of bilateral (or small multilateral) ledgers that are synchronized. Broadridge mentioned that **privacy and data segregation are built-in** to the integration, and that the platform is **"scalable to handle increasing volumes"** and a wide array of repo types (intraday, overnight, term, etc.) across jurisdictions.[108] This suggests that adding more participants or more trades will not slow down the network linearly, since partitioning of data limits unnecessary processing for unrelated parties.

Interoperability with other systems: One of DLR's strengths is that it is integrative rather than isolated. On the legacy side, DLR connects with the real-world settlement infrastructure for securities and cash.[109] For instance, if a repo involves U.S. Treasuries, those Treasuries ultimately reside in the Fed's book-entry system (Fedwire Securities) or in a custody account at a bank. DLR must coordinate with those systems to **immobilize and release collateral**. Although details are not publicly spelled out, it is likely that at the start of a DLR repo, the selling party (or a triparty agent on their behalf) moves the securities into a designated custodian account (perhaps a segregated DLR omnibus account) – effectively flagging them as pledged. The DLR tokenization would be tied to that action. When the repo is over, DLR would signal to release the securities back to the seller's normal account. This requires integration via APIs or messages to the custodian or depository. The **workflow synchronization** mentioned by Broadridge indicates that DLR is connected to participants' internal systems too, so that when a repo settles on DLR, the participants' general ledger, treasury systems, and risk systems get updated (likely via real-time feeds). On the **cash side**, since payment is conventional, if the two parties settle via a Fedwire transfer, DLR might receive a message or be manually updated to indicate that the payment was received, triggering the collateral transfer. In some cases, if both participants have an account at the same custodial bank, that bank could coordinate the DvP (acting almost like an escrow agent who only executes delivery when funds are received). Therefore, **DLR sits as a layer above existing FMI**, orchestrating them. Broadridge has emphasized that DLR was designed to **work with existing depositories, payment rails and participants' underlying technology**.[110] This ensures that DLR's novel features (such as 24/7 capability or intraday settlement) still ultimately tie back to real-world settlement finality in central bank money and securities depositories.

On the **DLT interoperability** side, Broadridge is proactively connecting DLR with emerging digital networks. A prime example is the interoperability **with Fnality**: Fnality is essentially a consortium creating **distributed payment systems backed by central bank funds**. In April 2025, Broadridge and Fnality completed a **proof-of-concept linking DLR and Fnality's network**.[111] In the test, an intraday repo was settled using **tokenized funds in Fnality's network** (which are a digital representation of funds at a central bank) – meaning the DLR smart contract directly interfaced with the Fnality ledger to atomically exchange a securities token for a cash token.[112] Essentially, DLR treated the Fnality token as the settlement asset for the cash leg. The success of this demo suggests that once Fnality (or similar DLT0-based Payment Instruments) go live and are widely accessible, DLR could incorporate them for production trades. Another integration is with **J.P. Morgan's Kinexys Digital Payments** platform (formerly known as JPM Coin), which offers blockchain deposit accounts.[113] Blockchain deposit accounts represent deposit liabilities of J.P. Morgan for use by its clients on blockchain platforms; Broadridge's Horacio Barakat noted that DLR had already **integrated with Kinexys Digital Payments** as one of the digital cash options they explored.[114] That likely means if two parties to a repo both have JPMorgan accounts and use blockchain deposit accounts, DLR can trigger a blockchain-recorded payment on Kinexys in synchrony with the repo's collateral transfer. These efforts indicate that **DLR is moving toward full "atomic settlement"** – where both legs of a repo can occur on-chain, possibly across interconnected ledgers (one for cash, one for securities). DLR is taking a cautious, step-by-step approach: DLR first addressed the DLT for collateral and will then plug in digital cash when it becomes available.

106. Ibid.
107. Ledger Insights, "Broadridge Demos Intraday Repo Settled with Tokenized Cash via Fnality", April 2025.
108. Digital Asset, "Customer Story: Broadridge", June 2024.
109. Digital Asset, "Broadridge Distributed Ledger Repo Case Study", April, 2023.
110. Ibid.
111. Broadridge, "Broadridge Collaborates with Fnality to Enable Real-Time Settlement for Intraday Repo Transactions", April 2025.
112. Ibid.
113. Ledger Insights, "Analysis: Broadridge demos intraday repo settled with tokenized cash via Fnality", April 2025.
114. Ibid.

In summary, **network architecture** of DLR is a closed, high-performance ledger network using Canton/Daml, governed by Broadridge with bank participation. It prioritizes privacy and finality, scales to large volumes, and integrates with existing systems. **Interoperability** is a key strength, allowing DLR to serve as a nexus between the legacy world (custodians, payment systems) and emerging digital cash/blockchain services (Fnality, JPM Kinexys Digital Payments, etc.).[115] DLR aligns more with **traditional FMI in governance and compliance**, but introduces **digitally native capabilities** such as programmable, instantaneous settlement and tokenized assets that modernize the repo market's functionality.[116] This positions it as a catalyst for gradual industry transition to DLT, rather than a radical replacement of existing financial infrastructure.

Conclusion

Overall, Broadridge's DLR case exemplifies how **Distributed Ledger Technology can be deployed in a live, regulated market to solve real problems**. It has achieved a notable level of adoption (major global banks, trillions in volume) and is evolving alongside regulatory and market developments. By focusing on **integration and legal certainty**, it has thus far avoided the pitfalls that some crypto-related projects faced. If it continues on this trajectory, DLR or similar DLT platforms could become a **standard component of market infrastructure**, operating under the hood to settle trades instantly while market participants and regulators gain confidence from the improved efficiency and transparency.

Legal Considerations[117]

The repo market is a central pillar to the efficient working of many capital markets. The key function of the market in relation to Intra-day repos, is the provision of short-term funding in an efficient manner, thus allowing many other markets to operate more efficiently. The size and importance of this market can be seen by the fact that the 61 institutions that responded to **ICMA's** European Market survey in December 2024[118] had an aggregate total outstanding value of repo contracts of EUR 10,860 billion.

DLT-based Securities and DLT-based Payment Instruments (if used to enable settlement) are a key focus for the Intra-day repo market expanding because the potential speed of settlement makes it possible to have repo transactions with terms of only a few hours.

Intra-day Repos

For the purposes of this report, the discussion is limited to the **GMRA**,[119] which is the most recently published version of ICMA's master agreement non-U.S. repo transactions and the 1996 Master Repurchase Agreement (the **"MRA"**), which is the primary standardized form for U.S. repurchase transactions. Additionally, the discussion is limited to repurchase transactions where the Purchased Securities are DLT-based Securities, although similar considerations would arise if any Margin Securities were DLT-based Securities. Other digital assets are not considered, save as a point of contrast.

The GMRA anticipates that the Purchased Securities will be "securities or other financial instruments", and the MRA anticipates that the Purchased Securities will be "securities or other assets", each of which are broad definitions. Industry may find a consensus as to how DLT-based Securities will, in and of themselves, be capable of satisfying this definition in the various legal systems but if they do not meet the definition then this would be a contractual point that could be addressed in any future market documentation (and in the interim, resolved by the parties agreeing an appropriate amendment to the GMRA or MRA between them). There is no further consideration of any points which could likely be satisfactorily resolved by parties through a contractual solution.

There are, however, several areas that might benefit from additional clarification to aid parties with the legal bases for market practices adopted by the parties. These are considered in turn below.

115. Ledger Insights, "Analysis: Broadridge demos intraday repo settled with tokenized cash via Fnality", April 2025.
116. Ledger Insights, "ICMA updates repo agreement for digital assets", August 2024.
117. In this deep-dive, references to law and regulation are to US law and regulation, unless stated otherwise.
118. **https://www.icmagroup.org/assets/documents/Regulatory/Repo/Surveys/ICMA-European-Repo-Market-Survey-Number-48-Conducted-December-2024-Published-April-2025-090425.pdf?utm_source=ICMA+Total+Subscribes&utm_campaign=ecad6edbed-EMAIL_CAMPAIGN_2025_APR_EUR+REPO+SURVEY+PR&utm_medium=email&utm_term=0_-74d917e8a6-257670038**.
119. **https://www.icmagroup.org/assets/documents/Legal/GMRA-2011/GMRA-2011/GMRA%202011_2011.04.20_formular.pdf**.

1. **Financial Collateral Arrangements.** The treatment for repurchase transactions conducted under a GMRA is dependent on receiving positive netting or set-off opinions. In some non-U.S. jurisdictions (for example the EU), the positive analysis is dependent on the arrangement qualifying as a title transfer financial collateral arrangement under the relevant implementation of the financial collateral arrangement directive (the **"FCA Directive"**).[120] In this regard, particular focus will be given to whether specific DLT-based Securities qualify as financial collateral (i.e. financial instruments, cash or credit claims). Of these, it is financial instruments (as defined in the FCA Directive) that are most likely to be relevant. The definition from the FCA Directive is copied below, although it is worth noting that different jurisdictions may have implemented the FCA Directive differently.

   "Financial instruments" means shares in companies and other securities equivalent to shares in companies and bonds and other forms of debt instruments if these are negotiable on the capital market, and any other securities which are normally dealt in and which give the right to acquire any such shares, bonds or other securities by subscription, purchase or exchange or which give rise to a cash settlement (excluding instruments of payment), including units in collective investment undertakings, money market instruments and claims relating to or rights in or in respect of any of the foregoing.

   This definition was not drafted with DLT-based Securities in mind. Further development of legal principles as to how DLT-based Securities fall within this definition, *i.e.*, whether a given digital security is "negotiable on the capital market" in its own right and/or otherwise qualifies as a financial instrument, for example by virtue of conferring a right to acquire such shares, bonds or other securities by an exchange, can help parties by providing a legal foundation with stability, clarity and predictability for transactions.

   In the United States, parties also seek positive netting opinions in connection with repo transactions. Positive netting opinions depend on whether the contract meets certain specified standards for the safe harbor exemptions from the automatic stay that otherwise applies under insolvency laws. Accordingly, it may be beneficial for U.S. repo transactions if these standards were clarified to confirm that they are inclusive of DLT-based Securities, given that DLT-based Securities did not exist at the time of drafting.

   Without further development on these points, growth in the market might be expected to occur more slowly while a market consensus develops.

2. **Property Rights and conflicts of laws.** For transactions under the GMRA, the economics of repurchase transactions are derived from the analysis that the Purchase Securities are property that has been transferred outright to the Buyer on the Purchase Date. In the MRA, the parties both express an intent that the transactions under the MRA are sales and purchases and not loans and also provide for a backstop provision that grants the buyer a security interest in the Purchased Securities. Further development of relevant legal principles related to the creation and perfection of a security interest in DLT-based Securities and DLT-based Payment Instruments and conflicts of laws analysis for DLT[121] could aid parties with the legal bases for repo transactions and associated rights.

   Unresolved legal questions can lead to an additional level of uncertainty that is likely to slow or fragment any market development in relation to DLT-based Securities. Various initiatives are seeking to resolve these points currently and provide the legal foundation for parties to rely on (for example, the UNIDROIT Digital Assets and Private Law Working Group[122] and the American Law Institute and the Uniform Law Commission,[123] the two sponsors of the UCC, in the United States). Therefore, this issue is not considered further here other than to note that the repo market is an international market and would therefore benefit significantly from a consistent approach across all relevant jurisdictions.

3. **Agency relationships.** Many participants in the repo market enter into transactions through an entity acting as an agent to Custody and help with the management of the collateral. For repo transactions that use DLT-based Securities and DLT-based Payment Instruments as collateral, this may lead to additional questions related to how DLT-based Securities and DLT-based Payment Instruments should be held for such market participants (either on a segregated or omnibus basis) to ensure legal certainty in the event of close-out. As legal precedents and market practices in this area continue to develop, clarity on the permissibility of such activities from regulators and supervisors could encourage more agents that are regulated institutions to act in these capacities.

120. Directive 2002/47/EC of the European Parliament and of the Council of 6 June 2002 on financial collateral arrangements, as amended.
121. The decentralised nature of DLT means that the traditional conflicts of laws analysis might not be applicable.
122. **https://www.unidroit.org/work-in-progress/digital-assets-and-private-law/#1622753957479-e442fd67-036d.**
123. **https://www.uniformlaws.org/committees/community-home?communitykey=1457c422-ddb7-40b0-8c76-39a1991651ac.**

4. **Regulatory capital treatment.** In November 2024, the BCBS revised the prudential standard on banks' cryptoasset exposures.[124] Recognition by the BCBS that repos that use DLT-based Securities and DLT-based Payment Instruments based on permissionless ledgers as collateral should not be automatically excluded from the definition of Group 1 assets subject to certain considerations would further the BCBS' goals of being technology neutral, and enacting rules that are in line with its "same activity, same risk, same regulatory outcome" guidelines. In relation to SCO60 generally, please refer to the Executive Summary.

5. **Regulatory classification and tax treatment.** Further development of principles in these areas would help ensure that market participants will be comfortable that the treatment of repurchase transactions in respect of DLT-based Securities and DLT-based Payment Instruments reflects that of repurchase transactions in respect of traditional securities and traditional cash.

Variation Margin

Where the OTC derivatives are uncleared and the parties are in scope of applicable uncleared margin rules, the parties will be required to post VM. As can be seen, the efficient posting and collection of VM is of critical importance to the reduction of credit risk in the market, just as OTC derivatives are a critical tool for the controlling of market risk.

The EU's EMIR,[125] and the corresponding legislation in the UK as amended following Brexit (**"UK EMIR"**) not only regulate how much VM must be exchanged (and when) but also what assets can be posted as collateral ("Eligible Collateral"). Similar restrictions are found in other sets of uncleared margin rules. The purpose of these legal requirements is to ensure that parties to OTC derivatives contracts mitigate their trading risks such that counterparty credit and operational risk are reduced when trading in OTC derivatives that are not cleared by a CCP.

For the purposes of this report, this discussion is confined to VM posted under the terms of a 2016 Credit Support Annex for VM governed by English law (the **"VM CSA"**) and a 2016 Credit Support Annex for VM governed by New York law (the **"NY VM CSA"**) and assuming the VM consists of DLT-based Securities. Other Digital Assets are not considered, save as a point of contrast.

As for intra-day repos above, the following discussion does not include consideration of points which could be satisfactorily resolved by parties through a contractual solution, for example, by defining the "Eligible Credit Support (VM)" in a way that includes the relevant Digital Assets. ISDA has published Tokenized Collateral Model Provisions[126] to address these contractual aspects for variation margin. There are several areas in the existing legal framework which might benefit from additional clarification. These are considered in turn below and cross-reference to the repo transaction considerations above where the points are of a similar nature.

1. **Financial Collateral Arrangements.** The treatment for collateral posted under a VM CSA or NY VM CSA is dependent on receiving positive netting opinions. In some EU member state jurisdictions, the positive analysis is dependent on arrangement qualifying as a title transfer financial collateral arrangement under the relevant implementation of the FCA Directive, as noted above in relation to repo transactions, and similar considerations apply in relation to the posting of VM. In the United States, similar to the analysis noted above, a positive opinion depends on whether the contract meets certain specified standards for the safe harbor exemptions under insolvency laws.

2. **Property Rights and conflicts of laws.** The economics of VM posted by way of title transfer (an approach commonly used for VM outside the United States) are derived from the analysis that the VM is property that has been transferred outright to the collateral receiver on the date of transfer. In the United States, a security interest in the collateral is typically granted. Further development of legal principles related to the creation, perfection and enforcement of security interests in DLT-based collateral could aid parties with the legal bases for their transactions and associated rights. As noted above in relation to repo transactions, the novelty and decentralised nature of DLT gives rise to several issues and similar considerations apply in relation to the posting of VM.

3. **Uncleared Margin Rules.** As stated above, UK EMIR and EU EMIR, amongst other sets of uncleared margin rules (including U.S. rules and regulations), regulate how much VM must be exchanged, when this VM must be exchanged, and what assets constitute Eligible Collateral.

124. **https://www.bis.org/basel_framework/chapter/SCO/60.htm?inforce=20260101&published=20241127.**
125. Regulation (EU) No 648/2012 of the European Parliament and of the council of 4 July 2012 on OTC derivatives, central counterparties and trade repositories, as amended.
126. See, ISDA, Tokenized Collateral Model Provisions for Inclusion in ISDA 2016 Credit Support Annexes for Variation Margin (VM), *available at* **https://www.isda.org/book/tokenized-collateral-model-provisions-for-vm-csa/#:~:text=Variation%20Margin%20(VM)-,Tokenized%20collateral%20model%20provisions%20for%20inclusion%20in%20ISDA%202016%20Credit,ledger%20technology%20(Tokenized%20Collateral)%20as.**

The definitions related to Eligible Collateral were not drafted with DLT-based Securities in mind. Further development of legal principles in this area might include considering whether the definitions across the different uncleared margin rules would benefit from clarification, rather than necessitate firms take a view on whether any individual Digital Security is within the scope of the applicable uncleared margin rule sets.

Development in the market might be expected to occur more slowly while a market consensus develops in relation to any problematic rule sets or Digital Securities.

Regulatory harmonization regarding discrepancies between the US and EMIR uncleared margin rules eligible collateral, such as money market funds, needs to be resolved before cross-border implementation of tokenized money market funds for uncleared margin derivatives' collateral purposes.

4. **Regulatory capital treatment.** As noted above in relation to repo transactions, the BCBS's prudential standard on banks' cryptoasset exposures could act as an impediment to market development, for example due to punitive treatment of permissionless ledgers.

Hong Kong

Since documentation of repurchase transactions in Hong Kong largely adopt the GMRA and are commonly governed by English law, the U.K./E.U. analysis on the regulatory landscape and points above are generally applicable to Hong Kong.

The key differences under Hong Kong law are highlighted below:

1. Currently there is no Hong Kong equivalent of the FCA Directive. Accordingly, in Hong Kong, it is typically necessary to satisfy 'true sale' transfers and positive close-out netting analysis.

2. Regarding VM requirements, financial institutions are subject to the HKMA Supervisory Policy Manual CR-G-14 on Non-centrally Cleared OTC Derivatives Transactions – Margin and Other Risk Mitigation Standards (**"CR-G-14"**), which sets out the minimum standards that the HKMA expects authorized institutions, such as banks, to adopt in relation to margin and other risk mitigation techniques for non-centrally cleared OTC derivatives transactions.[127] Schedule 10 of the Securities and Futures Commission of Hong Kong's (**"SFC's"**) Code of Conduct for Persons Licensed by or Registered with the SFA also elaborates on the risk mitigation requirements and margin requirements in relation to non-centrally cleared OTC derivative transactions.[128]

   Separately, with respect to collateralized transactions by way of security, uncertainty remains over what type of security can be granted and enforced (and how to grant and enforce such security) over digitized securities, for example, whether it is possible to create/register a fixed or floating charge over certain types of digitized security which affects priority and enforceability of such charges. Further, there could also be uncertainties over legal recognition of security document if they are "digitized" (e.g., in the form of smart contract or executed through electronic signatures). For example, where the security is required to be registered with the Companies Registry of Hong Kong, such registration procedures include the delivery of the certified copy of the security instrument. This would create difficulties where there may not be such an instrument in the context of digitized securities, and the current definition of a "certified copy" in the Companies Ordinance is unclear as to how an instrument created/stored on the DLT may be certified as a true copy.

Singapore

Much of the discussion covered above under the U.K. and E.U. legal and regulatory analysis are jurisdictionally agnostic. However, there are certain differences. Singapore does not have an equivalent of the FCA Directive. Accordingly, in Singapore, it would typically be required to satisfy 'true sale' transfers and positive close-out netting analysis.

In relation to uncleared margin rules, MAS has issued the Guidelines on Margin Requirements for Non-Centrally Cleared OTC Derivatives Contracts. Paragraph 7.1 of the Guidelines provides a list of eligible collateral to meet IM and VM requirements. As for the U.K./E.U., the list of Eligible Collateral was not drafted with DLT-based Securities in mind, and it might be helpful to consider whether the list would benefit from clarification in this regard.

127. **https://www.hkma.gov.hk/media/eng/doc/key-functions/banking-stability/supervisory-policy-manual/CR-G-14.pdf.**
128. **https://www.sfc.hk/-/media/EN/assets/components/codes/files-current/web/codes/code-of-conduct-for-persons-licensed-by-or-registered-with-the-securities-and-futures-commission/Code_of_conduct_05082022_Eng.pdf?rev=0fd396c657bc46feb94f3367d7f97a05.**

Japan

Intra-Day Repos

In Japan, the Financial Instruments and Exchange Act **("FIEA")** was amended in 2019 to regulate transactions of tokens representing securities in an attempt to facilitate capital formation in this manner while protecting investors. The amendment came into force in May 2020. As such, a regulatory framework for transactions in respect of DLT-based Securities has already been implemented in Japan (this framework is examined in further detail in **Chapter 4** below). Under this framework, tokens representing (i) a conventional class of financial assets listed as Type I Securities under the FIEA (such as shares and bonds) or (ii) an interest in a collective investment scheme, would be deemed to be "securities". In the case of Intra-Day Repos of traditional "securities", such Intra-Day Repos are subject to the regulations under the FIEA for the sale and purchase of "securities". Accordingly, Intra-Day Repos of tokens representing such "securities" would also be subject to the regulations under the FIEA for the sale and purchase of such "securities". In terms of financial collateral arrangements, the netting of tokens representing "securities" is not distinguished from the netting of "securities" themselves. Therefore, there does not seem to be specific discussion on the netting of tokens representing such "securities". On the other points, the analysis discussed in the U.K./E.U. legal and regulatory analysis above would generally be applicable to Japan.

Variation Margin

With regards to financial collateral arrangements, there has not been discussion to carve out tokens representing "securities" from applicable financial collateral in Japan. In terms of property rights and conflicts of laws, the analysis discussed in section 4.2.4 would generally be applicable to Japan. In terms of uncleared margin rules, requirements for securities to be qualified as VM (**"Qualified Securities"**) are stipulated in a public notification issued by the Japanese Financial Services Agency. However, the current public notification has not been drafted with DLT-based Securities in mind, therefore it would be expected to specify whether tokens representing Qualified Securities are also qualified as VM. In addition, regarding regulatory capital treatment, the current capital adequacy regulation is not made with DLT-based Securities in mind either and it would need to be seen how tokens provided as VM may be treated in the future.

DEEP DIVE #2: FIXED INCOME ISSUANCE

DLT and tokenization are emerging as transformative mechanisms within fixed income issuance, one of the cornerstones of global capital markets. Traditionally, bond issuance involves multiple intermediaries and sequential, manual processes, resulting in delayed settlement cycles and operational inefficiencies. Settlement periods of two days or longer tie up capital, elevate counterparty risk, and necessitate extensive reconciliation efforts among issuers, underwriters, custodians, and investors. Cross-border issuance further exacerbates these challenges, creating fragmented liquidity pools, operational complexities, and limited transparency.

Role, Objectives, and Key Stakeholders

Strategic Objective: The core goal of applying DLT and tokenization to fixed income issuance is to enhance market efficiency, reduce settlement risk, and streamline operational processes. By digitizing bonds on shared, immutable ledgers, stakeholders seek to accelerate settlement cycles, improve liquidity management, and deliver greater transparency and operational certainty.

Operational Objective: Tokenization of bonds enables atomic DvP, ensuring simultaneous, instant exchange of securities and payment tokens on-chain. This model minimizes settlement and counterparty default risk, reduces operational overhead through automation, and provides continuous, real-time market access and transaction transparency.

Key Stakeholders: The ecosystem for tokenized fixed income issuance involves diverse participants, including sell-side investment banks and broker-dealers that structure and underwrite bonds; issuers such as sovereign governments, supranational institutions, and corporations seeking cost-effective and rapid access to capital; buy-side investors such as asset managers, pension funds, and insurers requiring liquidity and transparency; central securities depositories and custodians managing the safekeeping and authoritative records of digital assets; market infrastructure operators launching and managing digital trading venues; and regulators and central banks actively involved in fostering secure, compliant, and stable markets. Collectively, advancements in tokenization have broad implications, promising substantial improvements in the efficiency, resilience, and accessibility of fixed income markets.

Market Overview and Tokenization Milestones (as of 2024)

The global fixed income market is **enormous in scale**, dwarfing equity markets. As of the end of 2023, **global fixed income securities outstanding exceeded $140 trillion**, and annual bond issuance consistently measures in the tens of trillions (about $27 trillion in new long-term bonds issued in 2024 alone)[129]. By contrast, the portion of this market that has been **tokenized** remains **minuscule but rapidly growing**. Only within the last few years have we seen the first live digital bond issuances. In 2018, the World Bank's pioneering *"Bond-i"* (a ~$110 million blockchain bond) was an early proof of concept.[130] Since then, adoption has accelerated: **in 2022 there were just 9 new "blockchain bonds" issued, rising to 16 in 2023, and by mid-2024 the count was 14 issuances worth ~$1.2 billion** (already outpacing the previous year). An industry survey in 2024 found a notable shift in sentiment, with **38% of market participants indicating they are considering DLT for debt issuance**, up from 29% a year prior.[131]

Several **key milestones and live pilots** mark this evolution. **Supranational issuers and sovereigns** have led many early tokenization deals under highly regulated conditions. The **European Investment Bank (EIB)** issued a €100 million **two-year digital bond on a public blockchain in April 2021**, settling in cooperation with Banque de France (which provided a tokenized central bank euro for on-chain DvP).[132] This was among the first fully regulated institutional bonds recorded on Ethereum. The EIB followed up with multiple digital bonds, including a £50 million pound-sterling tokenized bond in 2023 and a €100 million 5-year bond in late 2024.[133] Each of these served as a **real-world test of DLT in primary issuance** – for example, EIB's early trials demonstrated same-day or next-day settlement, automated coupon payments. On the sovereign side, **Hong Kong's government made headlines in February 2023 with the world's first tokenized green bond issued by a government.** This HK$800 million (~USD 100 million) 1-year green bond was issued under Hong Kong law and **settled T+1 with atomic DvP on a private blockchain network** (using GS DAP, Goldman Sachs' tokenization platform). The HKMA acted as both issuer's agent and operator of the bond's clearing system, ensuring that on-chain records were **legally recognized as the definitive record of ownership**

129. SIFMA, Capital Markets Factbook, Accessed 2025.
130. World Bank, "World Bank Prices First Global Blockchain Bond, Raising A$110 Million", August 2018.
131. OMFIF, Digital Assets 2024, Accessed 2025.
132. EIB, "EIB Issues it's First Ever Digital Bond on a Public Blockchain", April 2021.
133. European Investment Bank, "EIB Issues its first ever Digital Bond in Pound Sterling", January 2023.

– a crucial legal innovation.[134] This was followed in February 2024 with the issuance by **Hong Kong's government** of approximately HK$6 billion worth of "digitally native" green bonds denominated in HK dollars (HKD2 billion tranche), Renminbi (RMB 1.5 billion tranche), US dollars (USD 200 million tranche) and euro (EUR80 million tranche) under the Government Green Bond Programme. This used a private blockchain network (HSBC's Orion platform as part of the HKMA's Central Money Markets Unit (CMU)), and the bonds were constituted on-chain without first being issued in a traditional central securities depositary, and with direct participants in the platform holding legal (rather than beneficial) title and with their on-chain records again **legally recognized as the definitive record of ownership**. The bonds were also listed on the Hong Kong Stock Exchange.[135] This was followed in September 2024 with HSBC issuing a HKD 1 billion English-law governed digital bond using its Orion platform in Hong Kong, and further issuances, including in December 2024 by Zhuhai Huafa Group, an issuer incorporated in Greater China, in a 3-year 1.4 billion RMB-denominated digital bond offering, demonstrating the capacity of the Hong Kong regime to accommodate private issuers, incorporated in various jurisdictions, and digital bonds governed by the laws of various jurisdictions. In Europe, **Germany's Finance Agency and KfW** (a German public development bank) have also tested blockchain-based bonds under the country's eWpG electronic securities law. In August 2024, KfW issued a €50 million 3-month digital note which was **settled one day after pricing (T+1) using the Bundesbank's "trigger" bridge to central bank money**, demonstrating successful **DLT-based DvP in euros with automated exchange of tokens.** These milestones, alongside numerous private-sector trials, underscore that tokenization of bonds has moved beyond theory into practice.[136]

Importantly, the aggregate volume remains very small relative to the overall market – a recent industry report shows that **DLT-based fixed income issuance reached roughly €3 billion in 2024**, which is a **260% increase from ~€848 million in 2023** but still a tiny fraction of global bond issuance.[137] This growth in 2024 was boosted by special initiatives (the European Central Bank's market trials contributed about €1 billion, and an Swiss National Bank (SNB)-led trial about €0.8 billion, together accounting for 60% of the total).[138] Even excluding those central bank-led transactions, **the tokenized bond issuance volume roughly doubled year-on-year**, signaling broader momentum. Many of **these digital bonds have been issued in jurisdictions with supportive legal frameworks** – notably Europe (under EU or English law), and Asia (Singapore and Hong Kong), often by highly rated issuers. Platforms such as **SIX Digital Exchange (SDX) in Switzerland and HSBC's Orion platform** have facilitated a large share of the 2024 issuances.[139] Meanwhile, the E.U. **Pilot Regime (effective March 2023)** created a regulatory sandbox for market infrastructures to handle tokenized securities. Under this regime, licensed exchanges and CSDs can obtain temporary exemptions to issue, trade, and settle **DLT-based financial instruments** within a controlled environment. This has spurred a wave of **DLT market infrastructure projects in Europe**, with 2024 seeing the first regulated platforms for digital bond trading and custody go live. In summary, as of 2024, tokenization in fixed income has advanced from isolated prototypes to **live transactions in multiple major jurisdictions**, but the scale remains **pilot-level** (billions, not trillions) and these projects are still carefully overseen by authorities.

Objectives and Inefficiencies in Today's Fixed Income Issuance

Fixed income markets, crucial to global finance, are hampered by inefficient issuance and settlement processes involving multiple intermediaries. Traditional settlements, often taking T+2 days or more, expose counterparties to prolonged credit and settlement risks. For instance, a conventional European Investment Bank (EIB) bond might require up to five days to settle, whereas a blockchain-based digital bonds may achieve settlement in a single day. Additionally, each participant maintains separate ledger records, leading to manual reconciliations that are prone to errors and delays. Cross-border issuances further intensify these issues due to fragmented infrastructures and reliance on correspondent banking, limiting transparency and causing liquidity fragmentation.

How DLT Is Alleviating Pain Points: Use Cases and Outcomes

Early DLT applications in bond issuance demonstrate tangible improvements in settlement speed, efficiency, and transparency. Notably, the European Investment Bank's 2021 blockchain-based bond reduced settlement from five days to one, substantially lowering counterparty risk and enabling atomic DvP.[140] Hong Kong's tokenized green bond also demonstrated integrated digital lifecycle management, including instant settlement and automated coupon payments on-chain, significantly reducing operational complexity and reconciliation efforts.[141]

134. Hong Kong Monetary Authority, HKSAR Government Inaugural Tokenized Green Bond Offering, February 2023.
135. HKMA, HKSAR Government's Digital Green Bonds Offering, Feb 2024.
136. ICMA, Tracker of New Fintech Applications in Bond Markets, August 2024.
137. AFME, DLT-Based Capital Market Report – Size and Growth of the Global DLT Wholesale Market, February 2025.
138. Ibid.
139. Ibid.
140. EIB, "EIB Issues it's First Ever Digital Bond on a Public Blockchain", April 2021.
141. HKMA, HKSAR Government's Digital Green Bonds Offering, Feb 2024.

Tokenization has reduced issuance costs by digitizing record-keeping and bypassing certain intermediary fees. Platforms such as BNP Paribas' "NeoBonds" allow all stakeholders—including regulators—to track ownership and transaction histories in real-time, greatly simplifying compliance checks.[142] Experimental projects, such as the BIS Innovation Hub's Project Genesis, even linked tokenized bonds with real-time IoT environmental data, showcasing how programmability enriches bond transparency.

Market liquidity and accessibility may also benefit from DLT, as continuous trading on digital platforms could enhance global liquidity pools and investor participation. Early pilots indicate potential for fractional and smaller-denomination bond issuances, potentially broadening investor access, though institutional investors still dominate. Market participants remain cautiously optimistic, expecting substantial adoption within a few years, but emphasize the importance of flexible settlement cycles (T+1 or T+2) to balance operational practicality and liquidity management.[143]

Benefits Realized vs. Ongoing Limitations

DLT and tokenization in fixed income issuance offer significant advantages, notably faster settlements, reduced counterparty risk, lower operational costs, enhanced transparency, and potentially broader market access. Real-world pilots demonstrate tangible benefits such as near-instant settlement (minutes instead of days), automated processes reducing errors, and projected operational cost saving 40-60%.[144] Regulators appreciate improved real-time oversight, which could reduce systemic risk and simplify compliance. Flexibility in settlement cycles (e.g., T+0 or T+2) could further enhance market efficiency.[145]

However, challenges remain substantial. DLT's scalability for high-volume markets is largely untested. Legal and regulatory frameworks vary significantly across jurisdictions, creating uncertainty about enforceability and finality of tokenized securities. Interoperability issues persist, given numerous proprietary platforms lacking common standards, potentially further fragmenting liquidity.[146] Additionally, the limited availability of safe digital settlement assets such as wholesale tokenized central bank money complicates full-scale adoption. Concerns around governance, cybersecurity risks, smart contract vulnerabilities, and integration into existing financial infrastructures further impede rapid deployment.[147]

In conclusion, while early DLT deployments confirm significant potential to streamline bond markets, substantial adoption depends on overcoming regulatory, operational, and technological barriers. Stakeholders remain cautiously optimistic, actively collaborating on standards, legal clarity, and interoperability frameworks. Tokenization represents a realistic vision for more efficient and transparent fixed income markets, but realizing this vision requires prudent evolution of regulatory and market structures alongside technological innovation and adoption of industry-wide data standards.[148]

142. BNP Paribas, "Digital Bonds Using Blockchain vs. Traditional Bonds", December 2024.
143. Digital assets 2024 - OMFIF.
144. BCG, Ripple, Approaching the Tokenization Tipping Point, April 2025.
145. FSB, "The Financial Stability Implications of Tokenization", October 2024.
146. BNP Paribas, "Digital Bonds Using Blockchain vs. Traditional Bonds", December 2024.
147. FSB, "The Financial Stability Implications of Tokenization", October 2024.
148. ICMA, Tracker of New Fintech Applications in Bond Markets, August 2024.

Fixed Income Use Case #1: SIX Digital Exchange (SIX) and UBS AG Digital Bond Use Case

Overview of Use Case

The **SIX Digital Exchange (SDX)** is a Swiss-based, fully regulated capital market infrastructure for digital assets. Launched in late 2021, SDX received FINMA licenses to operate both a stock exchange and a CSD for blockchain-based securities.[149] It provides an integrated platform for the **issuance, listing, trading, settlement, and custody** of digital securities under Swiss regulatory oversight.[150] The **UBS AG digital bond** issued on SDX is a flagship example of this new infrastructure in action, representing one of the first large-scale implementations of DLT in a traditional bond market context.

UBS's digital bond (2022): On November 3, 2022, UBS AG issued a CHF 375 million three-year senior unsecured bond with a 2.33% coupon, natively on the SDX DLT platform.[151] This bond was **100% digital** (no paper or physical global certificate) and was recorded on SDX's distributed ledger, **yet it was dual-listed** on both SDX's digital exchange and the conventional SIX Swiss Exchange. Notably, it carried a single ISIN for both venues – a **"single-ISIN" structure** – so that the digital bond did *not* require a parallel traditional issuance ("twin bond"). This was a world-first: UBS's bond was the first ever **publicly traded, regulated digital bond by a global banking institution** that investors could access through either DLT-based infrastructure or traditional market channels.[152] In legal and economic terms, the instrument was **equivalent to a conventional UBS senior note** – same rank, same payment obligations, same credit rating – but with issuance and settlement taking place on a blockchain-based system.[153]

Participating firms and roles: In this use case, **UBS AG** was the issuer of the bond (raising funding as it would with any bond issuance). **SIX Digital Exchange** operated the DLT platform on which the bond was issued, and **SIX Swiss Exchange** provided the traditional trading venue for dual-listing.[154] Post-trade services were provided via **SDX CSD** (the digital ledger-based CSD run by SIX) and **SIX SIS** (the national CSD for Switzerland), which are linked. UBS's bond was arranged to be accessible to a broad investor base: even those without any blockchain infrastructure could buy it through their banks on the regular exchange, while tech-savvy institutions could opt to settle on SDX directly. This was made possible by a critical integration between the new and old infrastructure, as described below.

How the bond issuance and settlement works: The UBS digital bond was created on the SDX ledger as a native digital asset, represented by tokenized securities entries in SDX's **main register** (the authoritative record in the CSD).[155] During the **issuance process**, UBS and its syndicate banks carried out familiar steps such as drafting a term sheet, collecting investor orders, and allocating bonds – largely using traditional workflows off-chain (e.g. using order books and communication via banks).[156] Once allocations were final, the issuance was settled on SDX: investors' custodians received the bond tokens in their SDX CSD account against payment of the issue price. On SDX, **settlement is atomic and instant** – meaning the cash leg and the bond tokens change ownership simultaneously on the ledger, with no lag.[157] The SDX CSD, running on DLT, updates ownership in real-time, so **settlement is effectively T+0 (immediate)** instead of the typical T+2 cycle.[158]

Operational model and participant roles: The SDX model preserved the **role of banks as intermediaries**. In the primary market, banks in the syndicate gathered orders from their clients and interacted with UBS to place the bond – this remained a manual or off-chain process involving the same participant roles as a traditional bond issuance.[159] In the secondary market, trading could occur either on SDX's own digital exchange order book or on the SIX Swiss Exchange (the UBS bond was listed on both). Regardless of trading venue, the **custody and settlement** could happen on either the SDX CSD or via SIX SIS. If two SDX members traded the bond on the SDX platform, they would exchange the security for digital cash tokens on-chain within seconds. If two investors traded through the traditional exchange and wanted to settle in the conventional way, that trade would clear through the usual channels and settle in SIX SIS (with the bond ultimately moving

149. SIX, "SIX Digital Exchange Gets Regulatory Approval from FINMA", September 2021.
150. SIX, "SIX Digital Exchange Established Operational Link to SIX SIS", October 2022.
151. UBS, "UBS AG launches the world's first digital bond that is publicly traded and settled on both blockchain-based and traditional exchanges", November 2022.
152. Ibid.
153. Ibid.
154. Ibid.
155. Ibid.
156. Ibid.
157. UBS, "UBS AG launches the world's first digital bond that is publicly traded and settled on both blockchain-based and traditional exchanges", November 2022.
158. SUERF, "Towards Tokenized Bond Markets? Lessons from Switzerland", December 2024.
159. Ibid.

from a SDX account to a SIS account via the link). Importantly, an investor without any DLT access was not at a disadvantage – they could trade the bond on SIX like any other Swiss bond, and their bank's SIX SIS account would be credited at settlement. Meanwhile, SDX's ledger would simply show that the SIX SIS omnibus account now holds those tokens on behalf of that investor.[160] This design meant the **digital and traditional systems work in tandem**.

Single-ISIN and market reach: By using a single ISIN and connecting the infrastructures, UBS and SDX achieved a unified market for the bond. There was **no fragmentation of liquidity** into separate instruments – the digital bond was the same bond in both venues. This greatly expanded the potential investor base, as noted by SDX: the single-ISIN solution "leads to the greatest possible market reach for native digital bond issuances".[161] In practice, any qualified investor worldwide who could hold a normal Swiss franc bond could also hold the UBS digital bond, either directly on SDX or indirectly via their custodian. For instance, some investors purchased the bond through the traditional exchange and held it at Euroclear/Clearstream via links to SIX SIS, demonstrating that even non-Swiss, international investors could participate without needing to interface with the blockchain.[162] This was a strategic choice to ensure the use case was about efficiency and innovation, not about creating an exclusive market silo.

Quantitative insights: The UBS digital bond was **CHF 375 million**, issued at par. It carries a 2.33% fixed coupon and will mature in November 2025.[163] The bond's size (roughly $460 million) made it a benchmark-sized issue, and at issuance it was reported to be fully placed with institutional investors (the investor breakdown was not publicly detailed for UBS's bond, but it is comparable to other Swiss franc bonds of similar size). In terms of **transaction volume and adoption**, this landmark deal helped bring SDX's total volume of digital bond issuances above CHF 1 billion. By mid-2024, cumulative issuance on SDX's platform reached about **CHF 1.3–1.4 billion across roughly 10 bonds**.[164] The geographic scope of activity has been primarily within Switzerland (most issuers and lead banks are Swiss, and many investors are Swiss-based), but there is growing international involvement – for example, the **World Bank's 2024 digital bond** on SDX saw some allocations to central banks and official institutions outside Switzerland.[165] SDX's participant network is expanding, with global banks (such as **Commerzbank** and **Standard Chartered**) joining as members to enable cross-border access.[166,167]

Key milestones and developments (2021–2025): To put the UBS use case in context, the past few years have seen a series of milestones for SDX and digital bonds in Switzerland:

1. **November 2021 – SDX Launch:** SDX went live with its first digital bond issuance, a CHF 150 million bond by SIX Group (the exchange operator itself) to inaugurate the platform.[168] This initial bond was partially issued on DLT and partially in traditional form (a "twin" structure), as a pilot to demonstrate the technology.

2. **October 2022 – SDX–SIS Link:** SIX Digital Exchange established an **operational link with SIX SIS** (the traditional CSD), allowing digital CHF bonds on SDX to be held and settled in SIS accounts.[169] This created the technical and legal bridge enabling the single-ISIN model for future issuances.

3. **November 2022 – UBS Digital Bond:** UBS AG issued its CHF 375 million digital bond (the focal use case of this chapter) on SDX, dual-listed on SDX and SIX Swiss Exchange.[170] This was the first public, **benchmark-sized** digital bond by a global bank on a regulated platform, garnering significant market attention.

Further activity has been summarized in the **exhibit** below:

160. Ibid.
161. UBS, "UBS AG launches the world's first digital bond that is publicly traded and settled on both blockchain-based and traditional exchanges", November 2022.
162. World Bank Group, "World Bank partners with Swiss National Bank and SIX Digital Exchange to advance digitalization in capital markets", May 2024.
163. UBS, "UBS AG launches the world's first digital bond that is publicly traded and settled on both blockchain-based and traditional exchanges", November 2022.
164. Ledger Insights, "Swiss wholesale CBDC trial with SDX extended by 2 years", June 2024.
165. World Bank Group, "World Bank partners with Swiss National Bank and SIX Digital Exchange to advance digitalization in capital markets", May 2024.
166. Ledger Insights, "Swiss wholesale CBDC trial with SDX extended by 2 years", June 2024.
167. SDX "SIX Digital Exchange Gets Regulatory Approval from FINMA", September 2021.
168. Ian Allison, "Switzerland's Six Digital Exchange Launches with Blockchain Bond", May 2023.
169. SDX, "SIX Digital Exchange Established Operational Link to SIX SIS", October 2022.
170. UBS, "UBS AG launches the world's first digital bond that is publicly traded and settled on both blockchain-based and traditional exchanges", November 2022.

EXHIBIT DD.4

The Swiss Digital Bonds' Ecosystem

Year	Digital Bond Issuance					Volume	
						Helvetia Phase III	Overall
2021	SIX CHF 28.6mn					0	28.6mn
2022	UBS CHF 375mn					0	375mn
2023	Città di Lugano CHF 100mn	Helvetia Phase III Kanton Basel-Stadt CHF 105mn		Helvetia Phase III Kanton Zürich CHF 100mn		205mn	305mn
2024	Helvetia Phase III Città di Lugano CHF 100mn	Helveti Phase III st.gallen CHF 100mn	Helveti Phase III UBS CHF 150mn	Helvetia Phase III THE WORLD BANK CHF 200mn	Helvetia Phase III (Extended) Città di Lugano CHF 120mn	670mn	670mn
Total						CHF 875mn	CHF 1.379bn

Sources: SUERF "Towards Tokenized Bond Markets? Lessons from Switzerland, BCG Analysis.

In summary, the UBS digital bond use case exemplifies how a major bank leveraged a DLT-based capital market infrastructure to issue a **real-world bond** in a regulated environment. It demonstrated faster settlement and operational efficiency while preserving broad investor access. Over the last 2–3 years, this pioneering transaction has been followed by multiple other issuances on SDX, progressively scaling up the platform's usage (from Swiss francs 28 million in 2021 to over 1.3 billion CHF by 2024).[171] The use case underscores an important point: **tokenization and DLT can be implemented in a way that complements, rather than upends, traditional market structures**, easing the path for adoption.[172]

Settlement Asset

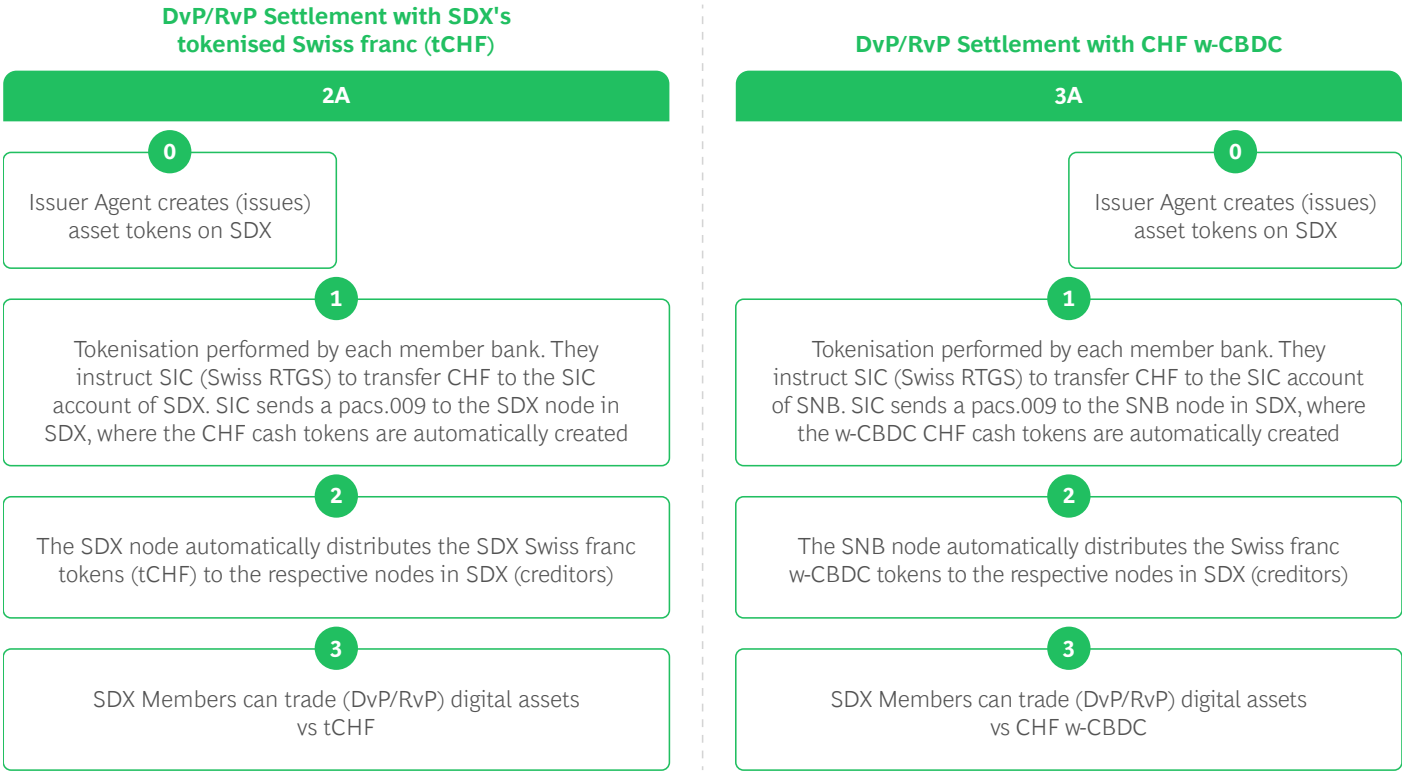
Settlement asset on SDX: To enable atomic DvP on the ledger, SDX utilized a **tokenized form of Swiss franc** on its platform. In practice, this meant that participating banks transferred CHF liquidity into a special account (presumably at the SNB or a commercial bank) in exchange for receiving **digital CHF tokens** (often termed "cash tokens") on the SDX ledger that represented that cash.[173] These tokens were essentially a 1:1 claim on Swiss franc deposits, allowing SDX to simulate cash leg movements within the DLT system. For example, in the **City of Lugano's first digital bond (Jan 2023)**, settlement was done using such tokenized CHF: Lugano's investors paid in fiat CHF which was converted to on-ledger tokens, and against those tokens they received the bond in SDX CSD.[174]

Wholesale CBDC pilot: In late 2023, the landscape evolved with the introduction of **SNB's wholesale CBDC (wCBDC)** on SDX. Under **Project Helvetia Phase III**, the SNB itself **issued digital Swiss franc tokens** (wCBDC) onto the SDX platform for participating banks to use.[175] During the pilot (Dec 2023 – June 2024), six bond issuances (collectively ~CHF 750 m) were settled using SNB's wCBDC.[176] This included the World Bank's CHF 200 m bond and UBS's CHF 150 m second digital bond, among others.[177] The process is demonstrated in the **exhibit** below:

171. SUERF, "Towards Tokenized Bond Markets? Lessons from Switzerland", December 2024.
172. Ledger Insights, "Swiss wholesale CBDC trial with SDX extended by 2 years", June 2024.
173. SUERF, "Towards Tokenized Bond Markets? Lessons from Switzerland", December 2024.
174. Ibid.
175. World Bank Group, "World Bank partners with Swiss National Bank and SIX Digital Exchange to advance digitalization in capital markets", May 2024.
176. Ledger Insights, "Swiss wholesale CBDC trial with SDX extended by 2 years", June 2024.
177. Ibid.

EXHIBIT DD.5

Settlement Asset Workflows for SDX Issuances



Sources: SUERF "Towards Tokenized Bond Markets? Lessons from Switzerland, BCG Analysis.

Settlement finality (technical and legal): On the technical side, SDX's DLT (Corda-based) reaches settlement finality when a transaction is confirmed by the required nodes (including notary service) – at that point, token transfers are irrevocably executed. The platform is designed so that once a trade is matched and instructed for settlement, the atomic swap of bond token for cash token is either done in its entirety or not at all, with no interim state. This is analogous to a DvP in a CSD: either both securities and cash settle, or nothing does. Because SDX is a regulated **CSD**, the finality of transfers on its ledger is also recognized under Swiss law. Switzerland's legal framework (the FMIA and Federal Intermediated Securities Act, among others) was updated to accommodate DLT-based settlements. In particular, Swiss law explicitly allows the creation of **"ledger-based securities"** which are securities whose legal ownership is defined via an entry in a distributed ledger that qualifies as a **main register**[178] SDX's CSD is such a main register for the bonds it issues. Transfers on the SDX ledger achieve **legal finality at the moment of ledger settlement**, backed by the same legal certainty as transfers in SIX SIS.

To elaborate on legal rights: holders of the UBS digital bond have the **same legal claim against UBS AG** as they would if they held a traditional UBS bond in a securities account. The bond's terms are defined in a prospectus (and/or final terms) just like any Swiss franc bond, specifying UBS's obligation to pay interest and principal. The fact that the bond is "digital" does not change investor rights – UBS explicitly noted that the digital bond "has the same instrument structure, legal status and rating as a traditional UBS AG senior unsecured note".[179]

Settlement finality from a legal perspective is further buttressed by designating SDX (and its notary function) under the umbrella of the Swiss **Finality** infrastructure. Switzerland is not in the EU, but it has analogous protections: FINMA's regulations and Swiss National Bank oversight ensure that once a transaction is settled on SDX, it is final even if a participant later defaults. The **atomic DvP** nature means there is no credit risk window where one side is unfulfilled. FINMA's approval of SDX as an exchange/CSD included vetting its DLT model for compliance with these principles.[180] For cross-border aspects, SIX SIS's involvement means that when tokens move to SIS (through the operational link), they effectively become regular

178. SUERF, "Towards Tokenized Bond Markets? Lessons from Switzerland", December 2024.
179. UBS, "UBS AG launches the world's first digital bond that is publicly traded and settled on both blockchain-based and traditional exchanges", November 2022.
180. Ian Allison, "Switzerland's Six Digital Exchange Launches with Blockchain Bond", May 2023.

intermediated securities in SIS; at that point, Swiss law and the rules of SIX SIS govern finality (which are aligned with the **Swiss Finality Act** and international standards). Notably, the World Bank's digital bond explicitly stated that the **securities are governed by Swiss law**, meaning any legal disputes or questions (e.g., around ownership transfers or insolvency treatment) would be resolved under Swiss jurisdiction, which has clarity on DLT securities.[181]

Rights and claims of token holders: Token holders (investors) have all the **economic rights** (coupon payments, redemption, etc.) that the bond promises. Coupons and redemptions on SDX are handled via smart contract-like actions or on-chain corporate actions: for instance, the World Bank's bond was set to pay coupons and principal in tokenized CHF on SDX to the token holders.[182] If an investor holds via SIX SIS, then SIX SIS (as a nominee on SDX) receives those tokenized CHF or wCBDC and passes the cash to the investor through normal payment systems. If UBS defaults, token holders would claim in UBS's insolvency no differently than traditional noteholders of equal seniority. There is no additional collateral or asset backing just because it is on DLT – it is an **unsecured bond** of UBS AG. The legal structure is designed such that holding the digital bond is **economically and legally the same as holding a traditional book-entry bond**.

In summary, the settlement and legal underpinnings of the UBS digital bond use case show a careful blending of novel technology with **established legal principles**.

Interoperability and Network Architecture

DLT network type and architecture: The SDX platform uses a **permissioned DLT network.** Unlike public blockchains (Bitcoin, Ethereum) which anyone can join and validate, SDX's ledger is restricted to authorized participants – mainly regulated financial institutions. Technologically, SDX is built on **R3 Corda Enterprise**, a distributed ledger framework tailored for financial use cases.[183] Corda operates through a network of known nodes where transactions are validated by a consensus service (called a *notary* in Corda) rather than by proof-of-work or proof-of-stake. This means that when UBS's bond tokens are transferred on SDX, a designated trusted node (or cluster of nodes) ensures the transaction is unique and final. The choice of Corda reflects SDX's priorities: **privacy, scalability, and integration**. Only the parties to a given bond trade (and the CSD/notary) see the transaction details, which preserves confidentiality in line with bank secrecy norms. The system is also scalable in the sense that it does not broadcast every trade to all members, reducing bottlenecks. **Consensus mechanism**: Corda uses a form of **Byzantine Fault Tolerant consensus** via its notary infrastructure. Essentially, when two parties agree on a trade, they propose a transaction updating the bond ownership and cash balances; the notary checks that the tokens are valid and not double-spent and then cryptographically signs off, which commits the transaction. This yields immediate finality – once notarized, a transaction is final and irrevocable. There is no block-chaining of many unrelated transactions together as in traditional blockchains; instead, confirmations are on a per-transaction basis. The system thus achieves **high throughput and low latency** settlement, which is important for a market infrastructure (trades can settle in seconds).

Network governance model: SDX is operated by **SIX Group**, and governance is largely centralized in this operator (subject to regulatory oversight). SDX trading has recently been consolidated with SIX, streamlining digital asset trading under a single regulated infrastructure.[184] The network's rules are set by SDX's regulations (which FINMA approves). **Member access** is tightly controlled: banks, broker-dealers, and other institutional players must undergo an onboarding process to run a SDX node or to become a participant. In effect, SDX functions as a consortium or **private network** where SIX is the operator and participants are the member firms – very much analogous to a traditional exchange/CSD membership structure, but with nodes and smart contracts rather than purely central software.

Interoperability with traditional systems: Perhaps the most distinctive feature of the SDX setup is its **interoperability with traditional capital market infrastructure**. Rather than exist as an isolated DLT network, SDX was designed to connect to **the incumbent systems**. The prime example is the **operational link between SDX CSD and SIX SIS** established in 2022.[185] This link bridges the ledger-based securities and conventional securities custody.

Beyond the SIS link, SDX's interoperability extends to international central securities depositories. As noted, SIX SIS acts as a conduit to **Euroclear and Clearstream**, large ICSDs.[186] In the World Bank's 2024 bond, for instance, foreign investors holding through Euroclear could still buy the bond; Euroclear relied on an account link with SIX SIS, which in turn had the link to SDX. This multi-layer linkage meant **SDX-settled securities can be held by global investors using their existing custodian relationships.** Such interoperability is a strong point of this model, as it does not require every end-investor or institution to reinvent their operations to handle DLT.

181. World Bank Group, "World Bank partners with Swiss National Bank and SIX Digital Exchange to advance digitalization in capital markets", May 2024.
182. Ibid.
183. Ian Allison, "Switzerland's Six Digital Exchange Launches with Blockchain Bond", May 2023.
184. SDX, "SDX announces the consolidation of trading for digital assets into SIX Swiss Exchange", May 2025.
185. SDX, "SIX Digital Exchange Established Operational Link to SIX SIS", October 2022.
186. World Bank Group, "World Bank partners with Swiss National Bank and SIX Digital Exchange to advance digitalization in capital markets", May 2024.

DLT network vs traditional FMI: Architecturally SDX **closely resembles a traditional FMI** in structure. It has an exchange (trading platform) – although as of June 2025, new digital bonds will trade only on the traditional SIX exchange, essentially phasing out the separate SDX order book – and it has a CSD for settlement and custody.[187] The roles of brokers, dealers, custodians, paying agents, etc., remain largely the same. This conscious mirroring means that many processes (such as corporate actions, regulatory reporting, etc.) could be adapted from existing frameworks. In effect, SDX chose a **"hybrid" model**: leveraging DLT for settlement efficiency and new capabilities (such as atomic DvP, 24/7 potential, smart contract features for asset servicing), but **retaining the governance and participant structure** of traditional markets.

Interconnection with other DLT platforms: As of now, SDX does not have a direct technical connection to other unrelated DLT networks (such as Ethereum or others). Each issuance on SDX is on **SDX's private ledger only**.

Consensus, scalability, and performance: The SDX/UBS bond use case did not encounter scaling limits in any reported way. The architecture, using Corda, is designed to scale to institutional transaction loads.[188]

The interoperability and architecture of SDX demonstrate an compelling **use case for DLT as a tool**. The system connects with existing market structure and the technology choices prioritize confidentiality, finality, and regulatory compliance. The UBS digital bond was able to be jointly issued in a DLT environment and traditional FMI because of this design. Market participants could thus experience the benefits (faster settlement, potentially lower operational risk, innovative features) without needing to overhaul business workflows. This interoperability model is a useful use-case blueprint for other digital market infrastructure projects.

Conclusion

In summary, SDX/UBS digital bond use case is a promising example of DLT for use in fixed income markets. **Swiss authorities provided a clear legal path and close oversight, which has enabled innovation** in live markets. Key policy considerations – such as maintaining settlement finality, protecting investors, and safeguarding financial stability – have been addressed through a combination of legal reforms and technical design (e.g., atomic DvP, use of wCBDC, integration with existing systems). Market participants have responded with growing interest, as evidenced by multiple issuances and the involvement of high-profile institutions. While still in a nascent stage (the volumes are a modest proportion of global bond markets), the UBS digital bond use case has been a **proof-of-concept at scale**, showing that DLT can be woven into the fabric of capital market infrastructure a promising development for DLT in the future of capital markets.

187. SDX "SIX Digital Exchange Gets Regulatory Approval from FINMA", September 2021.
188. Ledger Insights, SIX Digital Exchange to Settle Stock Trading Using R3's Corda Blockchain, March 2019.

Fixed Income Use Case #2: Euroclear Asian Infrastructure Investment Bank (AIIB) Digitally Native Note

Overview of Use Case

The Asian Infrastructure Investment Bank (AIIB) partnered with Euroclear in August 2024 to issue a **digitally native bond** ("Digitally Native Note", or "DNN") on Euroclear's **Digital Financial Market Infrastructure ("D-FMI")** platform.[189] This was a landmark issuance – **the first US dollar-denominated digital bond on Euroclear's DLT platform and the first by an Asia-based issuer**.[190] The bond was a 2.4-year $300 million sustainable development note rated AAA by Moody's, S&P, and Fitch.[191,192] It was **priced on 20 August 2024 and settled on 22 August 2024 (T+2)**, in line with conventional market timelines.[193] This places the AIIB bond among the largest digital bonds to date globally.[194]

Organizations and roles: AIIB was the issuer, **Euroclear Bank** acted as the CSD and platform operator, and two banks – **Citi and BMO Capital Markets** – led the distribution.[195] Citi served as **dealer and issuing/paying agent**, while BMO was a co-dealer.[196] Euroclear's **Digital Securities Issuance (D-SI)** service facilitated the entire primary market workflow on DLT: **issuance, book-building, distribution to investors, and DvP settlement** in a single integrated process.[197] The bond was assigned an ISIN **XS2615318362** and **listed on the Luxembourg Stock Exchange's regulated market**, making it a public benchmark transaction.[198]

Operational workflow: The issuance workflow largely followed a standard Euro Medium Term Note ("EMTN") process, but on a DLT backend. At pricing, the lead managers (Citi, BMO) collected investor orders and set the terms. Using Euroclear's D-SI platform, Citi as issuing agent **digitally created the new bonds (DNN tokens) on the ledger**, and investors' securities **wallets** on D-FMI were credited with their allotted bonds against payment.[199] **DvP settlement in USD** was achieved on the DLT platform, meaning investors received the bonds at the same time their cash payment was confirmed.[200] Notably, settlement **occurred in under a day,** allowing **issuance and initial secondary trading to settle on the same day** (T+0) if needed, although in this case a conventional T+2 cycle was used.[201] Once issued and settled, **the digital bonds were seamlessly transferred to Euroclear's traditional settlement system** on the same day.[202] This integration enabled investors and market makers to **hold and trade the AIIB bond within their existing Euroclear Bank accounts** in the same way as any other international bond, using established trading venues and infrastructure.[203] By close of issuance day, the DNN was accessible in **standard securities accounts**, ensuring normal post-trade operations (custody, corporate actions, etc.) under familiar processes.[204]

Involved parties and ecosystem: The use case spanned multiple financial infrastructure players, underscoring a hybrid model. **Euroclear Bank**, as an International CSD, was the issuer CSD and maintained the official record of the security.[205] **Luxembourg Stock Exchange** listed the bond and thereby provided regulatory oversight and transparency to the market.[206] Additionally, the bond was made eligible for clearing in **HKMA's CMU** ("Central Moneymarkets Unit") and **SIX Swiss Exchange's** settlement system.[207] In practice, this means that investors in Asia or Switzerland could hold and settle the bond through their local CSD links (the digital bond positions can be mirrored in HKMA's or SIX's clearing systems).[208] Such multi-CSD interoperability broadened the geographic reach of the issuance (Europe, Asia, and beyond) without fragmenting liquidity. On the advisory side, top international law firms were involved – **Clifford Chance advised AIIB, and Allen & Overy (in alliance with Shearman & Sterling) advised the dealers** – highlighting the importance of legal structuring in this innovative transaction.[209]

189. Euroclear, "Asian Infrastructure Investment Bank issues its first DNN", August 2024.
190. Ibid.
191. Ibid.
192. AIIB, "AIIB issues its first digitally native note on Euroclear's D-FMI platform", August 2024.
193. Ibid.
194. Ledger Insights, "AIIB digital bond issued via Euroclear reaches $500m after $200m tap", October 2024.
195. Euroclear, "Asian Infrastructure Investment Bank issues its first DNN", August 2024.
196. Ibid.
197. Euroclear, "D-FMI: Digital Financial Market Infrastructure", Accessed 2025.
198. Euroclear, "Asian Infrastructure Investment Bank issues its first DNN", August 2024.
199. Euroclear, "D-FMI: Digital Financial Market Infrastructure", Accessed 2025.
200. Ibid.
201. AIIB, "AIIB issues its first digitally native note on Euroclear's D-FMI platform", August 2024.
202. Euroclear, "D-FMI: Digital Financial Market Infrastructure", Accessed 2025.
203. Ledger Insights, "AIIB issues $300m digital bond using Euroclear infrastructure", August 2024.
204. Ibid.
205. AIIB, "AIIB issues its first digitally native note on Euroclear's D-FMI platform", August 2024.
206. Ibid.
207. Euroclear, "Asian Infrastructure Investment Bank issues its first DNN", August 2024.
208. Ibid.
209. AIIB, "AIIB issues its first digitally native note on Euroclear's D-FMI platform", August 2024.

Key facts and scale metrics: The AIIB digital bond carried a **4.00% coupon** (semi-annual) and matures on **15 January 2027**.[210] It was issued under AIIB's EMTN program as a **direct, unsecured obligation of AIIB**.[211] The transaction raised **$300 million for AIIB's sustainable development financing** needs, and due to oversubscription, the tapping brought the size to $500 million, underlining investor interest.[212,213] **Over 15 institutional investors** (all qualified investors) participated in the initial issue – a relatively small but significant group given the novel format. The issue was **AAA-rated** and came from a **supranational issuer**, which gave investors comfort despite the new technology. The **market coverage** was international: AIIB bonds typically attract investors from Asia, Europe, and the Middle East, and the listing in Luxembourg and clearance via Euroclear/CMU/SIX enabled global access. This use case demonstrated that even a **high-grade, publicly offered bond can be issued and settled on DLT at scale** without disrupting market access or liquidity. Euroclear noted that the DNN platform is designed to support issuances **"at scale" and broad adoption of digital bonds** by leveraging existing market structures.[214] The AIIB deal was indeed viewed as a **"milestone transaction of many firsts"**, paving the way for further digital issuance by attracting issuers and investors from across the world.[215]

Settlement Asset

Settlement asset: The cash leg of the AIIB digital bond was settled in **traditional fiat currency** (**USD**) **held as commercial bank money** within Euroclear's system. Euroclear Bank **handled the USD payments via its existing payment network** (investors paid USD into their Euroclear cash accounts or via correspondent banks, as with any dollar-denominated Euroclear settlement).[216] On the DLT platform, these cash movements were represented such that **DvP finality** could be achieved: when an investor's USD payment was confirmed, the corresponding DNN token was delivered to that investor's wallet on the ledger.[217]This atomic DvP on DLT was crucial to mirror the risk-free settlement of traditional systems. **Euroclear's D-FMI is integrated with its traditional settlement system**, so once the DLT-based DvP occurred, **records of cash and securities were automatically reflected in Euroclear's books**.[218] In effect, the DLT platform acted as an extension of Euroclear's existing infrastructure, with Euroclear Bank guaranteeing the cash settlement in its role as settlement agent.

Settlement finality: Legally and technically, settlement finality was achieved to the same standards as in traditional Euroclear operations. **Euroclear's DLT platform is fully CSDR-compliant and is part of Euroclear Bank's designated securities settlement system**.[219] This means that transfers of the AIIB digital bond on the platform enjoy the protections of the EU Settlement Finality Directive and relevant Belgian/Luxembourg law, as Euroclear Bank (incorporated in Belgium) operates the system. **Once a transaction is recorded on the D-FMI ledger and integrated into Euroclear's books, it is irrevocable and final** under the prevailing legal framework.[220] Technically, the D-FMI uses **R3 Corda DLT**, which achieves consensus via a notary mechanism to prevent double-spending.[221] When the notary service validates a bond transfer against payment, that transaction is considered final on the ledger. The **integration with the traditional CSD ledger effectively anchors the DLT transaction in the legal finality of Euroclear's system**.[222]

Legal status of the security and investor rights: The digital bond was structured to give investors **the same legal rights and protections as a conventional bond**. AIIB's note is a **direct, unsecured debt obligation** of AIIB, governed by **English law** (as per the EMTN program).[223] Each investor's ownership is represented by a token on the D-FMI ledger, but from a legal perspective, that token equates to a book-entry security entitlement held through Euroclear – **a dematerialized bond**.[224] Luxembourg Stock Exchange officially classifies the AIIB DNN as a **"security token" admitted to its official list**, but importantly it is admitted on the **regulated market**, meaning it had to meet all the regulatory requirements of a public bond issue (disclosure, prospectus approval if required, etc.).[225,226] Investors thus benefit from the usual safeguards: a listed security framework, AAA credit quality of the issuer, and clearly defined legal terms (coupon, maturity, repayment obligations) as per the offering documentation.[227] **Holding the bond via DLT does not diminish investor rights** – holders are entitled to semi-annual interest and full principal repayment at maturity, just as with any AIIB bond. Euroclear's role as CSD and common safekeeper ensures that the digital issuance is recognized under law as valid book-entry holdings. Notably,

210. Ibid.
211. Ibid.
212. Euroclear, "Asian Infrastructure Investment Bank issues its first DNN", August 2024.
213. AIIB, "Investing with Impact: AIIB's Sustainable Development Bonds", May 2025.
214. AIIB, "AIIB issues its first digitally native note on Euroclear's D-FMI platform", August 2024.
215. Ibid.
216. Euroclear, "D-FMI: Digital Financial Market Infrastructure", Accessed 2025.
217. Ibid.
218. Ledger Insights, "AIIB issues $300m digital bond using Euroclear infrastructure", August 2024.
219. Euroclear, "Asian Infrastructure Investment Bank issues its first DNN", August 2024.
220. Ledger Insights, "AIIB issues $300m digital bond using Euroclear infrastructure", August 2024.
221. R3, Glossary – Notary, Accessed July 2025.
222. Ibid.
223. AIIB, Base Prospectus Supplement – Global Medium Term Note Program, April 2024.
224. Ibid.
225. Luxembourg Stock Exchange, "AsiainfraInvBk 4%", August 2024.
226. AIIB, "AIIB issues its first digitally native note on Euroclear's D-FMI platform", August 2024.
227. AIIB, Base Prospectus Supplement – Global Medium Term Note Program, April 2024.

no physical global certificate was used; instead, the bond was **fully dematerialized on DLT** in line with recent legal reforms in Luxembourg and other jurisdictions that enable ledger-based securities.[228] The transaction involved external counsel to ensure that **the tokenized bond meets all legal definitions of a security**.[229]

Interoperability and Network Architecture

DLT network type and architecture: Euroclear's D-FMI platform operates on a **permissioned, private DLT network (consortium-type)** built on **R3 Corda technology**.[230] **Euroclear Bank serves as the network operator**, and key entities (such as the issuing agent, dealers, and CSD) interface with the DLT. Corda's design uses a **notary node to achieve consensus** on transactions ensuring fast confirmation and preventing double spends of securities.[231] The system is engineered for **high reliability and compliance**, aligning with financial industry requirements. **Governance of the network is centralized under Euroclear's control. Scalability** is addressed through the hybrid model: the D-FMI itself can handle issuance and a certain volume of transactions on-chain, but because it off-ramps assets to the traditional platform for secondary trading, it avoids hitting a throughput bottleneck on the DLT. In effect, **the DLT network is used for those parts of the process where it adds efficiency (initial issuance and atomic settlement), while heavy ongoing trading is handled by Euroclear's existing settlement engine**.[232,233] This architecture prevents the fragmentation of liquidity – the AIIB bond trades just like any other Euroclear-held bond post-issuance, instead of being confined to a DLT environment.

Integration and interoperability with traditional systems: A standout feature of this use case is **seamless interoperability between the DLT platform and traditional market infrastructure**. Euroclear **fully integrated D-FMI with its conventional settlement system**, meaning every digital bond issued is automatically recognized in the main Euroclear Bank system.[234] Investors did not need any new technology or wallets on their end; if they are Euroclear participants, they simply see the AIIB bond in their account and can settle trades as usual. This integration was key to **avoiding a bifurcation of liquidity or technology adoption**.[235] As AIIB's Treasurer noted, market participants could buy and sell the digital bond "within their existing account structures," avoiding any need to "embrace DLT" directly or face operational fragmentation.[236] In practice, immediately after issuance on DLT, Euroclear **transferred the securities balances and cash proceeds from the DLT ledger to its traditional ledger**.[237] The bond then became **fungible with other securities for secondary clearing and settlement**. This hybrid model ensures that interoperability with **trading venues, settlement channels, and liquidity facilities** is maintained.[238] By aligning D-FMI with existing post-trade processes (and complying with CSDR), Euroclear effectively bridged the new DLT network to the established **international securities infrastructure**.[239]

Interoperability with other DLT and external networks: While the AIIB use case did not explicitly involve connecting multiple blockchains, Euroclear's strategy emphasizes **interoperability with other emerging digital networks**. The AIIB bond itself could be **held in token form at Euroclear or mirrored into other CSDs (HKMA's CMU, SIX in Switzerland) via existing links**.[240]

Network governance and alignment with market infrastructure: Euroclear's D-FMI is often described as a **"digital hybrid" model** – it uses cutting-edge DLT but remains tightly aligned with traditional FMI governance.

Conclusion

In conclusion, the Euroclear-AIIB digital bond use case illustrates that with careful attention to legal structure, regulatory compliance, and system design, **DLT can be integrated into capital markets in a prudent, stepwise manner.** The use case navigated potential regulatory ambiguities by working within established frameworks (CSDR, listing rules) and was compliant with the relevant regulatory standards in the respective jurisdiction (for example Belgium and Luxembourg). It addressed market and policy concerns by ensuring **no disruption to liquidity or investor rights**, and showcased DLT benefits such as increased efficiency (faster settlement) and resilience (distributed technology under a controlled setup). Moving forward, this issuance is likely to have utility as a successful use-case for **broader adoption of digital securities**. It stands as a **neutral, professional benchmark**: a digital bond that is at once innovative and yet fully recognizable under existing institutional frameworks, thereby building confidence for future digital issuance projects worldwide.[241]

228. Luxembourg Stock Exchange, "Security Tokens", Accessed 2025.
229. AIIB, "AIIB issues its first digitally native note on Euroclear's D-FMI platform", August 2024.
230. Ledger Insights, "AIIB issues $300m digital bond using Euroclear infrastructure", August 2024.
231. R3, Glossary – Notary, Accessed July 2025.
232. Euroclear, "D-FMI: Digital Financial Market Infrastructure", Accessed 2025.
233. Ledger Insights, "AIIB issues $300m digital bond using Euroclear infrastructure", August 2024.
234. Euroclear, "Asian Infrastructure Investment Bank issues its first DNN", August 2024.
235. Ledger Insights, "AIIB issues $300m digital bond using Euroclear infrastructure", August 2024.
236. Ibid.
237. Euroclear, "D-FMI: Digital Financial Market Infrastructure", Accessed 2025.
238. Euroclear, "Asian Infrastructure Investment Bank issues its first DNN", August 2024.
239. Ledger Insights, "AIIB issues $300m digital bond using Euroclear infrastructure", August 2024.
240. Euroclear, "Asian Infrastructure Investment Bank issues its first DNN", August 2024.
241. Ibid.

EXHIBIT DD.6

Primary Market Issuances: Development has been fostered by a small number of issuers, including EIB and the HK government

	EIB-Mercury	EIB-Venus	EIB-Mars	HK-Evergreen 1	EIB-Saturn	HK-Evergreen 2
Date	**Apr–21**	**Nov–22**	**Jan–23**	**Feb–23**	**Jun–23**	**Feb–24**
DLT network	Public permissionless	Private Permissioned	Private Permissioned + Public Permissioned	Private Permissioned	Semi Permissioned	Private Permissioned
Currencies	EUR	EUR	GBP	HKD	SEK	HKD, CNH, EUR, USD
Total deal size (USD equiv.)	107m	107m	63m	100m	95m	750m
Number of External Investors	Less than 5	Less than 5	Less than 5	Less than 5	Less than 5	More than 50
Governing Law	France	Luxembourg	Luxembourg	Hong Kong	Lux	HK
Digitally native or tokenised?	Digitally native	Digitally native	Digitally native	Tokenised	Digitally native	Digitally native
Access via CSD accounts?	No	No	No	No	No	No
Platform	SOCIETE GENERALE	Goldman Sachs	HSBC	Goldman Sachs	CRÉDIT AGRICOLE	HSBC
Other Syndicate Members	Santander, Goldman Sachs	Santander, SOCIETE GENERALE	BNP PARIBAS, RBC	HSBC, ICBC, CRÉDIT AGRICOLE	SEB	ICBC, CRÉDIT AGRICOLE, Goldman Sachs, UBS

Source: "The Impact of Distributed Ledger Technology in Global Capital Markets", GFMA, BCG, Clifford Chance and Cravath, April 2023.

Project Mercure: EIB digital bond on public DLT, April 2021

In April 2021, EIB issued a DLT-based bond on Ethereum, the first multi-dealer led digitally native issuance using a public network.[242] Apart from its novelty, this issuance was notable because it was settled through CBDC from the Banque de France.[243] It also marked the first time the bond was sold to third parties, as opposed to pre-identified counterparties.[244] Key terms of the issue are summarized in the **exhibit**.

EXHIBIT DD.7

Summary of Key Terms, EIB Issuance (April 2021)

Issue Amount	**€100M**
Pricing Date	27 April 2021
Settlement Date	28 April 2021
Maturity Date	28 April 2023
Coupon	0.000%, annual
Re-offer Yield	-0.601%
Re-offer Price	101.213%
Governing Law	French law
Joint Lead Managers	Goldman Sachs, Santander, Société Générale
Registrar, Fiscal Agent, Settlement Agent and Platform Manager	Société Générale – FORGE
Legal advisers	Linklaters LLP (to EIB) and Allen & Overy LLP (to the joint lead managers)
DLT network	Ethereum (public DLT network)

Source: EIB.

242. European Investment Bank, "EIB issues its first ever digital bond on a public blockchain," Apr 2021.
243. Ibid.
244. Ledger Insights, "Goldman, Santander, SocGen help European Investment Bank issue €100m public blockchain bond," Apr 2021.

Issuance details

The EIB bond was a €100 million issuance of 2-year AAA-rated bonds on the SG Forge platform, which runs the on public Ethereum DLT network. The selection of a public DLT network was notable given that previous experiments from sovereign issuers had used permissioned private DLT network.[245] While the network was permissionless, the application provided by SG Forge for the issuance was tightly permissioned.[246] This meant that all tokens had whitelisting in place to restrict holders to only the eligible counterparties and investors.[247] Furthermore, there were smart contracts that conducted KYC/AML/CFT and sanctions checks to verify counterparty identities before the relevant transaction could take place.[248] Finally, in accordance with French law, SG Forge maintained a monitoring system outside of the blockchain ledger for the bondholders' positions to track any potential operational risk issues.[249]

The issuance was arranged under the Société Générale's Compliant Architecture for (DLT-native) Security Tokens ("CAST") standard, which is designed for French law and regulation.[250] The bond tokens were designated under French law as MiFID2 financial instruments.[251] Although the bonds were fully digitally native, the issue was legally equivalent to a traditional bond's rights and obligations.[252] Fitch Ratings, which provided the credit rating for the bond, noted that the DLT underlying the issue did not create any additional credit risk compared with a traditional bond issuance.[253] In accordance with French law, the issue proceeded without a traditional CSD or CCP, opting for a DLT-based registry instead.

The bond settled on a T+1 timeframe using a CBDC proxy provided by the Banque de France, meaning that the bond completed issuance, trade, and settlement entirely on the distributed ledger. Banque de France used smart contracts to issue and control CBDC tokens and ensure simultaneous CBDC transfer in accordance with DvP.[254]

Key Benefits

- EIB benefited from the lower cost of issuing on a public DLT network.
- The programmability of the SG Forge ecosystem allowed for robust layers of permissioning, security, and control on top of the public DLT layer.
- The issue demonstrated that a digitally native issuance can fit within a regulatory framework as legally equivalent to a traditional bond.

Project Venus: EIB digital bond on private DLT network, Nov 2022

EIB issued its second digitally native bond token in November 2022, this time on a private, permissioned DLT network via GS DAP, Goldman Sachs' tokenization platform. A notable aspect of this issuance was the same-day T+0 settlement across two distributed ledgers in partnership with the Banque de France and Banque Centrale de Luxembourg. In addition, the bond was admitted to the Luxembourg Stock Exchange and used the Common Domain Model for associated interest rate swaps (refer **exhibit**).[255]

EXHIBIT DD.8

Summary of Key Terms, Project Venus

Issue Amount	€100M
Pricing date	29 November 2022
Settlement date	29 November 2022
Maturity date	29 November 2024
Coupon	2.507%, annual

245. Ibid.
246. SIFMA, "Why Basel Should Not Apply A Blanket Infrastructure Risk Add-On For Group 1 Cryptoassets," Nov 2022.
247. Ledger Insights (2021).
248. SIFMA (2022).
249. Ibid.
250. Ibid.
251. Ibid.
252. Fitch Ratings, "Fitch Assigns European Investment Bank's Proposed Digital Bond Issuance 'AAA' Rating," Apr 2021.
253. Ibid.
254. Banque de France, "Experiment on the use of Central Bank Digital Currency (CBDC)," Apr 2021.
255. EIB, "EIB innovates further with Project Venus, the first euro-denominated digital bond on a private blockchain," Nov 2022.

Re-offer yield	2.507%
Re-offer price	100%
Governing law	Luxembourg law
Admission	Luxembourg Stock Exchange SOL (Securities Official List)
Joint lead managers	Goldman Sachs Bank Europe SE, Santander, Société Générale
Legal advisors	Clifford Chance (to EIB) Allen & Overy LLP (to the joint lead managers) Ashurst (to GS DAP™)
DLT network	Private DLT-network via Tokenization platform by Goldman Sachs (Hyperledger BESU/DAML)
Central Account Keeper	Goldman Sachs Bank Europe SE
Account Keeper	Société Générale Securities Services Luxembourg (SGSS Luxembourg)

Source: EIB.

Issuance Details

The issuance was issued, recorded, and settled as the first transaction on GS DAP, Goldman Sachs' tokenization platform. The DAP platform runs a private-permissioned distributed ledger using Digital Asset's DAML smart contract language and its Canton private DLT network.[256] Given the private-permissioned nature of the system, all participants were controlled and screened by default.

The settlement mechanism this time was atomic, completing the process in less than one minute.[257] In this implementation, clients purchased Security Tokens with cash. Goldman Sachs and the other lead managers (Santander and Société Générale) then settled the purchases on DLT using euro-based CBDC. The cash leg relied on a separate permissioned distributed ledger jointly operated by Banque de France and Banque Centrale du Luxembourg.[258] Settlement was therefore "cross-chain" between the central bank and Goldman Sachs' distributed ledger; it required a trusted message exchange protocol (HTLC) to coordinate the simultaneous exchange of experimental CBDC tokens for bond tokens in accordance with DvP.[259]

The bond was issued under Luxembourg law and subsequently the first syndicated digital bond to be admitted to the Luxembourg Stock Exchange.[260] Moody's, which gave the issue an Aaa rating, based its adjudication on EIB's strong credit position and robust risk management practices.[261] It noted the novelty and potential cyber risk posed by issuing the bond using DLT. However, it emphasized that the credit risk of the issue is ultimately dependent on EIB itself, not on the technology underpinning the issue.[262] Furthermore, it noted that the technology risk posed by DLT was "limited" by the private-permissioned nature of the platform, and the separation between EIB's internal technology systems and the DLT platform.[263]

Finally, the DAP platform supported an associated interest rate swap as a hedging instrument using the CDM, intended as a first trial of future on-DLT interest rate solutions.[264]

Key Benefits

- EIB benefited from the low issuance cost and successfully demonstrated atomic settlement.
- Permissioning, security, and control were built into the DAP platform and cash settlement distributed ledgers themselves.
- The issue successfully demonstrated a cross-distributed ledger settlement involving communication between the securities ledger and cash ledger.
- The interest rate swap could lead to further innovation with CDM-based derivatives on the GS DAP platform.

256. Digital Asset, "Goldman Sachs' Tokenization Platform GS DAP, Leveraging Daml, Goes Live," Jan 2023.
257. Ibid.
258. Banque de France, "The Banque de France and the Banque centrale du Luxembourg jointly conducted a successful wholesale central bank digital currency initiative," Nov 2022.
259. Ibid.
260. Ibid.
261. Moody's, "Moody's assigns Aaa rating to EIB's second digital bond," Nov 2022.
262. Ibid.
263. Ibid.
264. EIB (2022).

Project Mars: EIB GBP digital bond on private and public DLT networks, Jan 2023

On January 31, 2023, EIB issued its latest digitally native bond, and its first in pound sterling. This bond—a £GBP50 million 3-year floating rate note—was issued on both private and public distributed ledgers. Firstly, the bond was issued on a private-permissioned DLT network on HSBC's Orion platform. At the same time, HSBC Orion also mirrored key anonymized details of the issuance on a public DLT network. The bond is "digitally native", represented in securities tokens. Payment for bonds is processed on the platform using tokenized DLT GBP. BNP Paribas and RBC Capital Markets were the other joint lead managers.

EXHIBIT DD.8

Summary of Key Terms, Project Mars

Issue Amount	GBP£50M
Pricing date	31 January 2023
Settlement date	02 February 2023
Maturity date	03 February 2025
Coupon	SONIA + 12bps
Re-offer yield	SONIA + 12bps
Re-offer price	100%
Governing law	Luxembourg law
Admission	Luxembourg Stock Exchange SOL (Securities Official List)
Joint lead managers	BNP Paribas, HSBC, RBC Capital Markets
Legal advisors	Clifford Chance (to EIB) Allen & Overy LLP (to the joint lead managers)
DLT network	Private DLT-underpinned platform, via Tokenization platform by HSBC
Central Account Keeper	HSBC Continental Europe, Luxembourg Branch
Account Keeper	HSBC Bank, U.K. BNP Paribas Securities Services Royal Bank of Canada

Source: EIB.

Issuance details

This inaugural issuance on the HSBC Orion platform was the first ever GBP tokenized bond. The platform is the first to use the Central Account Keeper (**"CAK"**) status in Luxembourg digital assets regulation. The bond was issued under Luxembourg Law and is listed on the Luxembourg Stock Exchange. Money movement was handled by the creation of a settlement tokens backed by cash held at HSBC and deposited by Secondary Account Keepers. This approach allows later adoption of CBDCs or other money options, as they arise.

Issuing on both private and public networks was novel. The private DLT network is built using technologies including Hyperledger Fabric, and DAML smart contracts running on Canton. The public DLT network is Ethereum Mainnet. For future issuances on the platform the decision to use both private and public DLT networks, or just private, will be an issuer decision.

Key Benefits

- EIB benefited from low issuance cost and demonstrated atomic settlement with a floating rate coupon.
- The three banks gained significant insight into the operational and legal complexities of the market, and the platform is the first to use the CAK in Luxembourg law.
- The platform provides a simple low impact adoption pathway for existing market participants that enables transition to shorter settlement cycles.

Project Evergreen I: HK digital bond on private DLT network, Feb 2023

On February 15, 2023, the Government of Hong Kong issued its first tokenized green bond—a HK$800 million offering under the Government Green Bond Programme. The bond was issued using GS DAP, Goldman Sachs' tokenization platform and settled on a private-permissioned DLT network. Payment and lifecycle events—including coupon payments, secondary trading, and redemption—are executed using HKMA-issued cash tokens. On-chain records serve as the legally definitive source of ownership. The transaction marks the first government-issued tokenized green bond globally and forms part of Hong Kong's broader strategy to position itself as a hub for digital assets and sustainable finance. Ashurst advised Goldman Sachs on both the development of GS DAP and the execution of the transaction.

EXHIBIT DD.9

Summary of Key Terms, Project Evergreen I

Issue Amount	HK $800M
Pricing date	February 15, 2023
Settlement date	February 16, 2023
Maturity date	February 16, 2024
Coupon	4.05%
Re-offer yield	4.05%
Re-offer price	100%
Governing law	Hong Kong Law
Admission	Hong Kong Stock Exchange (HKEX)
Joint lead managers	Bank of China, Credit Agricole CIB, Goldman Sachs, HSBC
Legal advisors	Allen & Overy (to issuer) Ashurst (to Platform Provider) Linklaters (to banks and trustee)
DLT network	Private DLT-underpinned platform, via Goldman Sachs' DAP™ platform
Central Account Keeper	Goldman Sachs
Account Keeper	Bank of China Credit Agricole CIB Goldman Sachs HSBC Bank ICBC

Sources: HSBC.

Issuance details

Issued under the Hong Kong Government Green Bond Programme, it was executed on GS DAP, Goldman Sachs' tokenization platform and settled on a private-permissioned DLT network. The issuance used HKMA-issued cash tokens for delivery-versus-payment settlement on a T+1 basis, and all bond lifecycle events, including coupon payments and redemption, are processed on-chain.

On-chain records serve as the legally definitive record of ownership. The bond is cleared through the Central Moneymarkets Unit (CMU) and benefits from statutory settlement finality under Hong Kong law. This transaction follows earlier private sector trials and demonstrates government-scale deployment of tokenization infrastructure.

Key Benefits

- Enabled fully digital settlement and lifecycle management using central bank cash tokens.
- Demonstrated legal and regulatory readiness for tokenized government securities in Hong Kong.
- Showcased the GS DAP platform's ability to support sovereign issuances and complex market infrastructure requirements.

Project Evergreen II: HK digital bond on private DLT network, Feb 2024

On September 27, 2024, HSBC issued HK$1 billion in digitally native notes via its proprietary DLT platform, HSBC Orion—marking the first corporate issuance of its kind in Hong Kong. The transaction builds on the earlier landmark tokenized green bond by the HKSAR government, also executed on HSBC Orion. The notes are listed on the Hong Kong Stock Exchange and cleared through the Central Moneymarkets Unit (CMU) operated by the Hong Kong Monetary Authority (HKMA). Ashurst advised HSBC on the legal and regulatory structuring of the issuance, reinforcing collaboration between key stakeholders in advancing Hong Kong's digital asset ecosystem.

EXHIBIT DD.10

Summary of Key Terms, Project Evergreen II

Issue Amount	HK $1B
Pricing date	September 27, 2024
Settlement date	September 29, 2024
Maturity date	September 29, 2025
Coupon	3.6%
Re-offer yield	3.6%
Re-offer price	100%
Governing law	Hong Kong Law
Admission	Hong Kong Stock Exchange (HKEX)
Joint lead managers	Credit Agricole CIB, Bank of China, ICBC, UBS, HSBC
Legal advisors	Ashurst (to issuer) Clifford Chance (to platform provider)
DLT network	Private permissioned blockchain via HSBC Orion
Central Account Keeper	HSBC
Account Keeper	Credit Agricole CIB Bank of China HSBC ICBC UBS

Sources: Ashurst, HSBC.

Issuance details

HSBC issued HK$1 billion in digitally native notes through its proprietary DLT platform, HSBC Orion. This marks the first digitally native bond by a Hong Kong corporate issuer, following the HKSAR government's earlier use of the same platform. The bond is settled on a private-permissioned blockchain network, with full lifecycle events—including secondary trading, coupon payments, and redemption—executed digitally.

The notes are listed on the Hong Kong Stock Exchange and cleared through the Central Moneymarkets Unit (CMU), under Hong Kong law. The issuance showcases HSBC Orion's flexibility in supporting both sovereign and corporate digital bond offerings.

Key Benefits

- Enabled end-to-end digital issuance and settlement within an institutional-grade blockchain environment.
- Demonstrated HSBC Orion's capability to support corporate bond issuance at scale.
- Reinforced Hong Kong's position as a leading hub for digital assets and capital markets innovation.

Legal Considerations

The legal and regulatory considerations for sovereign bonds are largely covered in **Chapter 4** for U.S., U.K., E.U. and other jurisdictions.

U.K./E.U.

In principle, there is nothing that would expressly prevent the use of DLT in relation to the native issuance and trading of sovereign bonds. Generally, however, one of the main considerations when analyzing sovereign bond issuance in the context of DLT-based systems is whether the sovereign has adequate powers under the relevant legislation to pursue a digital issuance of sovereign bonds. Such legislation would have to be considered on a case-by-case basis and may contain requirements that are incompatible with a digital issuance, for example by mandating that the issuance takes place in certificated form or that the bonds are made available to certain persons. Provided the relevant legislation is compatible with digital issuance, then the digital sovereign bond issuance would still face the legal and regulatory challenges and hurdles that apply to debt instruments generally, as are set out in detail in **Chapter 4**. These challenges include: (i) whether the digital security issued constitutes a valid debt instrument in accordance with the laws of the local jurisdiction; (ii) whether, upon creation, the structure is such that it grants a legally enforceable obligation to the token holder; and (iii) whether the debt instrument (issued on a DLT-based system) can be traded in accordance applicable pieces of E.U.-level and UK legislation (for example, in accordance with book-entry requirements Article 3(2) of the Common Securities Depository Regulation (CSDR)).[265]

For a full legal and regulatory analysis of the current framework for debt instruments generally, and the challenges surrounding the application of DLT-based systems, please see **Chapter 4**.

Practically, there may be other factors that present challenges in the context of a sovereign bond issuance. Due to their public status, sovereigns may have a particular sensitivity to legal risk, and in practice sovereign issuers often rely on established value chains (and the checks and balances applied therein) to ensure legal certainty. Arguably, a key component of this reliance is the knowledge that adequate legal checks are being completed across the intermediaries by virtue of applicable regulation. By way of example, in the U.K., gilts are issued onto CREST, which qualifies as an "Operator" for the purposes of the Uncertificated Securities Regulations 2001[266](the "**USRs**"). As an Operator, CREST must comply with certain requirements, for example compliance with sanctions and the relevant AML/KYC legislation (for a discussion of such requirements, please see **Chapter 2.2** above). Accordingly, CREST's participants are authorized for the purposes of the relevant legislation, reducing the legal risk to which the sovereign issuer is exposed. Operating in an established value chain mitigates the risks of an open market.

The barriers to adoption of DLT are generally the same as for commercial bond issuances except that, due to the special position of sovereign entities, it is arguably more important to ensure that the chain of intermediaries and participants in the process are being regulated and monitored. Similar to the discussion in **Chapter 2.2**, this is likely to be achieved via the use of permissioned environments, either on private or public DLT networks.

Sovereigns are often keen to ensure that there is an unrestricted ability to tap existing bond issuances, which is usually achieved by issuing new bond tranches that are fungible with previous a previous tranche of bonds that have been issued by them. Therefore, a vital further consideration when implementing DLT-based systems in the context of sovereign bond issuances is to ensure that fungibility can be assured, such that holders are not able to distinguish between the relevant tranches of the same series of bonds.

On a national level, it should be considered whether the applicable statute or regulation may have to be clarified or amended. For example, in the U.K., gilts are one of the few debt securities issued under the USRs. It is unclear whether a DLT-based system utilizing a multi-jurisdictional spread of nodes could satisfy the requirement for a U.K. registrar under the USRs. Legislators and regulators could provide certainty to issuers (sovereign or otherwise) by clarifying that this requirement is either satisfied, or disapplied in respect of financial instruments issued under the USRs. Practically speaking to issue debt instruments using a DLT-based system under the USRs would require an Operator (e.g., CREST) to operate a suitable DLT platform. No Operators do so at present, and as such the USRs are not currently a practical option for the issuance of Digital Sovereign Bonds. Please see Section E of the Executive Summary for a summary of the U.K.'s DIGIT and DSS.

Secondary Market (Tokenized Securities):

While the discussion above contemplates the sovereign entity completing a native issuance of bonds, this is not the only relevant application of DLT in this context. Even if the sovereign entity issues traditional debt instruments, market participants may be able to create Tokenized Securities, in accordance with the "True Tokenization" process, as set out in **Chapter 4**. In this case, the same legal and regulatory challenges and hurdles that apply to the issuance of DLT-based Securities generally would be relevant for consideration (see **Chapter 4.1**).

265. Regulation (E.U.) No 909/2014.
266. The Uncertificated Securities Regulations 2001 (SI 2001/37755).

Hong Kong

The Government Bond Programme and Government Green Bond Programme are initiatives of the Hong Kong Government to develop the local bond market in Hong Kong. The bonds issued under these Programmes are a form of securities which are subject to the existing securities regulatory framework in Hong Kong including the Securities and Futures Ordinance ("SFO").

Where sovereign bonds are to be tokenized, below are several key legal and regulatory points which may benefit from additional clarification:

1. **Token creation and documentary formalities.** The documents required to support a sovereign bond's legal structure is multifold, including constitutional documents, subscription agreements and registry filings. The Tokenization process will need to clearly define which part of the bond issuance process and the relevant documents are "tokenized", what "Tokenization" of a certain process or document really means (e.g., whether the information is stored on a distributed ledger, or an agreement is executed using smart contract, and what rights and obligations a Security Token issued in this process confers), including whether a copy/version of the same exists outside of a distributed ledger and what its legal effect is in case of discrepancy.

   Further, the issuer may need to have Tokenization-specific documents in place, including a token purchase agreement that outlines the rights of investors and the tokenized bond offering details, tokenized bond creation deed/terms of the token, smart contract code, custody deed, disclosure documents including technical papers, underwriting agreement and third-party agreements with service providers including technology auditors and software/platform developers.

   As discussed in further detail in **Chapter 4**, there is legal uncertainty as to how current electronic transaction rules (e.g., the Electronic Transaction Ordinance) apply to DLT-based transactions and smart contracts, in particular potential non-recognition of electronic execution of certain instruments that are required to be stamped under the Stamp Duty Ordinance, transactions involving government entities where only limited certification authorities are recognized under the Electronic Transactions Ordinance, and deeds. This means the valid execution of such documents could be incompatible with migration to DLT absent legal clarification or update.

2. **Ownership and transferability.** Formal recognition of the legal nature, including what constitutes evidence of ownership, of tokenized bonds is required. Technical aspects of evidence of title should also be clarified, such as whether such evidence should be on a public or private network and the number of confirmations that will be required for a tokenized bond's transfer to be final.

   Clarification is required as to the content of a transfer of a tokenized bond – whether the transfer includes with it the legal rights and obligations of the bond or any rights on a distributed ledger or outside of a distributed ledger, or is merely a representation of a beneficial interest in the token or any underlying asset. The documentation on a distributed ledger/on an issuance platform should clearly delineate the consequences of a transfer, as well as potentially automating the corresponding notice procedures, assignments, or any other transfer mechanics.

3. **Suitability and investor protection.** Existing investor protection provisions including suitability and disclosure requirements may need to be updated in view of Tokenization, such as whether a tokenized bond would be a "complex product" due to its specific structure on the DLT or depending on exactly which part of the bond issuance is "tokenized". More regulatory guidance would be welcome on how various risks regarding the suitability of a tokenized bond vis-a-vis a client can be ascertained (e.g., the measurement and standards for product risk and concentration risk etc.), and guidance should be given to outline distributors' obligations and factors to be considered when evaluating the suitability of the tokenized bonds to clients.

Singapore

In Singapore, the issuance of Government securities and Treasury Bills are governed by the Government Securities (Debt Market and Investment) Act 1992. MAS is appointed to act on the Government's behalf as an agent for issuing of Government securities or Treasury Bills for moneys borrowed under this Act.

There is also the Significant Infrastructure Government Loan Act 2021, which authorizes loans to be raised by the Government in relation to nationally significant infrastructure. Similarly, MAS is appointed to act on the Government's behalf as an agent for issuing of securities for moneys borrowed under the Act. An inaugural sovereign green bond was issued in August 2022 under this Act.

Similar to how the issuance of digital tokens which constitute regulated products such as security tokens, are subject to the same regulatory regime under the Securities and Futures Act 2001 (the "SFA"), i.e. they are considered as offers of securities made through traditional means, MAS takes a technology-neutral stance towards the issuance of sovereign bonds whether digital or made through traditional means.

DEEP DIVE #3: TOKENIZATION OF FUNDS

Tokenization of investment funds, particularly money market funds ("MMFs"), is being pursued to transform capital markets through enhanced efficiency, transparency, and accessibility. This initiative involves digitizing fund shares using DLT to streamline and modernize traditional market infrastructure, closely paralleling the roles and mechanisms established within repos and collateral management.[267]

Strategic Objectives:

The strategic objective of tokenizing investment funds mirrors the repo and collateral management systems—efficiently allocating liquidity within capital markets while effectively controlling and mitigating risks. By tokenizing fund shares on blockchain technology, stakeholders aim to significantly reduce counterparty credit risk through accelerated settlement cycles (potentially instant or T+0).[268] This shortened settlement window greatly reduces the likelihood of counterparty default, aligning closely with the secured lending nature of repo markets, where timely settlement and liquidity management are essential. Additionally, tokenization strategically aims to unlock new liquidity pools by enabling fractional ownership and peer-to-peer transfers of fund shares at any time, including beyond traditional market hours, thereby broadening investor participation and market access.[269] Specifically for collateral purposes, tokenized MMFs will reduce liquidity concerns to the funds and also the entities that currently are liquidating money market funds to post cash as VM and then reinvesting into a money market fund post-collateral settlement. With tokenized MMFs, the transfer agent, custodian, pledgor, and receiver will all be part of the golden record and a margin call will be able to be settled with an eligible (government securities-only) MMFs without the additional operational and liquidity risks.[270]

Operational Objectives:

Operationally, tokenization seeks to create a robust, unified system of record with real-time updates and transparent asset transfers. These operational goals directly address traditional inefficiencies such as delayed settlement, manual processes, and fragmented records—issues similarly addressed by effective collateral management and repo operations.[271] Tokenized fund shares enable immediate and transparent transactions, significantly minimizing the risks of settlement failures and reducing reliance on intermediaries. Moreover, smart contracts, built with industry data standards like the Common Domain Model, embedded in tokenized fund platforms automate compliance checks, dividend distributions, and other administrative processes, significantly cutting operational costs and administrative burdens, comparable to efficient collateral management practices.

Key Stakeholders:

The key stakeholders involved in the tokenization of investment funds reflect the broader repo and collateral ecosystem. Sell-side banks and broker-dealers are actively participating, leveraging tokenization to improve settlement efficiency and offer innovative liquidity products. Asset managers benefit from enhanced distribution capabilities and access to a broader investor base. Market infrastructure providers, including custodians, transfer agents, FinTech platforms, and CCPs, are essential in facilitating the technological and operational transition. Institutional investors, such as corporate treasurers and fund allocators, gain significant advantages through improved liquidity management and potentially higher yielding, more secure cash management solutions.[272] Lastly, regulators and policymakers play a crucial role, engaging with these innovations to balance the benefits of enhanced market efficiency against the overarching goals of maintaining financial stability and investor protection.

267. World Economic Forum, "Asset Tokenization in Financial Markets: The Next Generation of Value Exchange", May 2025.
268. Ibid.
269. Linh Tran, "Key Insights from 'Tokenized Funds: The Third Revolution in Asset management Decoded'", 2025.
270. BCG, "Tokenized Funds – The Third Revolution in Asset Management Decoded", October 2024.
271. Ibid.
272. Ibid.

2024 Market Activity: Facts and Figures

Tokenized fund offerings gained significant momentum in 2024, moving from small pilots into broader market activity. By late 2024, the aggregate assets under management AUM in tokenized funds exceeded **$2 billion** globally.[273] This figure, while still a tiny fraction of the multi-trillion-dollar fund industry, reflects rapid growth from virtually zero just a few years prior. Notably, this AUM was spread across several major fund managers – a handful of large asset management firms launched tokenized funds (including money market or short-duration funds) that collectively reached the $2 billion milestone.[274] In one example, a leading global asset manager (Blackrock) introduced a tokenized U.S. dollar liquidity fund in 2024 that attracted over **$500 million in assets within a few months** of launch.[275] By early 2025, that fund's AUM had surpassed **$1 billion**, underscoring the accelerating interest once such products come to market.[276] These early entrants suggest growing demand, especially among institutional and digital native investors, for the convenience and features offered by on-chain funds.[277] Importantly, activity has not been confined to one region; **multiple jurisdictions saw high-profile tokenized fund initiatives in 2024**. For instance, in Europe a major asset manager launched its first tokenized fund, while in Asia and the US, large firms partnered with FinTech platforms to put money market funds on DLT infrastructure.[278] Several **global banks and custodians also participated** in these projects, either as tokenization service providers or by facilitating distribution on proprietary networks.[279]

In terms of asset focus, **money market funds have been a focal point** for tokenization. Tokenized MMFs allow nearly instant redemption and usage of shares, effectively bridging traditional cash management with digital rails. Beyond MMFs, 2024 also saw tokenization applied to other fund types such as private equity and private credit but **tokenized cash and liquidity funds led the activity** due to clear demand for on-chain cash equivalents.[280] Broadening participation, coupled with an estimated **85% year-over-year growth** in the overall tokenized real-world asset market (reaching about $15 billion excluding stablecoins in 2024), signals that fund tokenization is quickly moving past the proof-of-concept stage and into a scaling phase.[281] Still, it bears noting that **$2 billion AUM is a very small fraction** of even the U.S. money fund sector (roughly $7 trillion in assets).[282] Thus, tokenized funds remain in an early – albeit rapidly evolving – stage of adoption.

Frictions in Traditional Money Market Funds

Enthusiasm for tokenizing funds arises from key inefficiencies in the traditional MMF model. A major friction is operational latency, with typical settlement cycles of T+1 or T+2 days delaying liquidity and increasing counterparty risk. Even after adopting T+1 settlement in markets such as the U.S., cross-border transactions remain slow due to differing time zones and processing schedules, causing inconvenience and risk for institutional treasurers.[283]

Another significant challenge is reconciliation burdens. Today's process involves multiple intermediaries, each maintaining separate ledgers and relying on fragmented, message-based communications. This creates errors, additional costs, and a lack of real-time visibility, with no single definitive ownership record.[284]

Liquidity and trading flexibility are further constrained. Investors can redeem MMF shares only during business hours and through specific channels, limiting intraday and after-hours access. Fund pricing typically occurs just once daily, resulting in outdated valuations.[285] Operational and compliance costs are elevated by manual administrative processes, including shareholder management, transaction handling, and compliance checks such as KYC/AML. Regulatory measures like liquidity fees and redemption gates are cumbersome under current infrastructure. Overall, traditional fund management involves slow processing, operational complexity, fragmented data, and limited flexibility—areas tokenization aims to address through enhanced speed, transparency, and automation.[286]

273. Ibid.
274. Ibid.
275. Ibid.
276. MarketsMedia, "BlackRock Tokenized Fund Surpasses $1bn in AUM", March 2025.
277. BCG, "Tokenized Funds – The Third Revolution in Asset Management Decoded", October 2024.
278. The Investment Association, "Tokenized Funds", 2025.
279. Ibid.
280. BCG, "Tokenized Funds – The Third Revolution in Asset Management Decoded", October 2024.
281. Linh Tran, "2024: The Year of Institutional Real World Asset Tokenization", 2025.
282. "Release: Money Market Fund Assets | Investment Company Institute", June 2025.
283. BCG, "Tokenized Funds – The Third Revolution in Asset Management Decoded", October 2024.
284. Ibid.
285. Ibid.
286. Duncan Moir, "How Tokenization and Blockchain is Changing Money Market Funds", January 2024.

Implications of DLT and Tokenization for Funds

Adopting DLT and tokenization in fund deployments offers clear benefits, alongside notable challenges. Early implementations significantly reduce settlement times—from days to seconds—enabling T+0 settlement and lowering counterparty risks.[287] Tokenized funds also support continuous trading beyond traditional market hours, enhancing liquidity and flexibility. Transparent, blockchain-based ledgers provide regulators and participants with near-instant visibility of transactions, improving oversight. Automation through smart contracts simplifies corporate actions, compliance checks, and dividend distributions, reducing errors and administrative costs. Tokenized funds can integrate seamlessly with digital financial services, allowing investors to use shares as collateral or in decentralized finance applications.[288]

Despite these advantages, considerable limitations persist. Tokenized funds currently target limited, mostly institutional markets, resulting in lower liquidity. Many claimed efficiencies remain theoretical and have not yet been validated at scale.[289] Technical challenges, particularly interoperability between various DLT platforms and legacy systems, create fragmentation. Additionally, the absence of widely accepted regulated stablecoins or central bank digital currencies hampers seamless on-chain settlements.[290] Regulatory uncertainties across jurisdictions further complicate cross-border tokenization efforts.[291] Finally, operational risks, including cybersecurity threats and governance issues related to managing digital assets, highlight the need for careful oversight as adoption grows.[292]

In summary, the use of DLT for fund tokenization in 2025 has begun to **demonstrate real improvements –** faster settlement, better transparency, automated workflows, and expanded functionality of fund shares. These benefits align well with the policy goals of more efficient and resilient market infrastructure. However, this innovation also comes with **important caveats**. The technology is developing and **scaling:** current projects are essentially pilot-scale, and **broader adoption will depend on resolving interoperability, establishing regulatory clarity, and proving demand** beyond niche investors.[293] policymakers and industry participants are watching these developments closely. If the challenges can be addressed, tokenized funds could potentially transform fund markets much as ETFs did a few decades ago. In the meantime, a cautious, fact-based approach is warranted. The following sections of this report will delve deeper into these trends, providing data and analysis on the evolving tokenized funds landscape of 2025.

287. BCG, "Tokenized Funds – The Third Revolution in Asset Management Decoded", October 2024.
288. Ibid.
289. FSB, "Financial Stability Implications of Tokenization", October 2024.
290. Ibid.
291. Ibid.
292. Ibid.
293. Ibid.

Tokenized Funds Use Case #1: Franklin Templeton OnChain U.S. Government Money Market Fund (FOBXX)

Overview of Use Case

Franklin Templeton's **Franklin OnChain U.S. Government Money Fund (FOBXX)** is a pioneering use of DLT in a traditional financial product. It is a U.S.-registered government money market fund whose share ownership is recorded on blockchain networks, making it the **first mutual fund to use a public blockchain as its system of record**.[294] Franklin Templeton, a global asset manager with over $1.5 trillion in assets, launched this fund in 2021 as a proof-of-concept for blockchain-based mutual fund operations.[295] In essence, FOBXX functions like a conventional money market fund – investing primarily in U.S. government securities and maintaining a stable $USD1.00 share price – but **investors interact with it through digital tokens and wallets instead of paper share certificates or traditional accounts.**[296]

How the use case works in practice: Investors can access FOBXX via Franklin Templeton's dedicated mobile application **Benji Investments**, or through an institutional web portal.[297] After completing compliance onboarding, an investor funds their account either by depositing U.S. dollars (via bank transfer) or by converting **USDC stablecoin into FOBXX fund shares** within the app.[298] Each share of the fund is represented by a digital token (often referred to as the **"BENJI" token**) **on a blockchain**, which are fund shares. When an investor purchases shares, the fund's transfer agent issues the equivalent BENJI tokens to the investor's blockchain wallet. **FOBXX's portfolio managers then invest the cash in a conservative portfolio of government-backed assets (e.g., U.S. Treasury bills, government agency debt, and fully collateralized repurchase agreements) to generate a money market yield.**[299] The workflow thus involves traditional fund management on the back end, with a blockchain-based ownership record on the front end. Key participants include Franklin Templeton (as the fund sponsor and manager), the fund's transfer agent (maintaining the official share ledger on blockchain), the investors (retail and institutional), and the public blockchain networks that host the tokenized shares.

Workflow and user experience: Once shares are purchased and tokenized, investors hold their FOBXX tokens in a **digital wallet** linked to the Benji app. They can monitor their balance and earned yield through the app, which reflects live data from the blockchain. Notably, Franklin Templeton recently enabled **peer-to-peer on-chain transfers** of the fund tokens: **investors may send FOBXX tokens directly to another whitelisted investor's wallet without going through traditional intermediaries**.[300] This is a significant innovation – it brings mutual fund shares closer to the transferability of cash or stablecoins, while still preserving regulatory controls. In practice, an investor could, for example, pay another party by transferring FOBXX tokens to them, after which the recipient can either hold the tokens (earning daily yield) or redeem them for cash via the fund. Redemption works much like a normal MMF: an investor instructs the fund (through the app) to redeem some or all tokens, and the fund pays out the equivalent amount in fiat USD to the investor's bank, or potentially in USDC if the investor prefers digital settlement (the latter was facilitated by integrating USDC on-ramps in the app).[301] All purchase and redemption requests are processed during normal business hours on business days, aligning with the traditional daily liquidity cycle of mutual funds (transactions are queued and settled at the end of the day at the $USD1.00 net asset value).[302]

Benji Investments mobile app and web interface, which investors use to access FOBXX and other tokenized assets. The fund's digital platform allows investors to manage their shares in a user-friendly way. Through the app, **users can purchase FOBXX shares, view their portfolio** (with real-time fund balance and accrued income), and initiate transfers or redemptions. This mobile-first, blockchain-enabled approach lowers barriers to entry and helps bridge traditional investors into the world of on-chain finance, while still offering the familiar benefits of a regulated money market fund (stability, liquidity, and transparency).

Quantitative insights and milestones: Since its inception, FOBXX has seen steady growth and expanding functionality. The fund launched in April 2021 on the Stellar blockchain with a limited set of investors.[303] By April 2023, Franklin Templeton reported operational success and extended the fund's reach to the Polygon network (an Ethereum Layer-2), to tap into the broader Ethereum ecosystem and improve interoperability.[304] At that time, the fund was still relatively small, but growing. **In 2023–2024, Franklin Templeton aggressively expanded the fund's multi-chain support: adding Arbitrum (another**

294. Avalanche, "Franklin Templeton Launches Tokenized Money Market Fund BENJI on the Avalanche Network", August 2024.
295. Ibid.
296. Franklin Templeton, Frankin Onchain U.S. Government Money Fund Prospectus, January 2025.
297. Ibid.
298. Ibid.
299. Ibid.
300. Ibid.
301. Avalanche, "Franklin Templeton Launches Tokenized Money Market Fund BENJI on the Avalanche Network", August 2024.
302. U.S. Securities and Exchange Commission, "*Franklin Templeton – Form N-1A Registration Statement*", Filed January 3, 2025.
303. Avalanche, "Franklin Templeton Launches Tokenized Money Market Fund BENJI on the Avalanche Network", August 2024.
304. Franklin Templeton, "Franklin Templeton Money Market Fund Launches on Polygon Blockchain", April 2023.

Ethereum scaling network) in mid-2024,[305] **Avalanche in August 2024,**[306] **Aptos (a non-EVM Layer-1 blockchain) in late 2024,**[307] **and Base (Coinbase's Layer-2 network) in October 2024.**[308] By early 2025, **FOBXX was also available on Solana**, reflecting demand to support a high-performance blockchain environment.[309] Throughout this timeline, Stellar has remained the default record-keeping blockchain where most retail accounts reside, but the optionality to issue and/or transfer tokens to other networks was introduced.[310]

Alongside network expansion, the fund's AUM have grown markedly. **FOBXX reached about $USD420 million in net assets by mid-2024**,[311] then **surpassed $USD740 million by mid-2025**.[312] This makes it the **second-largest tokenized money market fund as of 2025**.[313] The broader tokenized money fund market (across all providers) has been expanding — roughly **$USD1.8 billion in combined assets by August 2024 —** indicating growing investor appetite for blockchain-based mutual funds and cash management products.[314] In terms of usage volume, Franklin Templeton has not publicly disclosed daily transaction counts, but the enablement of peer-to-peer transfers and multi-chain activity suggests an uptick in on-chain transaction volume as the fund scaled. Each new chain integration was a milestone not only for Franklin Templeton but also for the blockchain networks: for instance, the launch on Base was the first tokenized fund on that network,[315] and the launch on Arbitrum was touted as a "stamp of approval" that U.S. regulators are comfortable with L2 blockchains for recordkeeping.[316] These milestones underline how FOBXX's development has balanced innovation with compliance, gradually increasing functionality (such as adding wallet interoperability and support for user-managed keys) while staying within the boundaries of traditional mutual fund operations.

In summary, the Franklin OnChain U.S. Government Money Fund demonstrates a compelling **use case of DLT in asset management:** it delivers the low-risk yield and liquidity of a government money market fund, packaged with the efficiencies and flexibility of blockchain technology. The use case functions through a **hybrid model** – traditional in its investment strategy and regulatory structure, but novel in its **tokenized share ledger and peer-to-peer transaction capabilities**. Franklin Templeton's role has been critical as the trusted financial institution deploying this product, ensuring that despite the high-tech underpinnings, investors receive the expected safeguards and service of an institutional-grade fund. Publicly available figures attest to the success so far: USD hundreds of millions in AUM, thousands of transactions, and a growing base of users who are effectively interacting with a mutual fund through their digital wallets – a use-case of how blockchain could modernize capital market workflows.[317]

Settlement Asset

Settlement asset: The asset being transacted in this system is the **tokenized share of the money market fund**, effectively a digital representation of a USD-denominated mutual fund share. Each BENJI token corresponds to one share of FOBXX and is designed to maintain a stable value of approximately USD1.00 (since the fund uses amortized cost accounting to stabilize its NAV).[318] In practical terms, the BENJI token is like a tokenized dollar that carries the legal and economic rights of a mutual fund share. When two parties settle a transfer on the blockchain, what changes hands is this fund share token. The underlying settlement medium for fund subscriptions and redemptions remains fiat currency: investors ultimately invest U.S. dollars (or USDC which the platform converts into U.S. dollars) to buy the tokens and can redeem tokens back into U.S. dollars. However, on a peer-to-peer level, **transferring FOBXX tokens is akin to settling with a tokenized fiat instrument**, since each token is backed by a correspondingly valued share in a cash-equivalent fund portfolio (albeit, in contrast to a fiat instrument, subject to the balance from to time and security of the fund's custodian). No separate stablecoin or cash token is needed for on-chain transfers – the token itself is the settlement asset representing a claim to the assets (from time to time) in the fund's custodial account.

305. Cointelegraph, "Franklin Templeton's tokenized money fund launches on Arbitrum", August 2024.
306. Avalanche, "Franklin Templeton Launches Tokenized Money Market Fund BENJI on the Avalanche Network", August 2024.
307. Cointelegraph, "Franklin Templeton's onchain money fund goes live on Aptos blockchain", October 2024.
308. Cointelegraph, "Franklin Templeton launches tokenized money fund on Base", October 2024.
309. CoinDesk, "Franklin Templeton Expands $594M Market Money Fund to Solana", February 2025.
310. Franklin Templeton, Frankin Onchain U.S. Government Money Fund Prospectus, January 2025.
311. Cointelegraph, "Franklin Templeton's tokenized money fund launches on Arbitrum", August 2024.
312. CoinDesk, "Franklin Templeton Expands $594M Market Money Fund to Solana", February 2025.
313. Ibid.
314. Avalanche, "Franklin Templeton Launches Tokenized Money Market Fund BENJI on the Avalanche Network", August 2024.
315. Cointelegraph, "Franklin Templeton launches tokenized money fund on Base", October 2024.
316. Cointelegraph, "Franklin Templeton's tokenized money fund launches on Arbitrum", August 2024.
317. Franklin Templeton, "Franklin Templeton Money Market Fund Launches on Polygon Blockchain", April 2023.
318. Ibid.

Settlement finality mechanisms: Finality in FOBXX is achieved directly on-chain, where tokens issued on a public blockchain serve as the authoritative system of record ("**SOR**") for share ownership. Once a transaction is validated and recorded to the blockchain, it is considered legally and operationally final, eliminating the need for downstream reconciliation or duplication in internal systems. Unlike some traditional fund structures that rely on internal ledgers mirrored by blockchain records, FOBXX operates under a native digital issuance model, where the blockchain itself reflects definitive ownership. The blockchain-integrated recordkeeping system ensures that tokens represent actual ownership, while personally identifiable information ("**PII**") is securely maintained in a separate off-chain database by the Transfer Agent. This design enhances transparency, reduces operational risk, and enables a higher degree of settlement finality consistent with regulatory expectations and the evolving role of DLT in capital markets.[319]

A critical component of settlement finality here is the ability to **reverse or correct transactions under exceptional circumstances**, something not available in typical public blockchain transactions. Franklin Templeton has implemented administrative features in the smart contract/token design so that **the transfer agent can unilaterally control and rectify the ledger if needed**.[320] For example, if an erroneous transaction occurs or if a transfer to an unauthorized wallet somehow transacted the transfer agent can **burn (i.e. cancel) the mistakenly issued tokens or reassign tokens as necessary** to correct the record.[321] This ensures that legal finality aligns with an error mitigation capabilities, protecting investors. In normal conditions, this power is not used – a routine token transfer between two valid investors will be final on-chain and respected as final by the fund. But the existence of an "undo" mechanism governed by the transfer agent means that **ultimate settlement finality is achieved when the transfer agent affirms the transaction**. This approach marries the blockchain's speed and transparency with the **legal assurance that there is no detriment to investor interests by an irrecoverable error**. From a technical perspective, once a token is in an investor's wallet, they have control to initiate further transfers. However, **every wallet is associated with a known investor's identity in the transfer agent's system**, preventing unauthorized or non-compliant settlements from taking place. Thus, settlement finality is a blend of **blockchain consensus finality plus a layer of oversight** – the transfer agent can consider a transfer final for legal purposes once it is irreversible on-chain *and* passes any compliance checks, at which point the official share register is updated.

Legal structure and investor rights: The Franklin OnChain U.S. Government Money Fund is organized as a **regulated mutual fund** (an open-end investment company under the Investment Company Act of 1940 (the "Investment Company Act")). Investors in FOBXX tokens are legally shareholders of the Franklin Templeton fund, with all the rights and protections that entails. This means that a token holder's rights include: **the right to redeem shares on demand at NAV** (which the fund strives to keep at USD1),[322] **the right to receive dividends** (the fund accrues income from its investments, typically paid as additional shares to maintain the USD1 price), and **voting rights on certain fund matters**. For instance, shareholders can vote to elect the fund's board of trustees or approve material changes, as detailed in the fund's offering documents (the trust uses a typical mutual fund governance structure with proportional voting power by share count).[323] The **ownership claim is pro-rata on the fund's underlying assets**: since it is a government money market fund, each share (token) represents an interest in a pool of short-term U.S. government securities and cash. Importantly, **investors benefit from the regulatory protections of Rule 2a-7 of the Investment Company Act**, which imposes high liquidity requirements and credit quality standards to reduce risk. For example, the fund must hold at least 10% of its assets in daily liquid instruments and 30% in weekly liquid assets, and invest only in very short-term, high-quality debt (money-market funds are subject to 60-day weighted average maturity and 120-day weighted average life caps).[324] These rules are designed to ensure that even if many investors redeem at once, the fund can meet withdrawals without breaking the USD1 NAV. Token holders thus have **legal assurance of liquidity and asset quality** similar to any traditional money market fund investor.

The **legal structure ensures clarity of investor protections**. The tokens do not represent a claim on the blockchain protocol or any crypto-assets; they represent a claim on a **registered MMF**. Jurisdictionally, the fund is established in the United States (Delaware statutory trust or similar structure) and falls under U.S. law. Any disputes or legal questions would be handled in U.S. courts under securities law and contract law applicable to the fund's shareholder agreements. Token holders have the same legal standing as if they were on the fund's traditional share register. Notably, the fund's documents clarify that U.S. securities laws govern the relationship between the fund and investors, and that using blockchain for share

319. U.S. Securities and Exchange Commission, "*Franklin Templeton – Form N-1A Registration Statement*", Filed January 3, 2025.
320. Ibid.
321. Ibid.
322. Franklin Templeton, "Franklin Templeton Money Market Fund Launches on Polygon Blockchain", April 2023.
323. U.S. Securities and Exchange Commission, "*Franklin Templeton – Form N-1A Registration Statement*", Filed January 3, 2025.
324. Ibid.

records **does not change the fund's legal obligations or the shareholders' rights** – it is simply a different medium of recordkeeping. For additional investor safety, Franklin Templeton's transfer agent is a regulated entity that by law must exercise care in maintaining accurate shareholder records and safeguarding assets. The integration of blockchain within the structure required the transfer agent to build in compliance features: for example, every investor's wallet is whitelisted and linked to verified identity, and certain types of accounts (such as retirement accounts or omnibus intermediaries) are not allowed to use the tokenized platform to avoid complexity or regulatory uncertainty.[325] This ensures that **each token is always associated with a legally recognized account holder** in the fund's records, preserving the chain of legal ownership.

In terms of **settlement asset legal classification**, the BENJI token is deemed a **security (fund share)**, not a currency. This is important for legal finality and rights: holders are protected by securities law (anti-fraud provisions, disclosure requirements, etc.), and the tokens can only be traded or transferred in compliance with securities regulations. Franklin Templeton's approach essentially wraps a traditional security in a digital token form. Thus, token holders do not have to worry about issues such as the token being considered a "deposit" or "commodity" – it is clearly a share of a regulated fund. **Final settlement of a transaction legally occurs when the transfer agent registers the new owner of the share**. Because the transfer agent's system is integrated with a blockchain, this registration is instantaneous following an on-chain transfer. The **combination of technical finality and legal finality gives investors confidence that when they transact in FOBXX tokens, they are receiving a legally robust settlement:** once an investor's wallet shows the tokens and the transfer agent's ledger aligns, the investor has an enforceable ownership claim that cannot be unilaterally reversed by a counterparty.

In summary, FOBXX uses a **tokenized settlement asset (fund share token)** that settles on-chain with near-instant finality, where tokens issued on blockchains serve as the system of record. Investors enjoy the **same rights and protections as traditional mutual fund shareholders.** The legal structure (a U.S. Investment Act fund) underpins trust in the settlement asset.

Interoperability and Network Architecture

DLT network type and design: Franklin Templeton's FOBXX operates on a **hybrid public-permissioned blockchain model.** The fund leverages public blockchains (meaning the networks themselves are open and decentralized to varying degrees) but imposes permissioned access for holding and transferring the specific fund tokens. Initially, the fund launched on the **Stellar network**, a public blockchain known for fast and low-cost transactions. Stellar serves as the **primary ledger** for most FOBXX tokens in circulation.[326] Over time, Franklin Templeton extended support to *additional blockchain networks* to enhance interoperability: **Ethereum (and EVM-compatible chains)** such as Polygon and Arbitrum, other Layer-1s such as **Avalanche**, **Solana**, and **Aptos**.[327] Each of these blockchains is **public**; transactions can be seen by anyone and the network is not controlled by a single entity, but Franklin Templeton runs a **permissioned token smart contract** on each. Only authorized addresses (wallets of investors who have passed compliance checks and are entered in the fund's registry) can hold or transact the FOBXX tokens on these networks.

The multi-network blockchain means **FOBXX is blockchain-agnostic in principle** – the fund's share tokens exist as **parallel representations on multiple ledgers**, all managed by the fund's transfer agent to ensure the total supply across all networks equals the fund's shares outstanding. The **network architecture** involves smart contracts or token programs on each blockchain that implement the fund share token with specific controls. For example, on Ethereum and Polygon, FOBXX likely uses an ERC-20 smart contract with modifications (administration roles to allow mint/burn and to enforce transfer restrictions). On Stellar, a blockchain which does not use smart contracts in the same way, the token may be configured as a native asset with certain issuer flags (Stellar allows an issuer to require approval for transfers, etc., which aligns with permissioned operation).[328] Each network's token contract is linked to Franklin Templeton's systems, so that **when shares are issued or redeemed, or moved between networks, the appropriate contract is instructed to mint or burn tokens** accordingly.[329]

325. Ibid.
326. CoinDesk, "Franklin Templeton Expands $594M Market Money Fund to Solana", February 2025.
327. Ibid.
328. U.S. Securities and Exchange Commission, "*Franklin Templeton – Form N-1A Registration Statement*", Filed January 3, 2025.
329. Ibid.

Consensus mechanisms and performance: Because FOBXX spans different blockchains, it benefits from their diverse consensus algorithms and performance characteristics:

- **Stellar:** Uses a federated consensus model (Stellar Consensus Protocol) with validator nodes. It offers **fast finality (to the order of 3-5 seconds)** and negligible transaction fees, which is ideal for high-frequency or small transactions. Stellar's design prioritizes speed and has built-in features for asset issuance, which may have influenced Franklin's choice to use this blockchain initially.

- **Ethereum (Mainnet and Layer-2s such as Polygon, Arbitrum, and Base):** Ethereum Mainnet now uses Proof of Stake (with finality typically within a few minutes or less), but its gas (i.e., transaction) fees are high and throughput limited. Franklin Templeton **acknowledges this by setting a very high minimum investment for using Ethereum Mainnet (about $USD5 million) due to cost considerations**.[330] Instead, they emphasize **Layer-2 networks**: Polygon (which uses a Proof-of-Stake sidechain and commit scheme), Arbitrum and Base (which are rollups inheriting Ethereum security). These Layer 2s **provide much higher scalability and lower costs**. For instance, Polygon's fees are very low, and it has a high TPS capacity; Arbitrum and Base bundle many transactions into one, reducing cost per transaction. The **choice of Polygon in 2023 was to tap into Ethereum's broad ecosystem while avoiding Mainnet's bottlenecks**.[331]

- **Avalanche:** A high-speed Layer-1 using its Avalanche consensus protocol, which achieves **sub-second finality** and high throughput.[332] Avalanche's C-Chain (EVM-compatible chain) is likely where FOBXX tokens reside, giving them the benefit of Ethereum-like smart contracts but with faster settlement. Avalanche was chosen, as Franklin noted, for its **EVM compatibility, low latency, and customizable subnets** (although FOBXX operates on the main chain, not a subnet).[333]

- **Solana:** A high-performance Layer-1 blockchain using Proof of Stake and Proof of History consensus, capable of thousands of TPS with ~1 second or less block times. Solana's addition in 2025 suggests Franklin Templeton wanted access to an even broader base of cryptoasset users (Solana is popular for its DeFi and trading communities) and to leverage its speed. Solana does not use the EVM, so supporting it meant deploying a token program specifically for Solana (likely using Solana's SPL token standard, again with some authority control).

- **Aptos:** A newer Layer-1 blockchain that uses a variant of Byzantine Fault Tolerance consensus and the Move programming language. Aptos aims for high throughput (tens of thousands of TPS theoretically) and was appealing enough for Franklin Templeton to integrate in 2024.[334] Aptos is non-EVM, which shows Franklin's commitment to **interoperability across different technology stacks** (they have not limited the product just Ethereum-based blockchains).

Despite the variety of blockchains etc, Franklin Templeton manages this through a **unified governance model** for the token. The **governance model** here refers to how decisions are made about the token's operation and which networks to support. Franklin Templeton as the fund manager and transfer agent effectively has centralized governance over the token issuance and features (investors do not vote on technical matters of the token; their voting rights are about the fund's investment policies, not the IT implementation). Franklin Templeton can decide to add a new blockchain network, as it did with approvals in 2023-2025 for each addition, based on internal assessments and presumably regulatory comfort. Each new network is evaluated for security, reliability, and compliance. For example, **when adding Polygon and Arbitrum, Franklin Templeton noted those networks' maturity and adoption in the Ethereum ecosystem**.[335] Likewise, the decision to use **Stellar as primary blockchain** was likely due to its built-in compliance features and low cost, which are well-suited for being the "home" ledger for many small retail accounts (minimum investment on Stellar is only $USD20).[336] In contrast, networks such as Ethereum or Avalanche have higher barriers (Ethereum's $USD5M minimum, and Avalanche's $USD100k minimum) to ensure only appropriately sized accounts deal with potentially higher fees.[337] This governance approach aligns the network choice with user profiles, achieving scalability without burdening all users with, say, Ethereum fees.

Interoperability mechanisms: A standout feature of FOBXX is **interoperability across blockchains**. Franklin Templeton achieved this without relying on external bridges or wrap/synthetic tokens; instead, the transfer agent serves as the "bridge authority." If an investor wants to migrate their token holdings from one blockchain to another (say, from Stellar to Ethereum), they can request this through the platform. The **process (as described in filings) involves burning the tokens on the source chain and minting new tokens on the destination chain** in the same amount.[338] For example, an investor holding 100 FOBXX tokens on Stellar could have those 100 tokens retired (burnt)on Stellar and then receive 100 tokens (minted) on

330. Ibid.
331. Franklin Templeton, "Franklin Templeton Money Market Fund Launches on Polygon Blockchain", April 2023.
332. Avalanche, "Franklin Templeton Launches Tokenized Money Market Fund BENJI on the Avalanche Network", August 2024.
333. Ibid.
334. Cointelegraph, "Franklin Templeton's onchain money fund goes live on Aptos blockchain", October 2024.
335. Franklin Templeton, "Franklin Templeton Money Market Fund Launches on Polygon Blockchain", April 2023.
336. U.S. Securities and Exchange Commission, "*Franklin Templeton – Form N-1A Registration Statement*", Filed January 3, 2025.
337. Ibid.
338. Ibid.

Polygon, with no change in their ownership stake.[339] *No dual claims are created*: at any given time, each share exists on only one network at the time. This controlled interoperability avoids the complexities and risks of third-party token bridges (which can be targets of hacks). It's essentially an administrative transfer – while the blockchains themselves are not directly interoperable, Franklin Templeton's system ensures a smooth off-chain coordination to achieve cross-chain movement of assets.

From the user perspective, interoperability means **more flexibility and potentially more integration opportunities**. If a user wants to utilize FOBXX tokens in an Ethereum DeFi application, they would prefer to hold them on Ethereum or an EVM chain. In contrast, if the user wants cheaper, faster transactions, they might stay on the Stellar or Base blockchain. Franklin's design caters to both. It's worth noting that the **tokens on different networks are fungible in the sense that each represents a share of the same fund**, but technically they are separate instantiations (e.g., an ERC-20 token vs. a Stellar token). Franklin Templeton mitigated any confusion by using the same ticker and name across networks and by tightly controlling the supply on each.

Network governance and security: Each underlying blockchain has its own governance (e.g., Ethereum's community, Solana's validators, etc.), which is outside Franklin Templeton's control. This raises the question of how the fund handles blockchain-specific events: for example, what if a blockchain undergoes a fork or a major outage? The fund's documentation addresses this in the "risk factors" section. Since the **transfer agent can pause or halt transactions if needed**, they could choose to suspend recognition of a particular blockchain's transactions during a fork until clarity is achieved. The **primary record on Stellar** might serve as a reference in extreme cases (Stellar itself could fork, but it has a different consensus model with less forking typically). By participating on multiple networks, the fund also gains a form of redundancy: if one network is down or congested, investors could move (or be moved) to another network to transact (although that is predicated on being able to access the first network to burn tokens – an outage might temporarily lock tokens on that chain). In extreme cases, holdings can be migrated from a failing network to an alternative network, with the original network no longer recognized by the transfer Agent. This approach provides a form of "super redundancy," enabling even severe public blockchain failures to be mitigated—often with less complexity than the routine migration between traditional relational database systems ("RDMS") used for legal systems of record.

In terms of **scalability**, the multi-blockchain approach is quite powerful. The combined throughput of Stellar + Polygon, Arbitrum, and others is enormous, far beyond what a single blockchain could handle. Franklin Templeton likely does not need that level of scale yet (the volume of transactions for a single fund, even with thousands of investors, is not extremely high), but it future-proofs the platform. As more funds or more users come on board, they could distribute load across networks. It also helps to manage transaction costs for users. For instance, smaller retail investors are auto-directed to Stellar by default (to minimize their costs), whereas an institutional investor who might want to custody tokens in their own Ethereum wallet can do so if they meet the minimum size (and presumably are willing to bear gas costs).[340] This **aligns network choice with user needs** in a pragmatic way.

Interoperability with traditional systems: The architecture of FOBXX is designed to align with traditional capital market infrastructure where necessary. The **fund's custody of actual assets (i.e., cash, and Treasuries)** remains in traditional institutions – a custodian bank holds the U.S. government securities and cash in the fund's portfolio (as mandated by the Investment Company Act). The existence of tokens does not alter that; it only changes how ownership of the fund is tracked and transferred. Similarly, the **fund's accounting, valuation of assets, and NAV calculation occur off-chain** in the usual manner (the fund administrator calculates income and ensures $USD1.00 NAV maintenance, etc., each business day). Once the NAV and dividend factors are determined, they can be applied on-chain by adjusting token balances (e.g., if interest is paid daily, new fractional tokens might be issued to each holder to represent the accrued interest – or the fund could simply accrue internally and increase NAV. However, since they maintain a constant $USD1 value, it is likely they periodically credit additional shares/tokens as dividends).

The **transfer agent's blockchain system** keeps track of who owns what. The SEC was comfortable with this setup, indicating that from a regulatory standpoint the blockchain ledger is an acceptable alternative to, say, a Transfer Agent's SQL database.[341]

In terms of aligning or diverging from *digitally native design*: FOBXX is not a fully decentralized, autonomous financial instrument (unlike, say, a purely on-chain stablecoin or a DeFi lending pool). it is a hybrid. It aligns with traditional finance by requiring investor identity verification, operating within regulatory constraints, having off-chain governance (by a centralized manager and board), and using real-world assets as backing. At the same time, it adopts a digitally native approach by issuing tokens

339. Ibid.
340. Ibid.
341. Cointelegraph, "Franklin Templeton launches tokenized money fund on Base", October 2024.

on blockchains that are the fund's share ownership, enabling self-custody (investors control their own tokens/wallets), using smart contracts for instantaneous settlement, and potentially being composable with other blockchain services (although within limits set by compliance). This careful architecture shows a **close alignment with traditional financial safeguards (through the legal structure and centralized oversight) while embracing the efficiency and openness of DLT networks**. In essence, Franklin Templeton built a mini capital market infrastructure for its fund: **a permissioned token on a public network that parallels the role of a transfer agent, exchange, and central securities depository all in one**. This could be a blueprint for how traditional funds integrate with blockchain – keeping the familiar roles but changing the medium.

Finally, it is worth noting **interoperability with users' existing crypto holdings**: by accepting USDC and operating on networks such as Ethereum, FOBXX can plug into the existing digital asset ecosystem. For example, an investor already holding USDC can seamlessly move into FOBXX via the app (the USDC is likely converted to fiat currency and invested in the fund).[342] In the future, if allowed, an investor might even be able to use FOBXX tokens as collateral in a crypto borrowing platform or trade them on a digital exchange. Those use cases are nascent and depend on regulatory approval, but **the technical groundwork (tokens on interoperable chains) is laid**. Franklin Templeton has indicated future plans for features such as secondary market trading and collateral mobility for the fund tokens, which would further increase interoperability with the wider financial system (e.g., using FOBXX tokens in repo or as loan collateral).[343] Any such steps will be taken carefully, aligning with the fund's conservative nature and compliance requirements.

Conclusion

Franklin Templeton's FOBXX stands as a **groundbreaking, but carefully constructed DLT use case in capital markets**. It showcases that distributed ledgers can be integrated into regulated financial products to improve efficiency and broaden access, all while maintaining robust investor protections. The use case's success so far – measured by growing assets, expanding technology integrations, and regulatory acceptance – suggests that similar models could be adopted for other funds and financial instruments. The chapter of FOBXX is still being written, with ongoing developments in interoperability and potential regulatory evolutions. Nonetheless, it provides a powerful case study in how a financial institution can deploy blockchain technology to modernize a traditional product, balancing innovation with compliance. Franklin Templeton has effectively bridged the gap between **traditional money market fund investing and the digital asset ecosystem**.[344]

342. Avalanche, "Franklin Templeton Launches Tokenized Money Market Fund BENJI on the Avalanche Network", August 2024.
343. Ibid.
344. Franklin Templeton, "Franklin Templeton Money Market Fund Launches on Polygon Blockchain" April 2023.

Tokenized Funds Use Case #2: BlackRock USD Institutional Digital Liquidity Fund ("BUIDL")

Overview of Use Case

BlackRock's **BUIDL** – the *BlackRock USD Institutional Digital Liquidity Fund* – is a pioneering use case of DLT in traditional asset management. Launched in March 2024 on the Ethereum blockchain, BUIDL is a tokenized short-term U.S. treasury fund that allows qualified investors to hold and transfer shares of a USD liquidity fund as digital tokens.[345,346] The fund is managed by BlackRock (the world's largest asset manager) and tokenized by **Securitize**, a regulated tokenization platform that serves as the fund's transfer agent and distributor.[347] In practice, BUIDL functions much like a traditional treasury fund – investing in high-quality, short-term instruments – but with the added capabilities of blockchain-based settlement and the potential for 24/7 transferability. Key characteristics of this use case include its rapid growth, institutional scale, and integration with both FinTech and traditional finance infrastructure, as detailed below:

- **Launch and Scale:** BlackRock unveiled BUIDL as its first tokenized fund on a public blockchain in March 2024.[348] Within six weeks of launch, BUIDL became the world's largest tokenized fund, capturing nearly 30% of the tokenized U.S. Treasury market and reaching over **$650 million** in assets.[349] Growth continued through 2024 and early 2025 – by March 2025 BUIDL's AUM had **surpassed $1.7 billion**, and recently reached nearly $2.9 billion by June 2025.[350]

- **Participants and Workflow:** The fund is offered to investors primarily to institutional investors.[351] The minimum initial investment is $5 million. Investors subscribe to the fund through Securitize's online platform, undergoing full **KYC/AML verification** and accreditation checks.[352] Upon subscribing, an investor transfers in U.S. dollars (or potentially USDC stablecoins) and receives **BUIDL tokens** representing shares in the fund. BlackRock manages the underlying portfolio, while **BNY**, as custodian and administrator, holds the fund's assets and helps bridge the fund to traditional systems.[353] Investors can hold BUIDL tokens in various custody setups – for example, with digital asset custodians such as **Anchorage Digital Bank, BitGo, Coinbase Custody, or Fireblocks**, all of whom were early DLT ecosystem participants.[354] The **workflow** resembles that of a traditional fund with daily subscriptions/redemptions, but ownership is recorded on blockchain ledgers. Holders can **transfer tokens peer-to-peer** to other approved investors **24/7/365**, in contrast to traditional fund shares that may be transferred, if approved by the fund, only during banking hours.[355,356]

- **Technology and Operations:** Initially issued as an ERC-20 compliant token on **Ethereum**, BUIDL has since become **multi-chain**. By late 2024 it expanded to five additional blockchains – **Aptos, Arbitrum, Avalanche, Optimism, and Polygon** – and in March 2025 it launched on **Solana** as well.[357] This **multi-blockchain architecture** means the fund's tokens can exist on seven networks in total, leveraging each network's strengths (for example, Ethereum's broad adoption and Solana's high speed, Layer-2 networks' low fees, etc.). Despite spanning several ledgers, the token represents the same single fund; Securitize's platform coordinates the issuance and redemption across chains to ensure the total token supply remains consistent with the fund's net assets. Only whitelisted wallet addresses can hold BUIDL tokens, enforcing the **permissioned access** within these public networks.[358] Each BUIDL token seeks to maintain a stable value of **$1.00** by design, and the fund accrues income for investors through daily interest which is paid out as additional tokens daily.

- **Adoption and Usage:** Although BUIDL's AUM is large, the number of direct holders is relatively small, reflecting its institutional focus. These likely include **crypto firms' treasury accounts, FinTech yield platforms, and other corporate investors** seeking permissioned on-chain cash management.[359] Notably, startup Ondo Finance created a product (Ondo's "OUSG") that invests in BUIDL and offers investors exposure with a lower minimum (around $5,000).[360] By late 2024, Ondo's vehicle accounted for roughly $192 million of BUIDL's balance – indicating that some BUIDL demand is indirectly sourced from a broader accredited market via such intermediaries.

345. Ledger Insights, "BlackRock expands tokenized money market fund BUIDL to five more blockchains", November 2023.
346. Businesswire, "BlackRock Launches Its First Tokenized Fund, BUIDL, on the Ethereum Network", March 2024.
347. Ibid.
348. Ledger Insights, "BlackRock expands tokenized money market fund BUIDL to five more blockchains", November 2023.
349. Linh Tran, "2024: The Year of Institutional Real World Asset Tokenization" Accessed 2025.
350. RWA.xyz, BUIDL, Accessed July 2025.
351. PR Newswire, BUIDL Tokenized by Securitize Surpasses $1B in AUM, March 2025.
352. Arbitum, Securitize BUIDL Step Application, Accessed July 2025.
353. Businesswire, "BlackRock Launches Its First Tokenized Fund, BUIDL, on the Ethereum Network", March 2024.
354. Ibid.
355. Ibid.
356. CoinDesk, "BlackRock, Securitize Expand $1.7B Tokenized Money Market Fund BUIDL to Solana: March 2025.
357. Ibid.
358. Businesswire, "BlackRock Launches Its First Tokenized Fund, BUIDL, on the Ethereum Network", March 2024.
359. Ledger Insights, "BlackRock expands tokenized money market fund BUIDL to five more blockchains", November 2024.
360. Ibid.

Settlement Asset and Legal Structure

Settlement Asset: The asset being used for settlement in BUIDL is neither a central bank currency nor a traditional stablecoin, but rather a **tokenized security** – specifically, a digital share of a U.S. dollar-denominated liquidity fund. Each BUIDL token represents one share in the BlackRock USD Institutional Digital Liquidity Fund, which invests **100% of its assets in cash, U.S. Treasury bills, and fully collateralized repurchase agreements**.[361] In economic terms, holding the token is equivalent to holding a USD1 share of a money market fund, with the token's value anchored around USD1 and supported by the underlying portfolio. Importantly, BUIDL tokens **accrue dividend income**: the fund's interest earnings (from T-bill yields and repo rates) are **distributed to token holders as new token**s on a daily basis.[362] This means an investor's token balance grows over time to reflect earned yield, rather than the token price fluctuating.[363] Therefore, the token serves as the settlement asset itself (a claim on the fund's net assets), and its stability is predicated on BlackRock's fund maintaining a stable NAV through its high-quality investments. BUIDL is not a fiat-issued stablecoin and not legal tender – it is a security token, giving the holder a redeemable claim on the underlying pool of dollar assets.

Settlement Finality: Transactions in BUIDL achieve settlement finality through the finality mechanisms of the underlying blockchains combined with the fund's legal structure. When a BUIDL token transfer is executed on a blockchain (e.g., Ethereum or Solana), the transfer is recorded in that ledger once the block is confirmed and finalized. This record is then updated in an off-DLT relational database system that is operated under the sole discretion of the funds Transfer Agent whose system of record serves as legal record of ownership. Hence, this provides the potential for near-real-time finality; ownership changes settle within minutes, a stark improvement from the T+1 or T+2 settlement delays common in traditional fund transfers. This process is enabled by Securitize's smart contracts, which ensure that only valid, authorized transfers occur. Each token is a restricted security that can only move between wallets that have been whitelisted (pre-approved) by the transfer agent, preventing unauthorized or illegal settlements.[364] This improved process was a key attraction of the platform, providing "transparent settlement" of fund transactions around the clock.[365]

To connect these digital settlements with traditional money flows, **BNY** plays a crucial interoperability role.[366] As the fund's custodian and administrator, BNY coordinates movement of cash in the traditional banking system with the subscription and redemption of fund shares recorded by the transfer agent and the creation or destruction of the token by the tokenization agent.[367] For example, on subscription, an investor might send USD via wire or ACH to the fund's bank account and Securitize then mints the corresponding BUIDL tokens to the investor's wallet. On redemption, the process reverses: tokens are burned, and the equivalent cash is paid. This design ensures that **token circulation is always fully backed** by real assets held by the custodian, and that a token holder can redeem their token for USD1 (plus accrued interest) through legally enforceable rights against the fund.

Legal Rights and Protections: Holders of BUIDL tokens have essentially the same legal rights as an investor in a conventional private fund, with some additional considerations due to the digital format. Each token represents a **beneficial ownership interest** in the pooled fund assets. Token holders are entitled to their pro-rata share of the fund's income (paid as additional tokens) and can **redeem tokens for cash** (or in-kind assets, if ever necessary) pursuant to the fund's offering terms. The fund seeks to maintain a stable USD1.00 NAV per share, but it is **not guaranteed** – as disclosed, BUIDL "may not be able to maintain a stable value of USD1.00 per token at all times".[368] This means that in extreme circumstances (e.g. a major market dislocation or default of a holding), the token's value could fall below USD1, just as a traditional money market fund could "break the buck." However, the investment strategy (100% government-backed and cash assets) minimizes this risk, and any valuation change would be transparently reflected in token holdings (e.g., via a reduction in new dividend tokens issued).

Legal and Regulatory Structure: Legally, BUIDL is a limited company incorporated under the laws of the British Virgin Islands and operates as a **private fund** under U.S. law. It is **not registered** under the Investment Company Act (which governs mutual funds and retail money market funds). Instead, it operates under **Section 3(c)(7)** of that Act, which exempts funds sold only to "qualified purchasers" (generally high-net-worth or institutional investors).[369] Likewise, the offering of BUIDL tokens is conducted under an exemption from securities registration – specifically **Rule 506(c) of Regulation D** under the Securities Act.[370] Rule 506(c) allows general marketing of a private offering (hence BlackRock's public press release

361. Ibid.
362. MEXC, "In Depth Analysis of BlackRock BUIDL", July 2025.
363. Ibid.
364. Ibid.
365. Ibid.
366. Ibid.
367. Ibid.
368. Ibid.
369. Ibid.
370. Ibid.

and promotions) but mandates that sales be made only to **accredited investors** whose status is verified. In fact, BUIDL imposes an even higher standard by limiting investors to *qualified purchasers*, aligning with the Investment Company Act Section 3(c)(7) fund requirements. These legal constraints mean that BUIDL tokens **legally constitute unregistered securities** (specifically, security tokens) and are subject to the same transfer restrictions as any other privately offered fund. Tokens can **only be held or traded among eligible investors** who have been onboarded through Securitize (which, as a registered broker-dealer, serves as the placement agent).[371] There is no public secondary market or exchange listing for BUIDL – the press release explicitly notes that the interests "will not be listed on any exchange".[372] Instead, liquidity is provided by the ability to redeem with the issuer, or potentially peer-to-peer transfers.

Interoperability and Network Architecture

Network Type and Architecture: BUIDL is deployed across multiple **public DLT networks**, illustrating a unique multi-chain strategy for a financial instrument. Rather than using a private or consortium blockchain, BlackRock chose to issue BUIDL on **public permissionless blockchains** – including Ethereum mainnet and others – but with a **permissioned access layer** for token holders. The initial launch was on Ethereum (a public **proof-of-stake blockchain**), leveraging its mature infrastructure and security.[373] In the months following, Securitize and BlackRock expanded BUIDL to several **Ethereum Layer-2 networks** and alternative Layer-1 chains, to improve speed and lower transaction costs. By November 2024, BUIDL tokens were live on **Aptos** (a Move-based PoS chain), **Arbitrum** and **Optimism** (Ethereum Layer-2 rollups), **Polygon** (an EVM sidechain), and **Avalanche** (a high-throughput blockchain), in addition to Ethereum.[374] In March 2025, **Solana** (a high-performance chain using proof-of-history consensus) became the seventh blockchain in the BUIDL network roster.[375] On each of these chains, BUIDL exists as a smart-contract token that abides by that chain's token standard (for example, ERC-20 on Ethereum, and SPL token on Solana, etc.), with the contract logic ensuring only authorized transfers can occur.

The **consensus mechanisms** securing these networks vary (Ethereum's PoS finality, Solana's PoH/PoS, Avalanche's DAG-based consensus, etc.), but from BUIDL's perspective they all serve to maintain a ledger of token ownership. The fund does not rely on any single blockchain for its operation; rather, it treats all the supported chains as valid platforms where its tokens can reside. This architecture positions the fund to meet investors "where they are": different participants have different blockchain preferences or integrations (for instance, digital-native firms on Ethereum vs. trading firms on Solana). BlackRock's partner Securitize manages the **token smart contracts and mint/burn process** across these networks to ensure the aggregate token supply remains 1:1 with the fund's assets.[376] Whenever tokens are created on a new chain (due to new subscriptions or chain-to-chain transfers), a corresponding subscription of cash is recorded by the custodian; whenever tokens are destroyed (redemptions or moving off a chain), the assets are released or reallocated.[377]

Permissioned Token Model: Although the underlying blockchains are public, BUIDL's operation is permissioned at the token level.[378] Each BUIDL token contract incorporates logic (often via an allowlist or whitelist) so that only wallets belonging to verified, eligible investors can hold or transfer the token.[379] Securitize, as the transfer agent, controls this whitelist. In practice, an investor undergoes onboarding (completing KYC/AML and accreditation checks) and then provides one or more wallet addresses to Securitize. These addresses are added to the token contract's whitelist on the relevant chain. The token contracts will **reject any transfer** involving a non-whitelisted address – enforcing compliance in a fully automated way. This design aligns with regulatory requirements and means BUIDL tokens cannot be freely transferred to the general public or to unknown parties. The **governance model** for the token contracts is centralized: Securitize (and ultimately BlackRock as the issuer) can pause transfers or update rules if necessary, and they manage upgrades to the smart contracts.[380]

Interoperability Features: BUIDL's approach to manage interoperability is through the issuer/agent rather than trustless bridges. If an investor wishes to move their BUIDL holdings from one blockchain to another, Securitize can facilitate a burn-and-reissue: the tokens on Chain A are redeemed (burned) and an equivalent number of tokens are minted for the same investor on Chain B. This ensures no duplication of claims. There is no permissionless arbitrage or free-flow bridge between chains for BUIDL – all cross-chain movement goes through the fund's oversight. While this introduces some friction (and requires coordination with the transfer agent), it avoids the smart-contract risks of open bridges. It's a design choice balancing safety and interoperability.

371. Ibid.
372. Ibid.
373. Ledger Insights, "BlackRock expands tokenized money market fund BUIDL to five more blockchains", November 2024.
374. Ibid.
375. CoinDesk, "BlackRock, Securitize Expand $1.7B Tokenized Money Market Fund BUIDL to Solana: March 2025.
376. MEXC, "In Depth Analysis of BlackRock BUIDL", July 2025.
377. Ibid.
378. Ibid.
379. Ibid.
380. Ibid.

TradFi Alignment vs. Digital Native Design: The infrastructure of BUIDL is best described as a **hybrid of traditional capital market infrastructure and digitally native architecture**. The fund mirrors the traditional model: assets are custodied by a reputable bank, the manager and service providers are regulated entities, and investor rights are defined by legal contracts. BUIDL behaves like a money market fund.

On the other hand, BUIDL's **operational fabric is digitally native**. The use of public blockchains means settlement is decentralized and not reliant on any single company's database (albeit that the settlement governance is permissioned). The ability to transact 24/7, peer-to-peer, with cryptographic ownership is a hallmark of digital-native assets. The fund's **governance processes** (such as changing a smart contract parameter) are centralized, but the actual **transaction processing** is decentralized across node operators worldwide. Additionally, BUIDL's presence on-chain enables it to plug into other digital platforms – e.g. being used as collateral in a future on-chain lending platform or integrated into treasury management dApps – in ways a traditional fund could not without significant interfacing. Indeed, startups such as Ondo have already built a DeFi-like wrapper around BUIDL to broaden access, and one could envisage permissioned liquidity pools or trading venues where BUIDL tokens trade against other digital assets, bringing liquidity to what was previously an off-chain asset.[381]

In summary, BUIDL's network architecture leans on public, **permissionless networks for efficiency and reach**, but confines their openness with a **permissioned layer for compliance**. It aligns with *TradFi* in its trust structure and regulatory footing, yet it adopts *digitally-native* elements by making a traditionally static product (a money market fund share) **programmable and always-on**. This fusion illustrates how DLT can modernize market infrastructure: rather than replacing the roles of custodian, transfer agent, or regulator, it augments them – automating certain functions and extending the operating hours and connectivity of the product. In effect, BUIDL behaves like a digitally-native twin of a traditional fund, bringing the best of both worlds: institutional-grade asset safety on one side, and blockchain-based settlement and composability on the other.

Conclusion

In conclusion, BlackRock's BUIDL stands as a **leading case of institutional DLT adoption**, showing how a decades-old instrument structure (a treasury fund) can be enhanced with blockchain technology. If BUIDL continues on its current path, it could support a new era where **TradFi infrastructure and DLT converge**, enabling funds and financial products that are at once highly regulated yet as agile and accessible as digital assets. The chapter of BlackRock's BUIDL in the DLT story is thus a case study in balancing innovation with regulation – an approach that may well define the next stage of capital market modernization.

381. Ledger Insights, "BlackRock expands tokenized money market fund BUIDL to five more blockchains", November 2023.

Tokenized Funds Use Case #3: Spiko EU T-Bills Money Market Fund

Overview of Use Case

The **Spiko EU T-Bills Money Market Fund** is a tokenized European money market fund that invests exclusively in short-term government debt (Treasury Bills) of top-rated Eurozone countries. It is structured as a sub-fund of the Spiko SICAV (an open-ended investment company) and operates under the EU's UCITS fund framework.[382] Uniquely, this fund's share registry is fully tokenized on distributed ledgers, making it one of the first regulated UCITS funds in Europe to issue shares as blockchain tokens.[383,384] The fund launched in mid-2024 and quickly gained traction, reaching over **$250 million in AUM** by July 2025.[385] As of early 2025 it had **1,100+ on-chain holders** of its tokenized shares, including around **700 business clients** (e.g. corporate treasuries and institutions) alongside individual investors.[386] Each token represents a fund share with a variable NAV (value started near €1.00 and accrues interest daily) – by May 2025 the euro fund's NAV per share was about €1.033, reflecting earned yield.[387]

Deploying Entity & Operation: The initiative is led by **Spiko**, a Paris-based FinTech founded in 2023 by former financial regulators, in partnership with established financial institutions.[388] **Twenty First Capital**, a regulated asset management firm, serves as the fund's management company (investment manager), while **CACEIS Bank** (Crédit Agricole's custody arm) is the independent custodian holding the underlying assets. PwC audits the fund, and the French law firm Gide provided legal structuring advice.[389] Spiko itself provides the technical platform for issuance and investor interface but does not hold client funds on its own balance sheet.[390] Investors (retail or corporate) access the fund through the **Spiko web app or API** integration, allowing seamless subscriptions and redemptions with a low minimum investment of €1,000.[391] When an investor subscribes, they transfer in fiat currency (EUR) to the custodian bank; the fund then mints the equivalent number of **EUTBL tokens** (the on-chain fund shares) to the investor's address.[392] Redemptions work in reverse: tokens are burned and fiat currency is paid out from the fund's accounts, with no fees or notice periods.[393] This operational model enables **daily liquidity** (investors can withdraw any business day) and in practice **same-day settlement**, given the fund complies with money market fund rules requiring high liquidity.[394] Notably, because the shares exist as tokens, investors can also **transfer their fund shares peer-to-peer 24/7** outside the platform's business hours.[395] For example, one allowlisted investor can send EUTBL tokens to another allowlisted investor at any time, instantly shifting ownership of the underlying shares.[396] This 24/7 transfer capability, combined with the daily accrual of interest (pegged to risk-free rates such as the Euro Short-Term Rate, €STR), provides a novel way for holders to earn treasury yields with flexibility.[397]

Workflow and Participants: In summary, the fund's lifecycle involves several participants in a streamlined digital workflow:

Investors undergo KYC/AML checks before depositing EUR or USD, after which they receive EUTBL tokens representing fund shares. These tokens can be stored in Spiko's custodial wallet (standard mode) or transferred to a self-managed blockchain wallet (expert mode), with real-time visibility into balances and daily interest accrual. Spiko's platform acts as both user interface and middleware, automating token minting/burning during subscriptions and redemptions. It enforces wallet-level restrictions via an allowlist and provides APIs for FinTech or corporate treasury integration. The fund is managed by Twenty First Capital, a licensed investment firm that executes strategy through Eurozone T-Bills and repos while ensuring regulatory compliance. NAV is calculated daily, and each token's value directly corresponds to the fund's underlying assets. Importantly, the fund's share registry is maintained directly on-chain, bypassing traditional securities depositories. CACEIS acts as the custodian bank, safeguarding cash and securities under UCITS rules. Investor funds are held securely at the custodian—Spiko never touches them—ensuring segregation and protection. Subscriptions begin with fiat transfers to CACEIS, after which tokens are issued. Redemptions burn tokens and trigger same-day fiat payouts to bank accounts. Token transfers are allowed peer-to-peer among

382. Spiko, SPIKO SICAV – Prospectus Articles of Association, February 2025.
383. Spiko, "Spiko launches the world's first tokenized Money Market Funds", June 2024.
384. Twenty First Capital, "Spiko EU T-bills Money market Fund", Accessed July 2025.
385. Rwa.xyz, "Spiko EU T-Bills Money Market Fund", Accessed July 2025.
386. Ibid.
387. Spiko, SPIKO SICAV – Prospectus Articles of Association, February 2025.
388. Ibid.
389. Ibid.
390. Ibid.
391. Spiko, "Documentation", Accessed July 2025.
392. Spiko, "Documentation", Accessed July 2025.
393. Spiko, "Spiko launches the world's first tokenized Money Market Funds", June 2024.
394. Spiko, "Bpifrance announces its subscription to Spiko's tokenized money market fund, using its own cash reserves", April 2025.
395. Spiko, "Spiko launches the world's first tokenized Money Market Funds", June 2024.
396. Spiko, "Transfers & Redemptions", Accessed 2025.
397. Twenty First Capital, "Spiko EU T-bills Money market Fund", Accessed July 2025.

approved addresses, legally transferring share ownership instantly on-chain. Although no public exchange exists, these OTC-style transfers provide significant flexibility and liquidity beyond traditional fund setups.[398.399,400]

Quantitative Insights: The Spiko Euro T-Bill fund began operations in May 2024, and within its first year it demonstrated significant uptake.[401] By early 2025 it amassed over **$200 million AUM** and continued growing (over $250M by July 2025).[402] This scale, while modest relative to giant money market funds, is notable for a blockchain-based fund in Europe. The **transaction volume on-chain** is also substantial: in a recent month, over $43 million worth of EUTBL tokens changed hands across ~625 transfers between holders.[403] This indicates active use – investors are not only buying and holding but also moving tokens (for portfolio rebalancing or operational needs). The fund had **1,103 token holders** as of mid-2025, ranging from retail users to large entities such as **Bpifrance** – France's public investment bank – which became a notable participant by investing a portion of its cash reserves into the fund.[404] Each share/token is in the **€1 range** in price (initially set at €1.00), and the NAV per share floats slightly with accrued interest (for example, about €1.03 as of May 2025, reflecting the yield earned over time).[405] The fund charges a low management fee (0.25% annually) and no entry/exit fees, aiming to closely deliver the risk-free rate net of minimal costs.[406] In terms of market coverage, as a UCITS fund it can in principle be offered across the EU; currently, the focus is on European investors (the fund is domiciled in France and marketed under French AMF approval).[407] U.S. investors are not allowed (to avoid U.S. securities law issues).[408] **The geographic scope** of usage so far is primarily France and Europe, given marketing in those regions, but the infrastructure (being on public blockchains) is globally accessible if regulatory permissions are addressed. The project timeline has been rapid: conceived in 2023, regulatory approval and fund launch in H1 2024, and key milestones such as surpassing €100M AUM by late 2024 (unofficially reported) and onboarding institutional participants by 2025. In April 2025, the partnership with Bpifrance was highlighted as a milestone signaling institutional confidence in this DLT-based approach.[409] Overall, the use case demonstrates how traditional cash-management products (such as a T-Bill fund) can be enhanced via blockchain to offer 24/7 transferability and integration with digital finance rails, all while operating within a fully regulated framework.

Settlement Asset and Legal Structure

Settlement Asset: The primary asset involved is the **tokenized fund share** itself (EUTBL token), which represents a pro-rata claim on the fund's portfolio of EUR-denominated government T-Bills. When investors buy into the fund, they use **fiat currency (EUR)** outside the blockchain (e.g., a SEPA bank transfer) – effectively exchanging central bank money for the tokenized shares. Redemptions are settled in traditional fiat currency through the custodian bank.[410] Once issued, however, the **tokens serve as the settlement vehicle** for any on-chain transfers of ownership. In other words, if two parties trade fund shares, the delivery of the EUTBL token itself constitutes settlement of that trade (no separate cash leg on-chain, unless the parties privately exchange payment). The token is **denominated in the same currency as the fund (EUR)** and its on-chain value tracks the fund's NAV. Settlement of token transfers relies on the underlying blockchain mechanics: an ERC-20 token transfer, once confirmed in a new block, is considered final delivery of the asset to the recipient.[411] Notably, because the tokens are on public networks, **technical settlement finality** comes from the blockchain's consensus (for example, on Ethereum a transaction is typically irreversible after a few block confirmations, given Proof-of-Stake finality). There is no separate central clearing or T+2 delay; transfers are near-instant (typically seconds on L2 networks or a minute on Ethereum) and **irrevocable** once recorded. The prospectus explicitly states that the fund's shares are not registered on Euroclear France or any traditional CSD – instead the official **share register is maintained on distributed ledgers** (Ethereum and certain Layer-2 chains).[412] This means a blockchain transaction **updating the token ledger is the legal record of ownership**. In practical terms, when a token transfer is executed to an allowlisted address, **legal title to that portion of the fund's shares passes to the new holder at that moment**.[413] The transfer is "free of payment" on-chain; if it is an outright sale, the payment (euros or other compensation) would occur off-chain between the two parties. The *settlement asset* for the fund's internal operations remains fiat currency: when the fund itself settles redemptions or investments, it does so by moving euros (or dollars for the USD fund) through the traditional banking system. However, the innovation is that the

398. Spiko, "Spiko launches the world's first tokenized Money Market Funds", June 2024.
399. Spiko, SPIKO SICAV – Prospectus Articles of Association, February 2025.
400. Spiko, "Documentation", Accessed 2025.
401. Rwa.xyz, "Spiko EU T-Bills Money Market Fund", Accessed July 2025.
402. Ibid.
403. Rwa.xyz, "Spiko EU T-Bills Money Market Fund", Accessed 2025.
404. Spiko, "Bpifrance announces its subscription to Spiko's tokenized money market fund, using its own cash reserves", April 2025.
405. Rwa.xyz, "Spiko EU T-Bills Money Market Fund", Accessed July 2025.
406. Rwa.xyz, "Spiko EU T-Bills Money Market Fund", Accessed July 2025.
407. Ibid.
408. Twenty First Capital, "Spiko EU T-bills Money market Fund", Accessed July 2025.
409. Spiko, "Bpifrance announces its subscription to Spiko's tokenized money market fund, using its own cash reserves", April 2025.
410. Spiko, "Spiko launches the world's first tokenized Money Market Funds", June 2024.
411. Spiko, "Transfers & Redemptions", Accessed July 2025.
412. Spiko, SPIKO SICAV – Prospectus Articles of Association, February 2025.
413. Ibid.

ownership of the fund shares settles on-chain, providing continuous finality and transparency. In summary, the tokens representing shares are effectively the settlement instrument on the DLT side, while **central bank money** (fiat currency) is used for entering or exiting the DLT system.

Settlement Finality – Legal and Technical: Legally, the arrangement leverages French regulations that recognize ledger entries on a blockchain as an official securities register. The fund's documentation makes clear that **investors consent to the DLT-based issuance** and that the tokens are the technical form of the share.[414] At subscription, an investor chooses one of the approved blockchains to hold their shares, and the manager will register the shares on that ledger accordingly.[415] Once recorded, the **blockchain record is authoritative** – there is no parallel traditional certificate. Finality in the legal sense is achieved when a token transfer is confirmed on the ledger, at which point the fund's manager deems the share register updated. Each transfer is **"legally binding" upon the holder's cryptographic signature** (private key signature) and cannot be reversed unilaterally.[416] The prospectus warns investors that losing control of one's private keys or sending tokens to an improper address could mean loss of ownership, underscoring that **token custody and transfers are at the investor's risk**, much like holding a physical bearer instrument.[417] Technically, finality relies on the consensus of the chosen network. There is no separate "settlement layer" or custodian-based reconciliation needed for share transfers – once the chain says the token transferred, that is the final settlement.

Legal Structure and Holder Rights: The fund is organized as a **French SICAV UCITS** fund, which means each token holder is essentially a shareholder of the SICAV (specifically of the EU T-Bills sub-fund) with the associated rights and protections.[418] Under the UCITS and Money Market Fund regulations, investors benefit from strong safeguards: the fund's assets are segregated with a custodian and cannot be claimed by the manager or platform's creditors.[419] Token holders have the **right to redeem** their shares on demand at the current NAV (with no gates or lock-ups, aside from the standard daily cutoff).[420] They also have the right to any distributions, though in this case the income is accumulated into the NAV (no periodic dividend – interest is reflected by NAV increase).[421]

One important legal aspect is the **allowlist/KYC regime**: only verified investors' blockchain addresses are permitted to hold the fund tokens.[422] This means that even though the tokens exist on public blockchains, any transfer to an address that has not been KYC-approved by the platform will fail. This structure preserves compliance (no unknown or sanctioned persons can secretly acquire the security token) and ensures that all token holders are known to the fund's registrar in real life. The prospectus and onboarding agreements stipulate that an investor cannot circumvent the KYC process – any attempted transfer to a non-whitelisted address would not execute on the smart contract level.[423] Thus, token holders' rights are intertwined with their status as recognized investors in the fund's register. If a holder loses authorized status (e.g., due to sanctions), the platform can presumably revoke or restrict transfers from that address. This mechanism provides a **legal protection** by upholding securities laws (preventing free trading to the public), but it also means token holders are not completely permissionless. That said, among allowlisted members, the tokens are freely transferable, and the **holder of the token is conclusively presumed to be the owner of the fund shares** so represented.[424]

In terms of **settlement finality protections**, the use of a regulated custodian and traditional banking for cash settlement means that when investors cash out, they receive fiat currency in their bank accounts. The legal finality of redemption is when the custodian confirms payment; on the token side, finality is when the token burn is confirmed on-chain.[425] In summary, token holders have legally-enforceable rights to the fund's NAV and are protected by fund regulations and custody law, with the blockchain acting as the medium of record for those rights.

414. Ibid.
415. Ibid.
416. Spiko, "Transfers & Redemptions", Accessed July2025.
417. Spiko, "Open-Ended Investment Company with Sub-Funds", February 2025.
418. Ibid.
419. Spiko, "Regulatory Framework", Accessed July 2025.
420. Ibid.
421. Spiko, "Spiko Funds", Accessed 2025.
422. Spiko, "Transfers & Redemptions", Accessed July 2025.
423. Ibid.
424. Ibid.
425. Spiko, "Deposits and Withdrawals", Accessed July 2025.

Interoperability and Network Architecture

DLT Network Type: The Spiko EU T-Bills fund operates on a **public/permissioned blockchain model** – meaning the underlying networks are public blockchains, but the token contract itself is permissioned in terms of permitted counterparties (transfers restricted to allowed addresses).[426] Specifically, the fund's share tokens are deployed as smart contracts on multiple **public blockchain networks**: Ethereum Mainnet and several Ethereum-compatible Layer-2 networks including Polygon (Proof of Stake sidechain), Arbitrum One (rollup), Base (Coinbase's Layer-2), and Starknet (a ZK-rollup).[427] The project deliberately chose public decentralized ledgers (as opposed to a private or consortium blockchain) to maximize transparency and interoperability.[428] By using widely adopted chains such as Ethereum, the tokens can be held in standard digital wallets and potentially interact with other on-chain services (subject to whitelisting), aligning with Spiko's vision of "internet-native" financial instruments.[429]

Spiko's smart contracts for the fund shares are **ERC-20 tokens with added features**.[912] They implement extensions such as ERC-1363 (which allows a token transfer to call receiver logic) and ERC-2612 (permit signatures for gasless approvals).[430] The contracts are also upgradeable via a UUPS proxy pattern, meaning the code can be updated (under strict controls) to adapt to future needs or security improvements without replacing the token itself.[914] This upgradeability is important given the evolving multi-chain environment – it allows adding new networks or modifying allowlist rules if regulations change, with minimal disruption.

Interoperability Mechanisms: A hallmark of this use case is **cross-chain interoperability**. Because the fund's tokens exist on multiple networks, Spiko had to ensure that the total token supply remains consistent with the fund's NAV (preventing double spending across chains). The solution is a form of **managed bridging** or multi-chain issuance. According to the prospectus, the share register can be maintained on any of the approved DLTs, and an investor chooses a preferred network for their shares.[431] If an investor later wants to change networks, the platform likely facilitates a burn on one chain and re-mint on another (effectively a cross-chain transfer via the custodial backend). **Spiko acts as the gatekeeper and bridge**: it controls the minting function on each chain and only mints new tokens when new money comes in, ensuring that the sum of tokens on all networks equals the total shares of the fund. This is different from permissionless bridges; it is more akin to an administrative transfer aligned with the share register. It guarantees that **interoperability does not fragment ownership** – wherever the token resides, it represents the same fund share.

On the **traditional interoperability front**, the Spiko fund integrates with conventional finance through APIs and standard reports. For instance, Spiko offers an API so that FinTech companies or corporate treasurers can plug the fund into their platforms. This enables interoperability with existing systems: companies can use Spiko's API to move money into the fund or query balances, without manually dealing with blockchain transactions (the complexity is abstracted away). Additionally, because the fund is a regulated product, it produces normal financial reports, and has an ISIN code (FR001400ODL1 for the euro fund) and Bloomberg tickers (SPKEUMM), meaning it can be identified in financial databases.[917,918] This bridges the gap between the digital representation and traditional fund databases – for example, Bloomberg terminals can display the fund, and one can look up its price on aggregators such as CoinGecko.[919]

Scalability and Performance: By deploying on Layer-2 networks and sidechains, the architecture is built for scale.. Scalability is further enhanced by the fact that issuing or redeeming shares does not involve any batch settlement delays – as soon as cash is confirmed and tokens minted, the investor can use them immediately. In short, the architecture is closer to a **digitally native infrastructure** in its continuous availability and use of open networks, even though access is permissioned.

Spiko itself markets to **Web3 users** by highlighting that one can earn "risk-free rate on-chain", implying these tokens might be used in the decentralized finance ecosystem (e.g. used as collateral on a lending protocol that whitelists them).[920] Indeed, by making the tokens ERC-20 standard, it is possible for other compliant DeFi platforms to support them in the future. This

426. Spiko, "Transfers & Redemptions", Accessed July 2025.
427. Ibid.
428. Spiko, "Spiko's Smart Contracts", May 2025.
429. Ibid.
430. Ibid.
431. Spiko, "Spiko's Smart Contracts", May 2025.
432. Ibid.
433. Spiko, "Open-Ended Investment Company with Sub-Funds", February 2025.
434. Spiko, "NAV Data Feed", Accessed July 2025.
435. Ibid.
436. Ibid.
437. Bloomberg, "Spiko EU T-bills Money Market Fund", Accessed 2025.
438. Spiko, "Bpifrance announces its subscription to Spiko's tokenized money market fund, using its own cash reserves", April 2025.

contrasts with private bank-led DLT projects that often use proprietary networks and restrict interoperability. Here, **interoperability is achieved at two levels**: between the fund and various blockchains (multi-chain issuance), and between the blockchain tokens and other financial systems (via APIs and recognition in data feeds). This comprehensive interoperability design positions the Spiko MMF as a bridge between traditional cash management and the emerging tokenized finance ecosystem.

Conclusion

In conclusion, the Spiko EU T-Bills Money Market Fund stands as a proof of concept realized in operation for DLT in mainstream finance. It shows that with careful adherence to regulation and smart use of technology, blockchain can modernize the plumbing of a traditional financial product. The use case has navigated regulatory requirements successfully (obtaining UCITS/Money Market Fund approval) and addressed typical policy concerns (investor protection, AML, custody) by marrying the strengths of TradFi institutions (custodian, audits, oversight) with the efficiency of blockchain settlement. The broader market conditions of the mid-2020s – rising interest rates, increased institutional openness to tokenization, and demand for better cash management options – have provided a conducive environment for its growth. Going forward, this model has the potential to influence both regulators and market participation in how they approach the tokenization of other low-risk financial products, balancing innovation with stability.

Legal Considerations

There are various legal structures by means of which an asset can be tokenized. The methods available, and the requirements to achieve each, will depend on the legal and regulatory framework of the jurisdiction in which the asset is being tokenized.

Typical legal structures that can be used to tokenize assets include (but are not limited to):

1. the creation of a contractual framework under which economic exposure to the asset is created with no associated proprietary interest in the asset itself, effectively constituting a contract for differences, which would attract the applicable derivatives regulation in a given jurisdiction;

2. the creation of fractional entitlement to a pool of assets (either by contract or otherwise), which may be considered in certain jurisdictions to be a collective investment scheme, which would typically be subject to applicable rules for investment funds (for example, in the E.U., AIFMD); or

3. the creation of asset-backed tokens, whereby the reference asset is not fiat currency, and the token holder has a right of redemption either to the asset or a representative monetary value. For example, in the E.U., MiCA provides a framework allowing for the issuance of Asset Reference Tokens.[921,922] While the use of this legal structure may have been intended for the creation of stablecoins, it is also a means by which assets can be tokenized. As such, it is relevant in this context.

Once the regulatory treatment of the digital asset has been established, the activities that a regulated financial institution or service provider is able to carry out in respect of these will depend on its regulatory treatment, as well as the legal and regulatory framework of the jurisdiction in which the asset is being tokenized. In some jurisdictions, there may be nothing preventing financial institutions from carrying out certain activities, for example providing custodial services, in respect of some or all types of digital asset; however, other jurisdictions may actively prohibit the holding of certain other kinds of digital assets, or impose stringent/prohibitive capital requirements when holding these assets, making it impractical or impossible for financial institutions to do so. Similar considerations apply to other activities carried out by financial institutions or service providers, for example trading in or issuing of digital assets. Each activity will be subject to different rules and it will be necessary for the financial institution or service provider to see whether each activity will be permitted in the relevant legal and regulatory framework.

For collateral use, regulatory clarifications may be required regarding the use of tokenized funds as eligible collateral under the uncleared margin rules, and harmonization issues (-e.g., different rules for when a money market fund securities are eligible) need to be resolved between US and EMIR uncleared margin rules regarding the use of money market funds, tokenized or tradfi, cross-border.

Ultimately, clarity is required from legislators and regulators as to the delineation between the different categories of tokenized assets, so that it is clear which regulations apply to which type of asset. Additionally, clarity is required from regulators in relation to the ability of financial institutions to custody each form of tokenized asset for clients. The same consideration applies for other types of activity including (but not limited to) trading in or issuing of digital assets.

439. It should be noted that, in certain jurisdictions there are currently restrictions on the assets that can back a stable coin, for example in Hong Kong, stablecoins can only be backed by fiat currency, and in Singapore this is restricted further to a single type of fiat currency for a given stablecoin.
440. It should be noted that, these regimes are not available in all jurisdictions.