HOW DISTRIBUTED LEDGER TECHNOLOGIES ARE TRANSFORMING CAPITAL MARKETS AND HOW TO IDENTIFY YOUR ROLE IN THE EVOLVING ECOSYSTEM.

OPPORTUNITIES FOR DLT-SUPPORTED SOLUTIONS IN CAPITAL MARKETS

Co-authored by the Frankfurt School Blockchain Center (FSBC)

SettleMint | Frankfurt School Blockchain Center

INDEX

SettleMint NV Arnould Nobelstraat 38 — 3000 Leuven (Belgium) — hello@SettleMint.com

Distributed ledger technologies (DLT) are ideally suited to performing a range of capital markets functions. This is thanks primarily to their ability to facilitate coordination between disparate parties by providing a single, immutable version of the truth. While a "big-bang" shift from legacy systems to those built entirely on DLT is unlikely, the value-add brought by DLT is enough to merit its uptake in a growing list of capital markets use cases. Some of those use cases are already gaining commercial adoption and many more are in the advanced stages of testing, particularly in jurisdictions that have created regulatory sandboxes. As the technologies involved are still very new, and as the first successful applications are only now clearly emerging, we are still very early in the adoption curve. This means that there is plenty of opportunity for new entrants to gain market share and for early adopters to gain a competitive advantage.

With a view towards demonstrating the potential of DLT technologies in capital markets for enterprises looking to build and/or adopt new DLT solutions, this report will summarize the known benefits and use cases, outline the existing and emerging market participant roles, and highlight in-production solutions that are now gaining adoption.

THE STATUS QUO OF CAPITAL MARKETS

At their core, capital markets are venues where savings and investments are channeled between those who have excess capital and those who are in need of capital. **Buyers and sellers engage in the trade of financial securities** like shares, bonds, and other long-term investments. Taking their place between buyers and sellers, are a range of **intermediaries** including brokers, agents, clearing houses, custodians, central banks, and regulators.

In terms of capital markets' operations, the nucleus of activity involves the storage and maintenance of datasets relating to asset ownership and financial obligations. With trillions of dollars of securities and obligations exchanged daily, the current methods for doing so and the market infrastructure that enables these functions are highly complex, suffer from a lack of common standards, and utilize fragmented IT solutions and data architectures. This increases risks for financial institutions who must continually engage in costly data and process duplication and reconciliation. The end result is **increased systemic risk, a higher cost of capital** than is necessary, and **the exclusion of some participants** from accessing the capital they need.

WHAT IS DLT?

In the enterprise context, the purpose of the group of technologies that has come to be known as DLT (in this report, sometimes referred to simply as "blockchain") is to address **the challenge of sharing business and operational data efficiently and alleviating the need for constant reconciliation**.

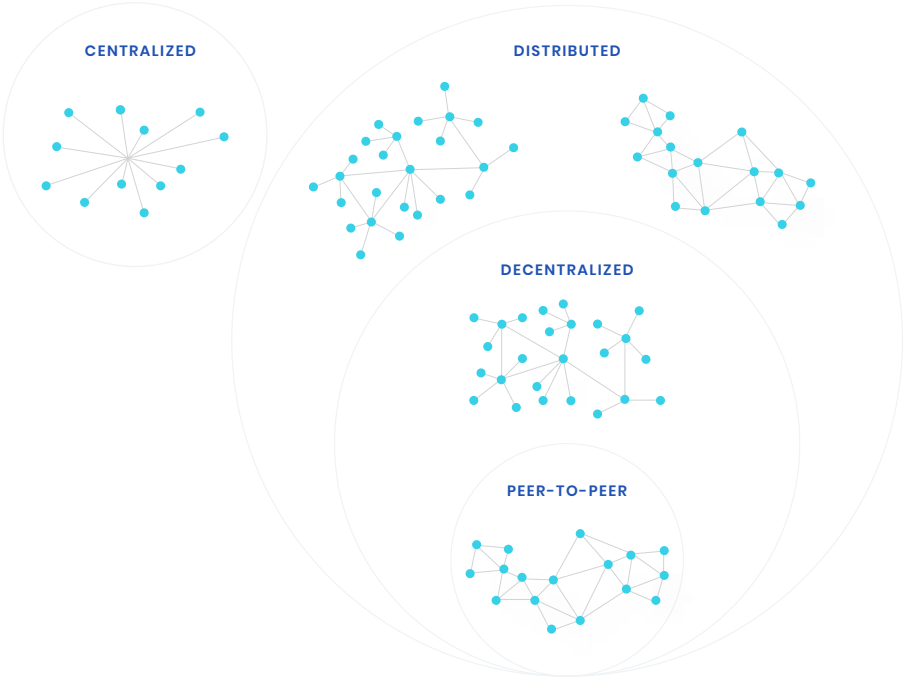
At the outset, it must be noted that there is no single distributed ledger technology being utilized by early adopters of DLT for capital markets. Instead, DLT solutions employ a *grab-bag* of technologies that are specifically tailored to the requirements for each use case being deployed.

The primary capabilities of the technologies available are:

1. **Distributed** storage of data
2. **Immutability** of stored data
3. **Self-executing** smart contracts

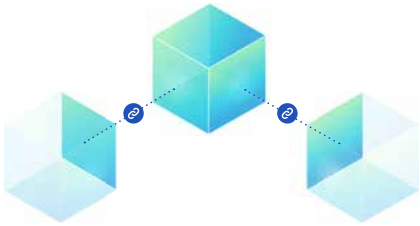
1. Distributed storage of data

Datasets can be distributed across a network of nodes, each of which holds an identical copy. In the enterprise context, most networks are permissioned, meaning participants are granted granular read/write access. Updates to the ledger occur at regular intervals and are committed to the ledger following an agreed-upon consensus protocol. The latter characteristic makes DLT solutions "decentralized" (note that decentralized in the DLT context is a subset of distributed, meaning a decentralized system is also, by definition, distributed).



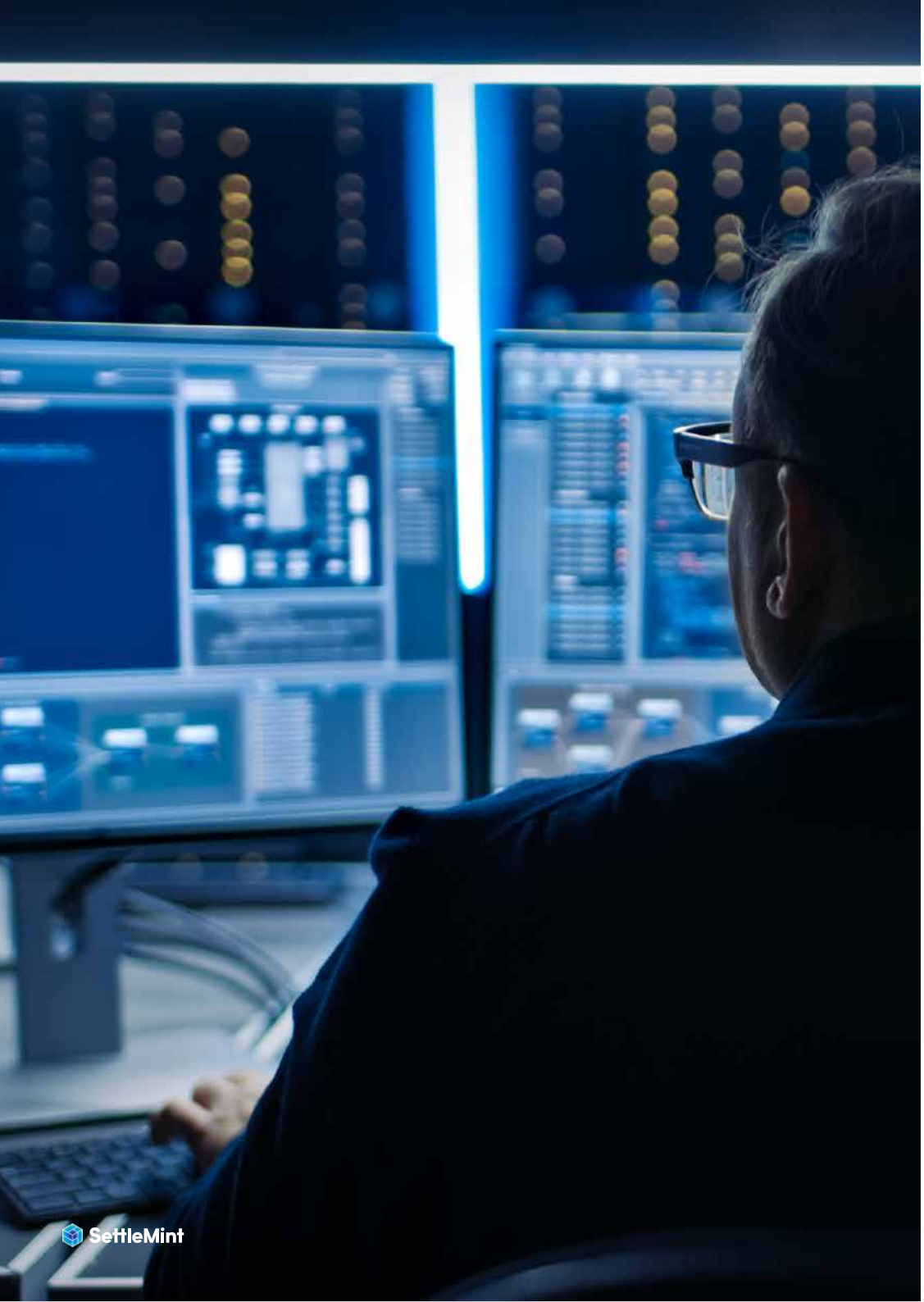
2. Immutability of stored data

Updates to the ledger cannot be erased. Rather, changes are cumulative. This makes it possible for (permissioned) participants to track all updates to the ledger going back to its genesis, thereby resulting in immutability of stored data.



3. Self-executing smart contracts

Participants can enter into agreements that are governed by computer code and when the conditions specified in the code are met (sometimes this requires input from external oracles such as third-party price feeds), the contract executes. This makes updates to the ledger, which is updated, again, by consensus along the decentralized model.

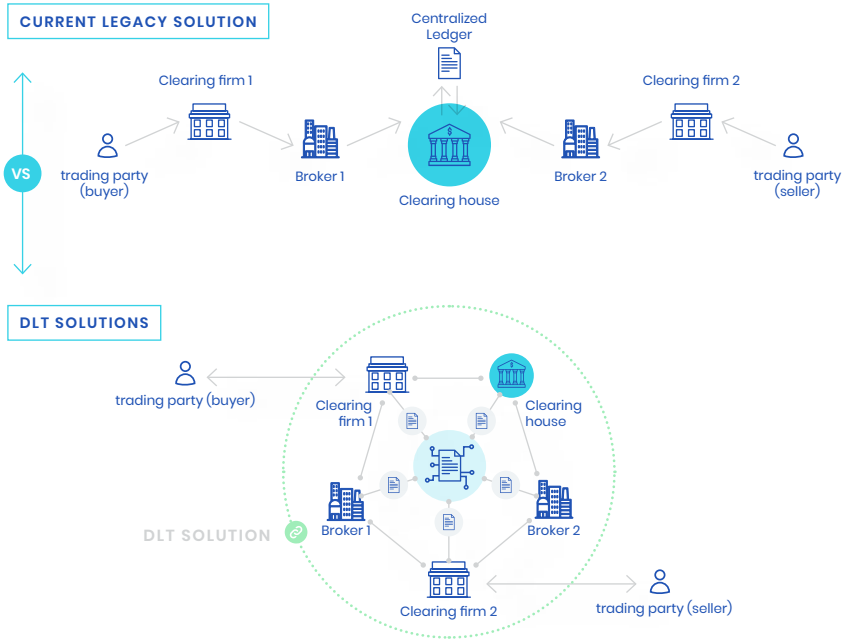


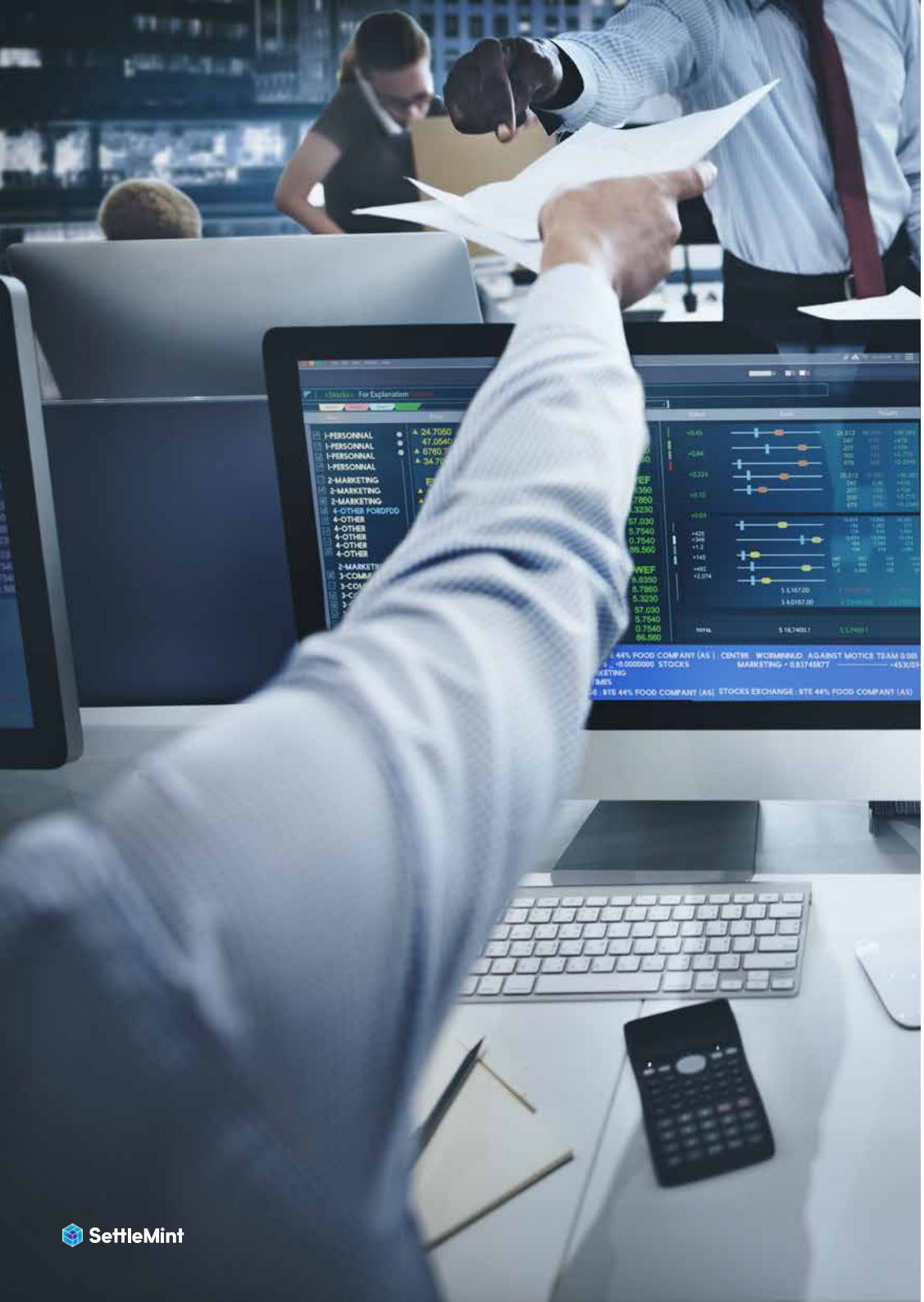
HOW CAN DLT BE APPLIED IN CAPITAL MARKETS?

In the context of capital markets, DLT solutions have the potential to affect:

- How **asset ownership** is recorded
- How **trust** between parties is established
- How **transactions** are executed

The following diagrams provide a (simplistic) visual overview of how legacy solutions compare to potential DLT solutions at an architectural level:





WHAT ARE THE POTENTIAL BENEFITS?

Reduced counterparty risk

Transparent, (near) real-time data availability combine with reduced clearing and settlement time (T+0) to lower risks when trading securities. This compares to daily batch jobs to update static information about securities and a clearing and settlement time of three days (T+3) for most liquid securities in the status quo way of working with today's existing market infrastructure and venues of exchange.

Reduced systemic risk

For less liquid assets and OTC products, clearing and settlement times can be much longer, leading to higher counterparty risk and even the potential for cascading defaults. Since the 2008 financial crisis, in response to regulations aiming to reduce the risk of systemic failure, large global Central Counterparties (CCPs) were increasingly adopted as intermediaries. While CCPs deploy complex risk mitigation strategies, they have now become interconnected such that they exacerbate the risks they were meant to alleviate. In fact, according to a 2018 report from the Financial Stability Board, the 11 largest CCPs are connected to between 16 and 25 other CCPs, and the two largest account for "nearly 40% of [the] total prefunded financial resources provided to all CCPs."[1]

This means that the default of a single CCP will adversely affect most and could result in cascading defaults worse than even those associated with the 2008 financial crisis.

Lower operational costs

Automated administration, baked-in compliance, and reduced transaction fees can lower operational costs across capital markets. For example, a 2017 report from research firm Accenture found that the technology could reduce investment banks' infrastructure costs by 30%.[2]

Improved liquidity

Previously illiquid assets can be fractionalized with rights and obligations encoded, lowering the barrier to entry for issuers & investors, and reducing slippage.

Less rent seeking

With participants in the financial markets forced to rely on a complex chain of intermediaries, fees for financial transactions of all kinds are much higher than they need to be. For instance, a report by Wynam and SWIFT found that revenue from settlement, custody and collateral management amounted to US$40–45 billion in 2013.[3] A separate 2016 report from SWIFT found that between 6-13% of the trade value chains that include execution, settlement, custody and collateral management, is consumed by intermediation.[4]

DLT-based capital markets, by reducing reliance on intermediaries and automating trades, can eliminate much of this excessive rent seeking, enabling buyers and sellers to retain a greater portion of trade value.

Improved Balance Sheet Management

An indirect yet very significant benefit of the near instantaneous clearing and settlement provided by DLT-based market infrastructure is the greatly diminished reserve requirements for parties engaging in capital market transactions. Financial institutions involved in capital markets must reserve cash on their balance sheet to cover their exposure to the risk of non-delivery by their trading counterpart. The reserve requirements are defined by the parties in the trade and, until a transaction is settled (3+ days), they must tie up cash on their balance sheet to compensate for this risk.

Compare the amount reserved on balance sheets globally (therefore not engaged in an economic or interest-generating activity) where trades are unsettled for three days with the reserve requirements when trades settle in less than 10 seconds. The reserve requirements with the near real-time clearing and settlement enabled by DLT infrastructure are a fraction of a percentage of the amount required to hold in reserve with 3-day clearing and settlement, so the vast majority of capital tied up on the balance sheet today can be put to economic use in the capital markets to for instance, purchase fixed income securities. This turns an opportunity cost into economic gain.

IDENTIFYING YOUR ROLE IN THE DLT LANDSCAPE

Most traditional roles such as brokers, exchanges and asset custodians will continue to exist in a DLT-based capital market in at least the near to mid-term future, and their ability to function will be enhanced as outlined above. However, **the shift to a DLT-based capital market also necessitates the emergence of new roles**.

The diagram on the left shows the new shared information exchange model with traditional roles in blue and the new roles required for DLT-based capital market infrastructure in white.

To better understand the new roles and how traditional roles fit into this new shared information model, each role will be discussed in view of the expected changes. Note that a single entity can take on one or more roles.

CUSTODIANS

A custodian is **a financial institution that holds customers' securities for safekeeping in order to minimize the risk of their theft or loss**. These are regulated entities with high capital requirements ($50,000,000 in the US for instance), so they tend to be large and reputable firms. In DLT-based capital markets, custodians will continue to play an important role for two main reasons:

1. Managing custody of digital assets presents a unique technical challenge.

While it's true that a key feature of DLT-based assets is the ability for individuals to take direct custody of them, in practice the risk of doing so is high. Taking custody of DLT-based digital assets means holding the private key (a long alphanumeric sequence) that encrypts the digital wallet corresponding to the digital assets. Whoever holds the private the key to a wallet, has full access to the assets contained in it. Further, if the private key is lost, the assets are irretrievable. Custodians of digital assets must therefore leverage specialized technical know-how, deploying layers of security against hacking, and redundancy against loss, to ensure private keys are appropriately safeguarded.

2. They are required for legal compliance.

The use of custodians is a vestige of the evolution of capital markets, where long ago it was determined impractical to register shares traded on public exchanges in each specific shareholder's name. In most jurisdictions and for a wide array of financial assets, there is a legal requirement to safeguard the assets with qualified custodians.

DIGITAL ASSET VAULT

A Digital Asset Vault (DAV) is the software or technical custody solution – purchased externally or developed internally by custodians – that provides them with the required infrastructure to **store private keys for digital asset accounts**. This new infrastructure requirement creates a whole new industry, with at least 150 DAV providers having already emerged worldwide.[5]

While a DAV may be functionally separated from a custodian, it is also possible that a company takes on the roles of custodian and DAV at the same time (given the company has been assigned the required license to operate as a custodian).

BROKERS

A broker is **an individual or firm that charges a fee or commission for executing an investor's buy and sell orders**. Operating with a licence issued by the relevant financial authorities, they receive investment requests and pass them on to exchanges. To find the best price possible for their clients, brokers are typically connected to multiple exchanges.

The current role and function of brokers is merely touched by DLT. Brokers will still play a vital role in the DLT-based capital market, mainly in **price discovery and executing transactions**. However, they will benefit from an **improved ability to source liquidity thanks to the DLT-supported capital market structure**.

EXCHANGES

An exchange is **a marketplace for the trading of securities, commodities, derivatives, and other financial instruments**. Exchanges will remain unchanged in their role as matching counterparties and facilitating price discovery. Mainly the settlement process will change in that trades will be settled "on chain" by providing signed transaction data to the ledger.

Note that a growing volume of asset exchange may ultimately be facilitated through decentralized exchange protocols (which are discussed in the "Decentralized Finance in the crypto markets" section below). In this scenario, a custodian could simultaneously take on the role of exchange, as exchanges are effectively replaced by code.

ISSUERS

An issuer is **a legal entity such as a corporation, investment trust or government that offers its own securities for sale**. Although the role of the issuer does not change, they are expected to significantly benefit from a **reduction in issuance costs**. Issuers can also benefit from **improved direct access** to capital markets.

ASSET TOKENIZERS

The asset tokenizer **is new to the capital market ecosystem and enables legally compliant issuance processes by providing smart contracts in order to tokenize financial instruments on behalf of the issuer**. When tokenizing financial instruments using smart contracts, it's possible to "bake-in" regulatory compliance to the tokens that represent the assets. For example, when an issuer tokenizes securities, the tokens that represent the securities can be coded such that they can only be traded amongst whitelisted accredited investors, that no single investor holds more than the defined upper limit of the total supply, and so on. **This allows for the creation of secondary markets for previously illiquid assets** like private securities, private REITs, and private funds.

Asset tokenizers file smart contracts with the digital asset registrar (see opposite) and execute transactions (e.g. issuing) on behalf of the issuer. Note that it is entirely possible for an issuer to simultaneously take on the role of asset tokenizer as well as exchange (for example, see iSTOX in the use cases section below).

DIGITAL ASSET REGISTRAR

The digital asset registrar is another **new role** precipitated by the emergence of DLT-based capital markets. **They facilitate consensus across different stakeholders and govern the digital asset registry/ contract registry by observing, recording, and validating all transactions on the platform.** They register smart contracts filed by the asset tokenizer and connect digital assets with associated rights, as well as possible on-chain twins in the case of, for example, asset-backed tokens. Digital asset registrars operate as one of the nodes in a permissioned blockchain network (eg. R3 Corda).

GATEKEEPERS

The gatekeeper, another new and emerging role, **controls access to the DLT-based capital market infrastructure**. They grant and restrict access to the permissioned platform, perform initial screening of participants with the required KYC / AML checks, and take care of the technical setup and on-boarding of participants.

BANKS

Banks will still be required for **providing fiat accounts as a bridge between cash-on-ledger** (see below) **and the existing fiat currency network**. However, through the use of cash-on-ledger, there will be fewer transactions, resulting in less revenue for banks. Banks will execute payment instructions of fiat currencies (e.g. deposits and withdrawals), safeguard fiat currencies in bank accounts, and reconcile the amount of cash in fiat accounts with the supply of cash-on-ledger.

CASH-ON-LEDGER ISSUERS

Cash-on-ledger issuers are also new to the ecosystem. **They ensure the regulatory compliance of the cash-on-ledger issuance process and they are responsible for the management of smart contracts**. Moreover, they initiate fiat currency transactions through the bank and validate cash-on-ledger transactions. Cash-on-ledger issuers could potentially even take the form a central bank emitting, for example, Euros onto the chain.

CASH TOKENIZERS

The cash tokenizer is another new role that — mirrored to the asset tokenizer — **provides the legally-compliant technical infrastructure to issue 100% collateralized cash-on-ledger for on-chain settlement** (Delivery vs. Payment) **for the cash-on-ledger issuer**. Banks, cash-on-ledger issuers, and cash tokenizers have different roles and functions, and these can exist separately or coincide in a single entity. This single entity could potentially even be the central bank as issuer, using a cash tokenizer to make the smart contracts clean and compliant.

REGULATORS

Regulators may **monitor transactions of digital assets and cash-on-ledger in real time with a read-only DLT node**. The immutable audit trail enabled by DLT enables lower cost and more accurate regulatory reporting.

UNIVERSAL ADOPTION: THE DLT UTOPIA

A big-bang shift to an entirely DLT-based system would have all market participants working from common datasets in real-time. This would potentially eliminate the need for the intermediaries that today hold custody of this data, end the requirement for constant reconciliations (and the computational and labour-power these activities consume), and provide regulators with universal visibility where required by law. The result would be more direct, more efficient capital markets, with all of the above-described benefits, including reduced systemic risks.

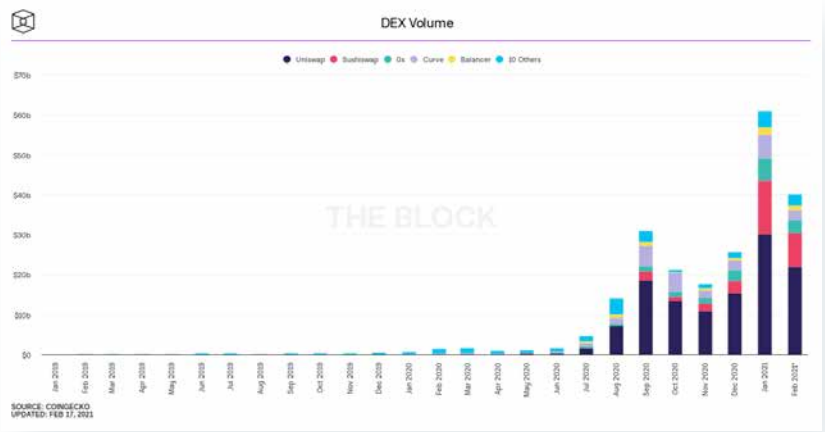
DECENTRALISED FINANCE IN THE CRYPTO MARKETS: A window into the future

Large segments of the cryptocurrency markets exist entirely outside the purvey of the traditional markets, and in many cases completely without regulation. This makes them an ideal environment for studying what a “big bang” shift towards DLT-based capital markets might look like.

Specifically, the innovations within the wider crypto ecosystem collectively known as **decentralised finance** (DeFi) present a model for the direction traditional markets are likely to take in the coming years as regulation catches up with the capabilities of the technology and as the technology itself is refined through "in-the-wild" usage.

One such innovation is **decentralized exchange protocols**, also known as **automated market makers** (AMMs). Here, one set of users are incentivized by the yield generated through trading fees to lock up assets into liquidity pools governed by smart contracts. Traders meanwhile leverage the liquidity in the pools to trade in and out of assets. Critically, neither the liquidity providers nor the traders ever hand over custody of their assets to the exchange. Instead, they merely interact with the smart contracts that define the protocol.

While AMMs present risks in terms of custody (users must manage their own private keys) and anonymity (making them noncompliant from a regulatory standpoint, at least in their current form), they nevertheless demonstrate the potential offered by the efficiencies brought through disintermediation. These efficiencies enable **bootstrapping of not only market depth, but also capital for newly issued assets**. It should come as no surprise then, that AMM protocols have exploded in popularity in the "wild-west" of cryptocurrency markets where self-custody and anonymity are default. By January 2021, spot volume traded through AMM protocols exceeded US$60 billion in a single month (led by Uniswap and Sushiswap)[6], representing greater than 7% of the total spot trade volume in the wider cryptocurrency markets.[7]



Source: www.theblockcrypto.com/data/decentralized-finance/dex-non-custodial/dex-volume-monthly

Other financial products, again governed by smart contracts, have also been gaining steam over the last year. One such example is **lending**, where users lock up digital assets in collateral pools that can be borrowed from. Smart contracts hold the collateral until both sides of the transaction fulfill their obligations. In this model, the smart contract-driven automated management of custody, settlement, and escrow reduces the rent charged to perform those actions. This, combined with the increased perception of risk, enables **higher yield for stakeholders, attracting market participants**.

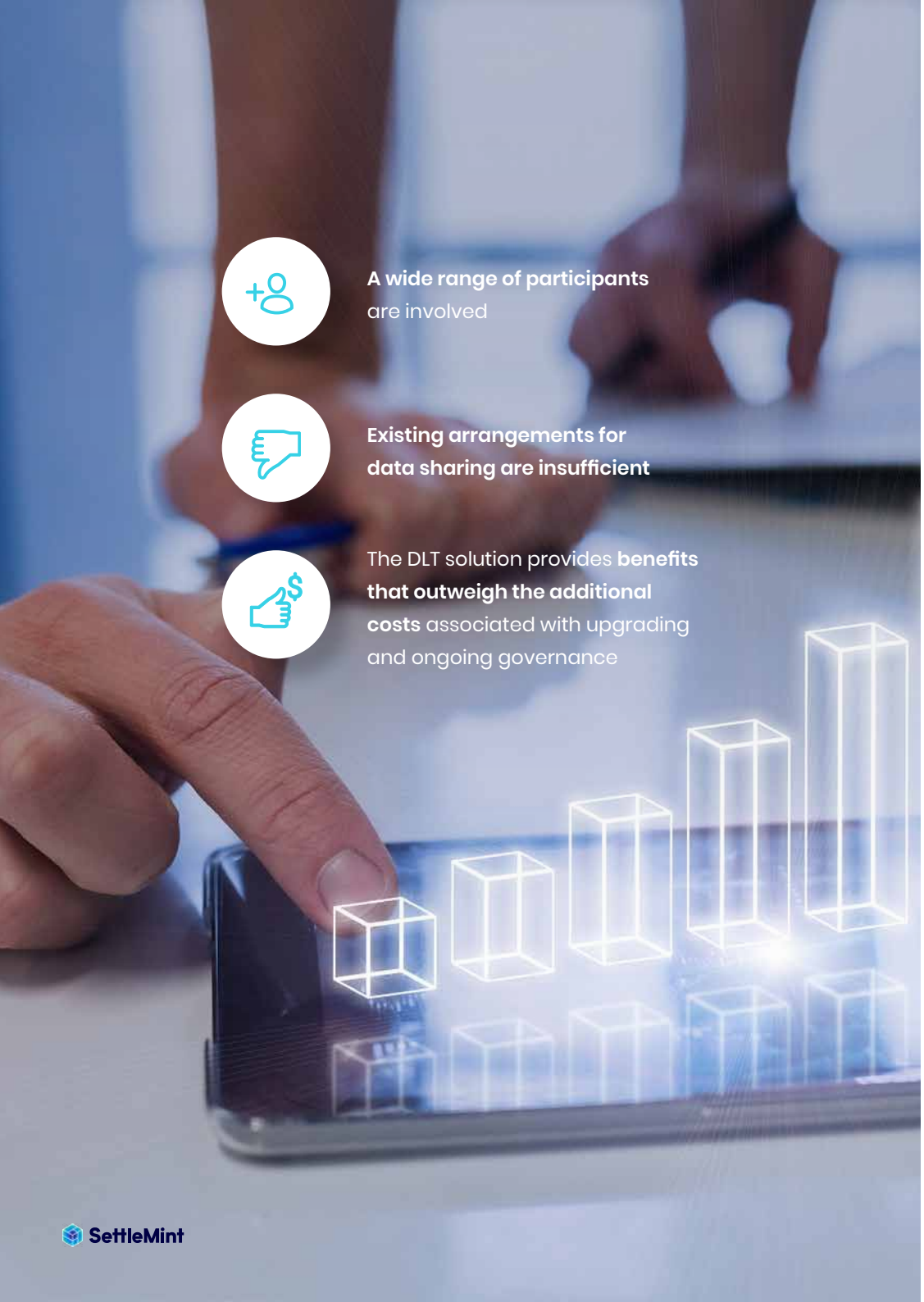
Thus, debt outstanding in DeFi lending (a key metric for tracking adoption) rose from $500 million in mid-2020 to exceed $6 billion by the end of January 2021, led by the Compound, Aave and Maker protocols.[8]

Source: https://defipulse.com/defi-lending

Beyond lending, smart contracts combine with distributed autonomous organization technologies to **enable more complex derivative instruments including options, futures, and synthetic assets**. Notable examples here include UMA - a protocol that enables the decentralised creation, maintenance, and settlement of financial contracts for any underlying asset - and Synthetix, a decentralized platform for the creation of on-chain synthetic assets that track the value of real-world assets. In addition to bringing similar efficiencies as with AMMs and decentralised lending, the technologies underpinning these derivative protocols provide a **much greater level of transparency** than the equivalents in the "traditional finance" world.

If this model were to be widely adopted in traditional derivates markets (something that would, of course, have be done in a permissioned form to achieve regulatory compliance), there's **potential to reduce the systemic risk posed by, for instance, the aforementioned Central Counterparty (CCP) structure**.

The above-described innovations in the DeFi space provide a glimpse into the future of capital markets where regulation catches up to the point that disintermediation is feasible. They also demonstrate that the move to a decentralized capital markets infrastructure is more of a change management exercise than a technical feasibility one. Therefore, forward-thinking stakeholders in the traditional capital markets who are looking to secure their seat in the capital markets of the future should take note of innovations in the DeFi space. The challenge for incumbents is to find ways to shift their business model and redefine what value adding services they offer; not an easy task for any market participant, but a necessary one for long term sustainability.



INCREMENTAL CHANGE: THE DLT REALITY

Of course, with a complex and structurally critical system such as modern capital markets, the reality is that changes can only come incrementally. Consider the example of custodians, which are legally and practically entrenched in the structure of capital markets. It will likely take a decade or more before disintermediation of custodians can occur at scale as 1) regulations need to change and 2) DLT-based market infrastructure needs to be developed, tested, and broadly adopted.

Note that a number of forward-thinking jurisdictions have already set up regulatory sandboxes to encourage experimentation and innovation with DLT-based solutions. Examples include the Monetary Authority of Singapore with its Fintech Sandbox and Sandbox Express[9], Europe's Regulator Sandboxes and Innovation Hubs for FinTech[10], and the Securities and Exchange Board of India's regulatory sandbox.[11] It is likely that such jurisdictions will emerge as leaders in the changes to regulation and new market infrastructure.

For existing players looking to stay relevant, and for new entrants looking to gain market share, it's important to recognize where the opportunities lie as DLT-based capital markets advance. **To that end, DLT solutions have potential to gain adoption for capital markets use cases where all three of the points listed opposite are true.**

WHAT ARE THE USE CASES?

The potential capital markets applications of DLT can be broadly divided into four groups:

Asset ownership and management

EQUITY OWNERSHIP AND TRANSACTIONS — 3

BOND OWNERSHIP AND TRANSACTIONS — 3

ILLIQUID ASSET MANAGEMENT (SYNDICATED LOANS ETC.) — 4

FUND ALLOCATION — 4

Trading and derivatives

DERIVATIVE EXPOSURE AND CLEARING — 3

COLLATERAL MANAGEMENT — 3

FOREIGN EXCHANGE MARKETS — 2

COMMODITY MARKETS — 2

Corporate financial services

INTERNATIONAL TRADE FINANCE — 4

SUPPLY CHAINS — 3

INSURANCE — 2

CROSS-BORDER PAYMENTS — 3

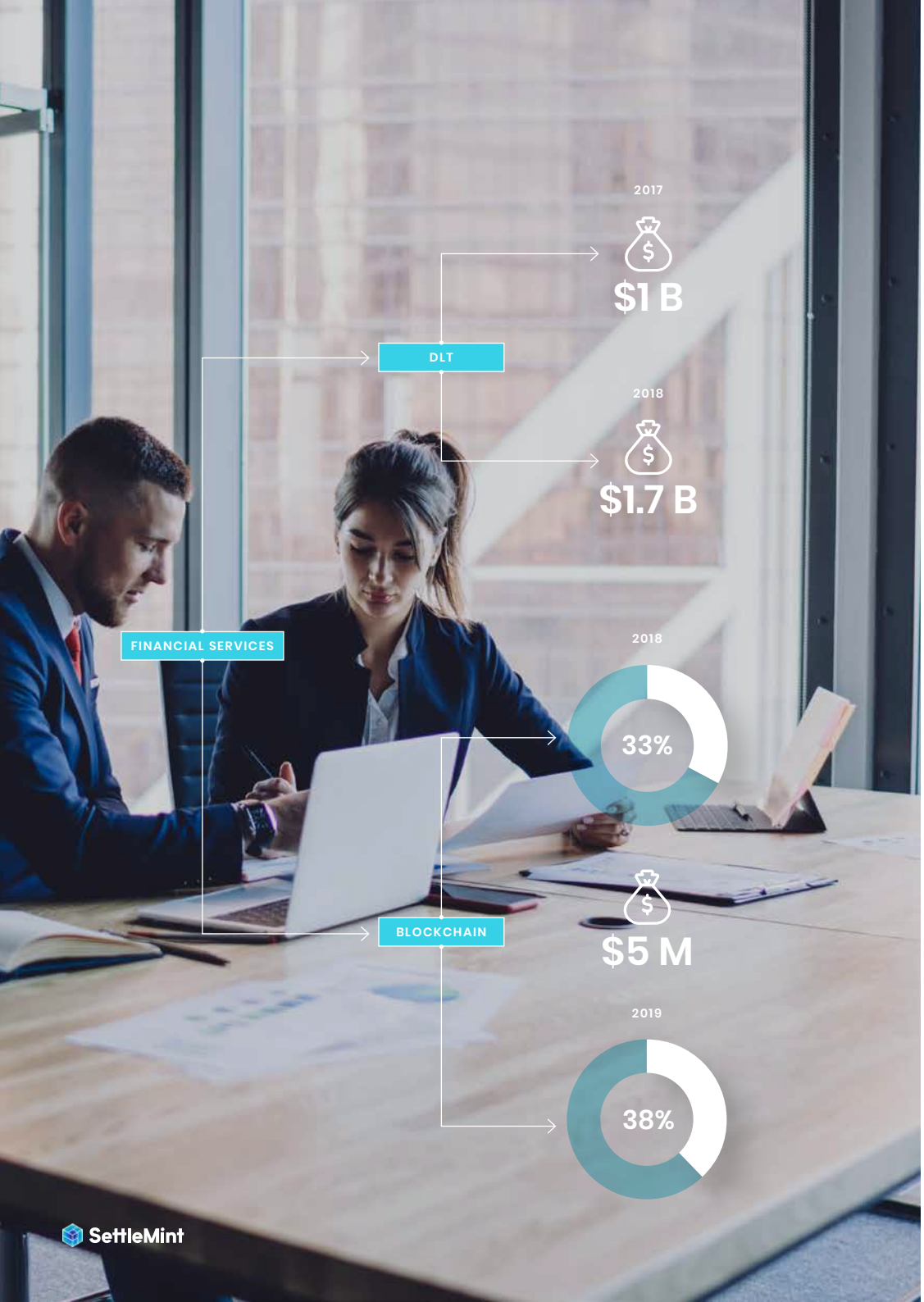
SECURITIES ISSUANCE — 4

Regulatory

KYC/AML PROCEDURES — 4

REPORTING — 4

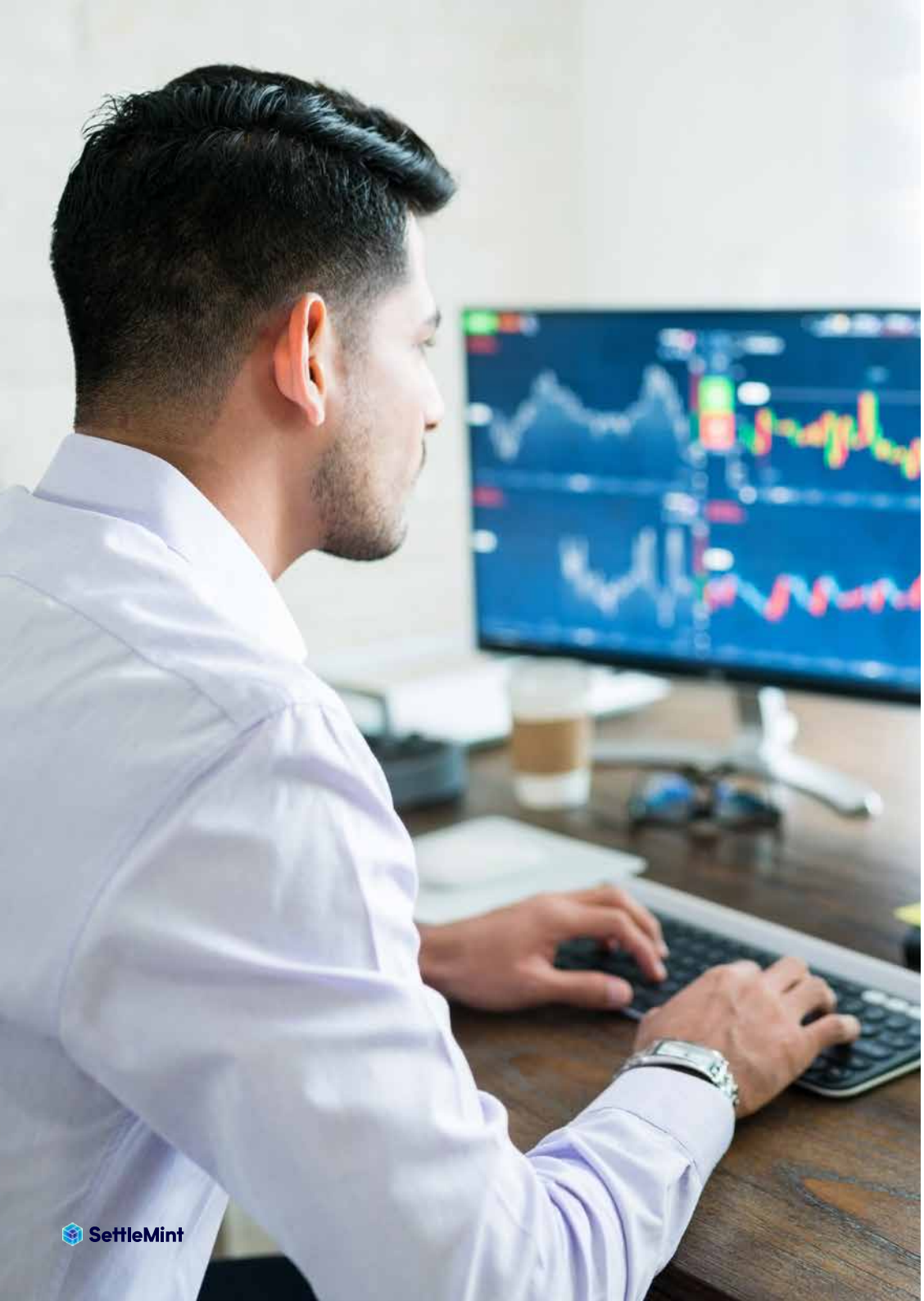
OVERSIGHT — 3



THE CURRENT PROGRESS OF DLT SOLUTIONS IN CAPITAL MARKETS

A wide range of players – from FinTech start-ups to venture capitalists and specialist consultancies - have been heavily investing in DLT since at least 2012. The breadth of investors has expanded in recent years to now include banks, exchanges, clearing houses, and broker-dealers. A 2018 study from analytics and research firm Greenwich found that over $1 billion had been invested in DLT projects in financial services in 2017, with a prediction of $1.7 billion in investment for 2018.[12] A 2019 Deloitte survey revealed that blockchain had cemented its position in enterprise as a top-five strategic priority, with 33% of surveyed financial services companies investing at least $5 million in blockchain initiatives in 2018 and 38% committed to invest that amount in 2019.[13]

Hundreds of proofs of concept were conducted between 2015 and today. With many now rapidly evolving into customer-facing platforms, the potential impact on capital markets is likely to be high in the near to medium term.



SettleMint

SELECTED EXAMPLES OF EARLY-STAGE AND IN-PRODUCTION DLT APPLICATIONS IN CAPITAL MARKETS

The best way to understand how DLT solutions can impact capital markets is to examine the projects that are gaining real adoption. Here we've divided these solutions into market segments:

- CUSTODY SOLUTIONS
- SECURITIES ISSUANCE
- SECURITIES LENDING
- BANK FINANCING
- TRADE FINANCE
- FUND ADMINISTRATION

CUSTODY SOLUTIONS

Metaco

As Metaco specializes in digital asset custody solutions, it maps to the digital asset vault provider role described in this report. The Switzerland-based company is part-owned by telecom provider Swisscom; national postal service, Swisspost; and banking technology vendor Avaloq. Metaco's signature product, known as SILO, focuses on providing digital asset custody to institutions.

How SILO works

Launched at the start of 2018, SILO is a multi-wallet solution deployed partly on premises and partly in the cloud. Designed to manage multiple accounts with different digital assets, it integrates security features such as multi-signature and transaction flow limits. Metaco's SILO product also allows for asset tokenization and management with a smart contract framework that supports equities, bonds, derivates and other assets classes. As such, Metaco demonstrates the ability for a single entity to take on multiple roles in the DLT-based capital markets (in this case, asset tokenizer in addition to digital asset vault provider).

Benefits

According to a Metaco press release, the product "allows banks to provide clients with the highest-grade protection of their assets while still giving them liquidity to trade and make payments."[14]

Reception

Clients include the German securities exchange Deutsche Börse, who is using Metaco's product as part of the custody solution for its digital asset pilot in Switzerland.[15]

Metaco closed out a twice-oversubscribed Series A $18 million investment round in July 2020 with Standard Chartered contributing an undisclosed amount.[16]

> *"If digital assets more broadly are here to stay as an asset class, then you will need the infrastructure to keep them safe."*
>
> *- Alex Manson, head of Standard Chartered Ventures*[17]

Commenting on the rationale for Standard Charter's allocation to the Metaco Series A, Standard Chartered Ventures head Alex Manson also noted that many current digital asset custody offerings lack the needed function segregation, meaning the custody business isn't separated from other ventures – something that's important for regulatory compliance. This sentiment in the market confirms that capital markets leaders see digital asset custody via third parties as a critical enabler for capital market adoption of DLT.

SECURITIES ISSUANCE

ISTOX

ISTOX is a Singapore-based capital market platform that features integrated issuance, custody, and trading of digitized securities. This means it maps to the digital asset vault, asset tokenizer, exchange, and custody roles described in this report. Founded in 2017 and owned by blockchain infrastructure firm ICHX, iSTOX graduated from the Monetary Authority of Singapore's FinTech Regulatory Sandbox. This makes it the first DLT-based capital markets platform to be approved and licensed by a major regulator.

How ISTOX works

The tokenisation process converts rights to an underlying asset class such as shares in a private equity offering into digital tokens, which then become eligible for trading.

Benefits

ISTOX' digitised securities are more accessible to both companies raising capital and buyers of the securities for a number of reasons. These include the lower cost of issuance and management, the ability to settle instantly, fractionalization, and the capacity to have regulatory compliance baked-in to the digital tokens representing securities.

Current progress

ISTOX managed to garner six listings as of the end of 2020, and expects to increase that to 20 listings in 2021.[19] This may include fractional wholesale bonds under medium-term notes (MTN) programmes listed on Singapore Exchange (SGX), which would bring SGX-listed wholesale bonds to a wider pool of investors.[20] In 2020, iSTOX also announced plans to expand into China.

Source: iSTOX

Reception

ISTOX closed a $50 million Series A in January 2021, bringing investments from a number of Japanese state-owned entities, including the Development Bank of Japan and JIC Venture Growth Investments, the venture capital arm of the Japan Investment Corporation.[21] Such investments are another strong signal that capital markets incumbents see DLT-based infrastructure as a winning play.

> *"Capital markets are transforming rapidly because of advancements in technology. The regulator MAS and our institutional investors have been far-sighted and progressive, and they support the change wholeheartedly."*
>
> *-iSTOX chief commercial officer Oi Yee Choo[22]*

SECURITIES LENDING

Background

Typical securities lending requires clearing brokers to facilitate transactions between the borrowing and lending parties. Transactions in securities lending involve the movement of collateral on one hand, and the loan of securities on the other. In the status quo, clearing houses use centralised ledgers to track transactions and balances. This effectively creates a single source of truth for participants. However, verifying the integrity and correctness of such ledgers relies on costly and time-consuming reconciliation processes that involve multiple administrations.

HQLA[x]

The HQLA[x] model and platform

Luxemburg-based fintech firm HQLA⌧ and Deutsche Börse Group formed a strategic partnership in 2018 for the creation of a joint operating model and platform to support the securities lending market. The scheme, which went live in December 2019, aims to improve speed, lower cost, and reduce risk in the securities lending market.

How HQLA[x] works

HQLA[x] is a securities lending platform that uses a decentralized ledger to create an improved single source of truth. Market participants run nodes to form a Corda Business Network. In the model, ownership of securities is transferred virtually amongst participants. While the underlying securities remain in the custody of the collateral giver, a traditional legal framework guarantees ownership transfer should it be required.

The initial use case of the HQLA[x] platform is precisely timed Delivery versus Delivery (DvD) ownership transfers of baskets of securities that reside in disparate securities depositories. DvD is a securities settlement mechanism that links two securities transfers in such a way as to ensure that delivery of one security occurs if, and only if, the corresponding delivery of the other security occurs.

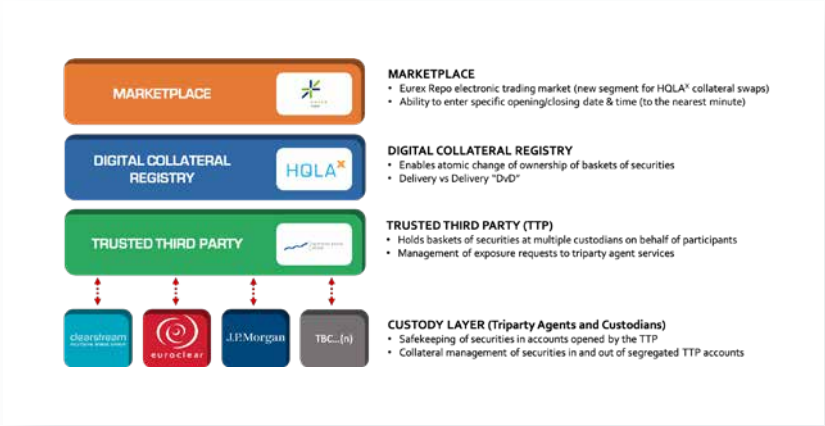
A typical business transaction on the platform is a collateral upgrade transaction where one party lends a specified quantity of a high-quality liquid asset to another party that offers a specified quantity of a lower-quality collateral in return. The DLT-based digital collateral registry records the atomic change of ownership of baskets of securities between the institutions (atomic in this context means no further process of settlement is required). The registry, which is built using Corda's enterprise blockchain protocol, is structured such that businesses manage their transactions directly while maintaining strict privacy. Corda's architecture helps to ensure that data is shared between participants on a need-to-know basis. Institutions gain full transparency of only the transactional data for transactions that they are directly involved in.

Using existing rails

HQLA[x] is an example of a DLT solution that, rather than building a new eco-system from scratch, is instead linking industry incumbents with a single additional tech layer. According to HQLA[x] Co-founder and CEO Guido Stroemer,

> *"the goal from the very beginning was to build a solution for enhancing collateral fluidity without a 'big bang' requirement for our clients to change the way in which they interact with existing securities settlement infrastructure."*[23]

HQLA[x] thus allows market participants to connect to the platform via well-established interfaces. Trades are conducted on Eurex Repo F7, a widely-used trading platform. In terms of compliance, the model is built on existing legal constructs (specifically the Global Master Securities Lending Agreement). At the custody layer, the platform connects to major custodians (currently Clearstream, Euroclear and J.P. Morgan) through a trusted third party using SWIFT messaging.



Source: https://www.hqla-x.com/post/from-revolution-to-evolution

Current progress

Commerzbank, Credit Suisse, and UBS successfully executed the first live transaction on HQLA[x] in December 2019. The transaction entailed the exchange of a basket of corporate bonds and German government bonds between UBS and Commerzbank, with ownership transfer recorded on HQLA[x]'s digital collateral registry rather than being moved physically between collateral agents as in the status quo. Commerzbank, Credit Suisse, UBS, and over 15 other market participants in the EU region, including CIBC, Citi, Goldman Sachs and ING, are currently engaged in different phases of onboarding to the HQLA[x] platform.[24] Most of these participants currently rely on HQLA[x] partners to host their nodes. According to a June 2020 post from HQLA[x], ING Bank was among the first to actively host its own node.

Reception

HQLA[x] promotional materials suggest that the platform enables participants to "seamlessly execute capital-efficient securities lending transactions for enhanced balance sheet optimization."[25] This appears to be borne out by real-world experience. When Commerzbank, Credit Suisse and UBS successfully executed the first live transactions on HQLA[x] in December 2019, co-head of the Repo Desk Treasury at Commerzbank Peter Schmidt commented:

> *"HQLA[x] delivers a fascinating approach to overcome the fragmented post-trading landscape. It enables treasury departments to manage their collateral pools more efficiently by significantly reducing the settlement cycle and avoiding resource-intensive collateral movements. It is a first but important step toward a new ecosystem where tokenised assets can be traded in a DLT environment."*[26]

Future

The project's long-term vision is to accelerate the financial ecosystem's transition towards frictionless ownership transfers of assets of all kinds. HQLA^{x} hopes to expand beyond DvD to address other pain points in the securities lending markets such as digital collateral record re-use, intraday trades, delivery-versus-payment trades, and support for various types of collateral pledges. The latter use case could satisfy margin pledge requirements for counterparty credit exposures with central clearing counterparties and/or bilateral counterparties. The firm also hopes to expand into other asset classes such as cash, precious metals, and commodities. This could be realised by tokenizing such assets directly in the HQLA^{x} operating model or through interoperation with other blockchain applications.

Related

BME

Spanish stock exchange group Bolsas y Mercados Españoles (BME) went into production in December 2019 with its DLT-Prenda, a platform that enables the exchange of collateral pledges in the securities lending markets (Prenda is Spanish for pledge). The system eliminates the need to exchange physical certificates in the collateral transfer process, thereby reducing processing time from 24 hours to just minutes.

The platform was built on Hyperledger Fabric, an open-source enterprise blockchain protocol under the Hyperledger umbrella that is sponsored by organizations such as the Linux Project, IBM, Intel, and SAP. Hyperledger Fabric, similar to Corda as used in the above-described HQLA^{x} platform, has channels that create a private "subnet" of communication between two or more specific network members, allowing for configurable privacy and transparency as needed.

BME Clearing, the Spanish central counterparty, and IBERCLEAR, the Spanish central securities depository, participate as nodes in DLT-Prenda by confirming to the registry the reservation of securities. According to a December 2019 Securities Lending Times report, DLT-Prenda's first external customer to register digital pledges on the platform was Renta 4 Banco.[27] The roadmap includes expanding the system to integrate digital bank guarantees.

TASE

The Tel Aviv Stock Exchange (TASE) was expected to go live with its Blockchain Securities Lending platform on 2 November 2020 and although details about the utilization of the platform in production are difficult to track down, TASE and Abu Dhabi Global Market (ADGM) have recently signed an MoU that could lead to increased adoption of the platform. According to TASE Chief Information Officer Uri Shavit as described in a July 2020 Securities Lending Times article, the platform will facilitate securities lending activities by permitting access to larger securities volumes within shorter timeframes, and by making securities lending available to more players in the Israeli market.[28]

The platform was built in collaboration with several technology partners including Accenture and Intel, using Hyperledger Sawtooth, another open-source enterprise blockchain protocol under the Hyperledger umbrella. Testing was completed in early 2020.

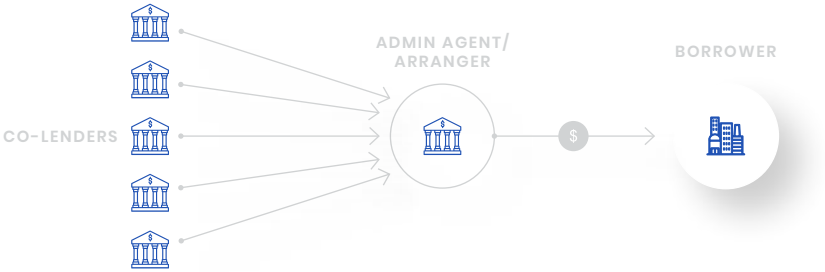
BANK FINANCING

Syndicated loans

Background

A syndicated loan is a financing method in which multiple constituencies (in Europe it is typically commercial banks and institutional investors) cooperate to make a loan under the same conditions based on a single loan agreement. This is generally done to spread the risk of loan default amongst several lenders for large corporate loans .

Agent banks take their place in a loan syndicate to facilitate the terms of the loan transaction, acting as a conduit between the borrower and the lenders. Agent banks need to communicate frequently with an often large and changing pool of lenders on issues such as documentation amendments, payment collection, interest falling due, and rollovers. These communications, and also tasks such as adjusting the conditions of syndicated loans, reviewing contracts, and inquiries after concluding a contract, are still conducted largely via e-mail or telephone. Since syndicate participants lack a single view of the whole loan, the risk of mistakes creeping into the system when inputting new data is high. As syndicated loans involve multiple lenders, multiple intermediaries and information asymmetries in the status quo, they are a "natural fit" for distributed ledger technologies, which can be leveraged to facilitate agreements and transactions between the large number of parties involved. Further, the existing institutional arrangements for ownership and trade of syndicated loans are underdeveloped and fragmented, making this a doubly ideal candidate use case.



Finastra's Fusion LenderComm

The Fusion LenderComm platform

Fusion LenderComm is a platform for facilitating the management of syndicated loans. It was developed by London-based fintech company Finastra in collaboration with blockchain consortium R3 and leading European banks including NatWest, Natixis, BNP Paribas, HSBC and ING. Finastra is the provider of Loan IQ, an information platform that services half of the world's syndicated loans.

How Fusion LenderComm works

The platform enables financial institutions acting as syndicated loan agents to publish loan data to a distributed ledger built on the Corda Enterprise protocol. The ledger displays credit agreements in real-time, providing all permissioned participants in the syndicate granular access to the information. This enables individual lenders to drill down into the loan data and servicing events without needing to query positions by phone, fax or email as per the status quo.

Benefits

According to Finastra's marketing materials, the Fusion LenderComm platform "*reduces the cost and burden of agent-to-lender administration and enables lenders to see accurate information on-demand so they can optimize syndicated loan portfolios.*"[29]

Fusion LenderComm Vice-President Grant Jones noted in a 2019 Euromoney article:

> *"I was looking at one bank's internal case study for using this technology, which talks about a 90% reduction in labour costs for lenders and a reduction for agents of 66% in the labour costs of managing the syndicate, including distributing information and resolving queries on a loan."*[30]

Borrowers may eventually benefit from these efficiency gains if the reduced cost of servicing loans is passed on to them.

Reception

Frédéric Dalibard, Head of Digital for corporate and investment banking at LenderComm consortium member *Natixis*, commented in the same abovementioned Euromoney article that the platform enables "*the sharing of information between agents and lenders on a need-to-know basis while being fully compliant with our stringent IT security policies.*"[31]
Elsewhere, Dalibard noted that:

> *"Fusion LenderComm addresses a key pain point by automating the costly manual processes traditionally involved in such sharing of information."*[32]

Cécile Bartenieff, COO of global banking and investor solutions at ***Societe Generale***, wrote in a 2019 Fintech Futures article;

> *"The Fusion LenderComm initiative will help provide greater transparency and operational efficiency to the syndicated loan market for the benefit of all participants, including the pool of banking lenders and our borrower clients. This is an illustration of how blockchain can help banks optimise the entire flow of financial operations in a standardised and secured framework."*[33]

Philippe Boulas, Global Head of Corporate Banking Operations at *LenderComm* consortium member BNP Paribas commented in the same article;

> *"With the creation of this community and a collaborative mindset we have a unique opportunity to tackle the operational pain points we have all been experiencing for years and that constrain syndicated loan market expansion."*[34]

Progress

Following successful pilots, Fusion LenderComm became commercially available as an app on R3's Corda platform in April 2018. In mid-2019, Natwest became the first bank to complete the second phase of the project that involves further integration with the platform by **enabling banks to read and write information from Fusion LenderComm directly into their systems**, rather than merely sharing the data through a web portal as in the first phase[35]. The ultimate aim of the platform is to **facilitate secondary trading, including both trade discovery and settlement**. According to Finastra, that phase was planned to launch in 2020.

Source: www.globalbankingandfinance.com

Other bank financing

BBVA

Since early 2018, Spanish financial services company BBVA has been using its blockchain-supported corporate lending platform to facilitate a string of high-profile loans:

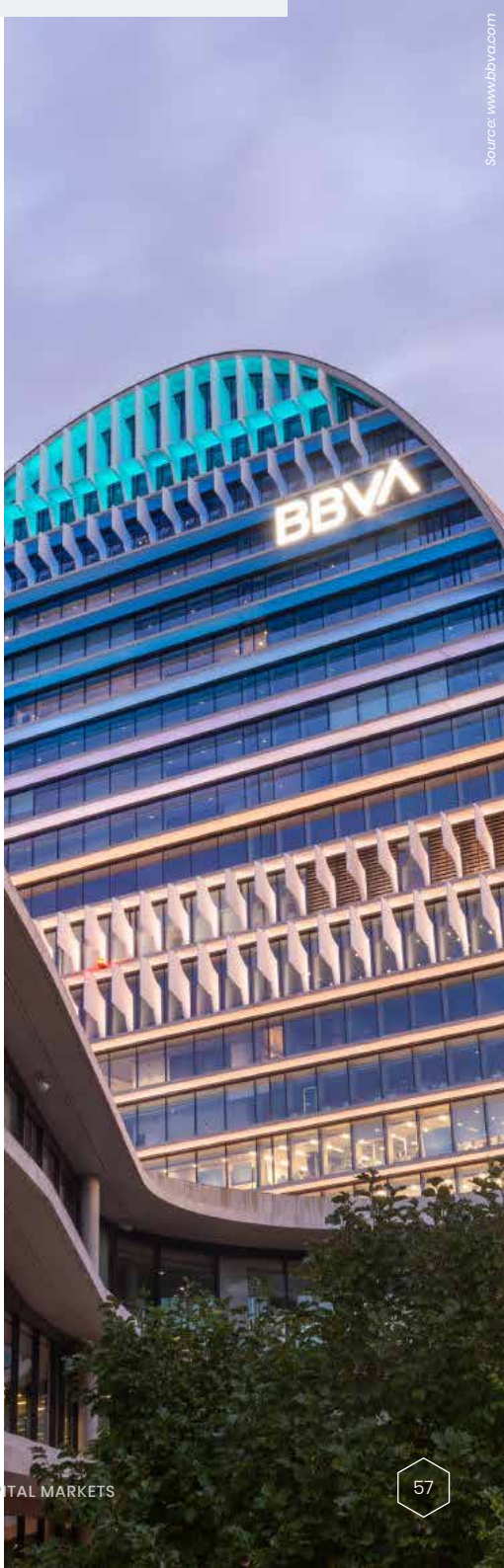
Date	Type	Amount	Company
Apr 2018	Corporate Loan	€75M	**Indra Minsait**
June 2018	Revolving Credit	€325M	**Repsol**
July 2018	Corporate Loan	€100M	**ACS**
Nov 2018	Syndicated Loan	€150M	**Red Electrica**
Dec 2018	Term Loan	€150M	**Porsche**
Dec 2018	Synthetic Guarantee	€60M	**European Investment Bank**
Feb 2019	Structured Green Bond	€35M	**MAPFRE**
Apr 2019	Sustainable Schuldschein Loan	€220M	**Madrid Government**

Source: www.ledgerinsights.com/bbva-blockchain-loan-banking-tech-award

BBVA's model integrates a combination of private and public blockchains. The private platform, built on Hyperledger Fabric, facilitates the negotiation process between the bank and the customer by making all data related to the deal available in real-time to permissioned participants. Finalized deals, meanwhile, have so far been published publicly on the Ethereum testnet.

In 2019, the platform was awarded the Banker's Tech Project Award in the distributed ledger technology category.

Referring to the 220 million euro "*Schuldschein*" *loan* to the Madrid Government, BBVA's corporate materials noted that **the DLT "ensured traceability and immutability during the negotiations and in the resulting agreements."**[36]



Source: www.bbva.com

TRADE FINANCE

Background

Trade finance refers to the provision of credit in international trade where the long period between ordering and receiving goods means large amounts of capital are effectively frozen, making it difficult to companies to maintain positive cashflow. Trade finance is a complex sector where a wide variety of instruments are used to determine financing, including:

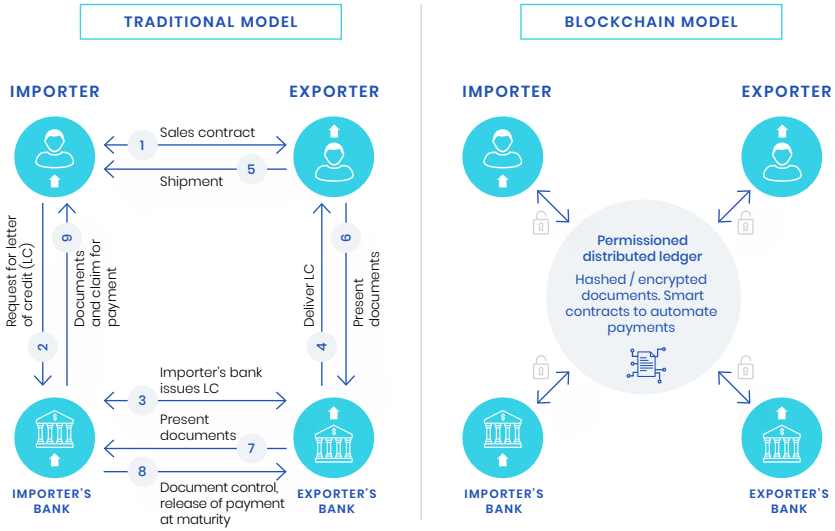
- **lines of credit** from banks to both importers and exporters
- **letters of credit** (where the buyer's bank guarantees payment to the seller for the goods shipped as long as terms contained in the letter of credit are met by the seller)
- **account receivable factoring** (where invoices are turned into working capital)
- **shipping and goods insurance**.

Regulatory compliance is also a contingent factor in trade financing, further complicating deals. Fraud is another factor as fabricated documents and phantom cargos are occasionally used to fraudulently secure financing. Status quo trade financing is held back by paper-based operations and the frequent need for manual interventions arising from the complexity of the process. All of these factors make trade financing an ideal candidate for distributed ledger technologies.

We.trade

we.trade

Conceived by a small group of banks in Europe, the we.trade platform - which was initially built by IBM, -is powered by Hyperledger Fabric and focuses on managing, tracking, and protecting open account trade transactions between European small and medium enterprises. Each participating SME must have an account with one of the banks that make up the consortium. The consortium consists of (as of writing) 16 European banks, each of which constitutes a node on a decentralized ledger that tracks transactions and enhances the data-sharing and coordination capacity of participants. Because client needs and regulations vary in each of the 15 supported countries, member banks at each end of the trade choose which products they wish to offer.



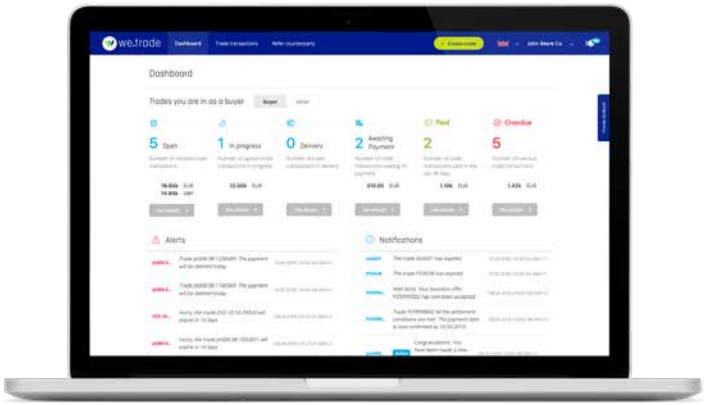
Source: https://cib.db.com/insights-and-initiatives/flow/trade-finance/trade-and-the-blockchain-where-are-we-now.htm?kid=nl2020

We.trade offers an alternative to the traditional letter of credit system in the form of a "Bank Payment Undertaking" (BPU) which guarantees payment by the importer's bank to the exporter (because letters of credit are so complicated and costly, most SMEs don't use them, particularly in Europe). Once a BPU has been procured by a buyer (importer), the seller can obtain financing from its respective bank, based on the BPU. A case study presented in we.trade's promotional materials demonstrates the system:

> A Swedish shoe importer is asked by their supplier in Spain for prepayment on their order. The delivery time for the order is typically 3-5 months, but the shoe importer cannot invoice customers until the order is delivered. With payment terms of between 30-60 days, the importer is thus burdened with lack of access to the needed capital for up to 7 months.
>
> To free up capital, the shoe importer requests a BPU on we.trade. Once the importer's bank approves the BPU, the supplier is now able to request BPU financing from their bank. This effectively allows the supplier to be paid in advance for the delivery. The result for both the importer and exporter is that they can retain their working capital. The involved banks meanwhile earn their fees for providing the needed capital.

The platform also supports automated payments by tracking and linking supply chain progress with smart contracts. If and when the goods are confirmed delivered as contractually agreed, a smart contract triggers a payment via SWIFT or SEPA.

As of early 2020 such automated payments constituted the majority of transactions on we.trade, according to a Ledger Insights article, while BPU and BPU financing accounted for 27% and 18% of transactions respectively.[37]



Progress and reception

At the time of writing, more than 60 million euros of transactions have been conducted through the we.trade platform. Feedback, displayed on we.trade's website, highlights the ease with which SMEs gain access to capital in order to facilitate international trade:

> *"We.trade is the future of trade finance. It is a win-win digital solution for seller and buyer, in just one click you can extend payment terms in a secured way and get the cash in advance if needed"*
>
> *Philippe Breistroff — CFO, Segafredo Zanetti France*[38]

Future

We.trade is also looking to expand the consortium and Trader Directory (a list of member SMEs) to Asia. Additionally, there are plans for technical upgrades such as ERP integration which would automate invoice uploading to the platform.

Related

A number of blockchain-supported trade finance platforms have now moved beyond proofs of concept and into commercial production. A summary of the leading efforts follows:

Contour

Contour (formerly Voltron) is a consortium of banks, led by HSBC, which leverage Corda's DLT to digitize and share the letters of credit and other trade finance documents towards the goal of cutting the processing time and reducing costs. Other consortium banks include ING, Bangkok Bank, BNP Paribas, CTBC Holding, NatWest, SEB, and Standard Chartered. In April 2019, the Singapore-based platform integrated data from essDOCS' CargoDocs DocEx, a service that legally digitizes documents used in global trade. This provided a connection for Contour to CargoDocs' user network of over 6,000 exporters, traders, importers, shipowners, ship agents and independent inspectors. A series of successful pilots were completed in mid-2019, such as an oil cargo shipment from Thailand to Singapore in which a letter of credit was processed in 12 hours as opposed to the five days it had taken previously. The platform became commercially available in the second half of 2020 and, as of February 2020, it was reported that the consortium counted 50 participating banks.

Komgo

A collaboration between banks and corporates, Switzerland-based Komgo is a trade finance platform that focuses on commodities trading, particularly in the oil and gas sector. The solution, which is powered by JP Morgan's Quorum (a DLT platform), provides a single source of truth amongst commodity traders and banks. The Komgo platform integrates KYC compliance controls where the exchange of documents is executed with encryption over the blockchain on a need to know basis. The platform currently has over 1000 registered users who have issued more than 20,000 letters of credit.

Dltledgers

The Hyperledger Fabric built dltledgers blockchain platform that digitalises trade processes and financing documentation is now commercially available and gaining adoption. In April 2020, Cargill and Agrocorp for instance completed a cross-continent commodity trade finance transaction using the platform. That transaction involved a US$12 million wheat shipment from North America to Indonesia. A financing bank, a shipowner, and shipping agent utilized the shared ledger to facilitate the deal alongside the agri-commodity traders. The transaction was settled in five days rather than the typical 30 days for similar deals using status quo methods.

iTrust

Singapore-based trade financing platform iTrust is also now commercially available. The platform combines IoT with blockchain to improve supply chain visibility and risk management. In October 2019, CIMB Singapore used iTrust to log documents for a transaction involving the financing of dairy products into China.

FUND ADMINISTRATION

Background

Investment fund administration involves coordination between a wide variety of participants including investors, brokers, asset managers, and regulators. Manual reconciliation is still the norm in the industry and stakeholders in fund administration often have to input the same information, which is time-consuming and can be prone to manual errors. In an environment of downward pressure on fund fees, asset managers are looking to reduce costs. Additionally, regulations, such as MiFID II in the EU, further complicate compliance for fund managers.

Solutions

A number of blockchain-based initiatives have emerged in recent years aiming to provide value-added complexity reduction in fund administration.

Funds Record Keeping

Calastone, a UK-based global transaction network for the mutual fund industry, migrated its entire infrastructure in mid-2019 to its blockchain-based Distributed Market Infrastructure (DMI) after two years of testing. The infrastructure helps its more than 1,900 clients manage mutual fund transactions. The company, which processes $218 billion in transactions monthly, estimates DLT solutions can save the industry $4.3 billion. The infrastructure enables participants to access, according to the company's promotional materials, a "fully mutualised global funds marketplace whereby the trading, settlement and servicing of funds is conducted in real-time."[39]

Reception and adoption

In May 2020, Calastone announced that JP Morgan Asset Management would use Calastone's blockchain-based solution for automated money market fund settlement. Paul Przybylski, Head of Product Strategy and Development at JP Morgan Asset Management, was quoted in a press release from JP Morgan saying Calastone's technology enables JP Morgan to "bring automated settlements to the [Morgan Money] platform, allowing our users to settle trades in real time, with automated trade workflow."[40]

Related

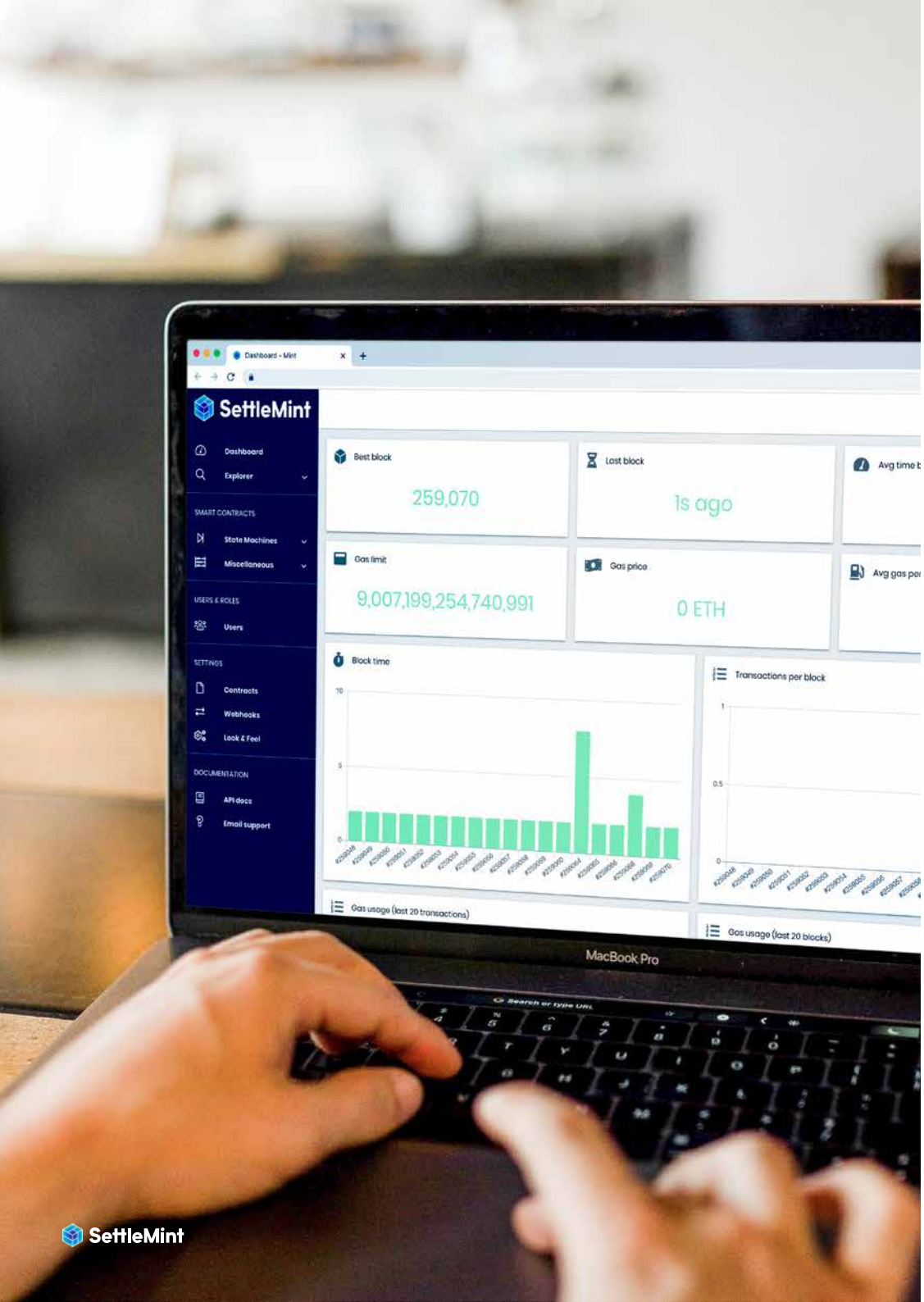
London-based SETL's IZNES is a platform for pan-European investment funds record keeping. It is currently seeing uptake in the French market.
Luxembourg Stock Exchange subsidiary Fundsquare has developed the FundsDLT platform where Credit Suisse Asset Management recently ran a pilot.

Future: Tokenization

Asset tokenization refers to the process of creating decentralized, digital ownership of assets which can later be traded. The future of fund administration will likely involve tokenization of a fund's underlying securities enabling funds to be composed and broken down into easily tradeable tokens. A distributed ledger recording the creation, redemption and transfer of fund units represented by such tokens would eliminate many of the current complexities of fund administration. This should enable asset managers to offer more affordable investment products. Early adoption in this field is coming from private markets such as real estate, diamonds and fine art, where digitalisation of trading processes and venues has lagged behind. For example, French based Mata Capital, an independent real estate investment management company, developed a tokenization platform that uses Ethereum smart contracts to define compliance requirements and validate KYC in order to issue corresponding shares to verified investors. Since launching in 2019, the platform has issued security tokens for three separate funds worth a combined total of €350m.

CONCLUSION

Distributed ledger technologies are tools that support the wider trend toward digitalization in capital markets. The in-production commercially available applications supported by DLT that are currently gaining adoption demonstrate clear potential to provide value add. The next few years will see existing applications gain momentum and as new entrants come online, the benefits will be further demonstrated. As more solutions are deployed, the need for interoperability between solutions will grow. If common standards can be adopted and buy-in from regulatory bodies can be achieved at a wider scale, DLT solutions will take on a greater and greater role in capital markets over the next 10 years. The result will be more direct capital markets, reduction of risk, and new financial instruments.



SETTLEMINT'S BLOCKCHAIN PLATFORM-AS-A-SERVICE (BPAAS)

SettleMint has developed a low-code platform for enterprise blockchain applications. Using the platform, organisations can speed up the go-to-market of DLT-based capital markets products and infrastructure.

Leverages existing IT skills

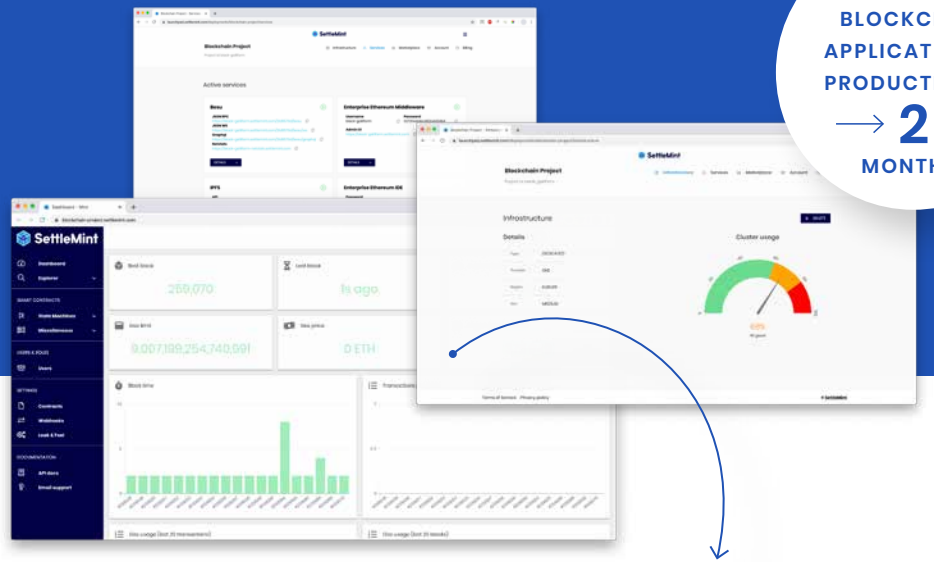
Built up in several layers that solve the many technical challenges developers face with blockchain technology, the platform empowers organizations to use their existing IT skills to build and deploy blockchain solutions. Featuring an integrated development environment that contains the base components for blockchain platforms as well easily customizable code libraries, organizations using SettleMint's Platform can go from concept to in-production applications in weeks not months, and at a fraction of the cost of building from scratch.

Easily integrates with legacy infrastructure

Several of the layers that make up SettleMint's BPaaS are specifically designed to simplify the process of integration with legacy systems, something that is particularly relevant in the context of capital markets' applications where lack of common standards and fragmented IT solutions and data architectures prevail. For example, SettleMint provides an infrastructure wrapper that enables developers to deploy secure blockchain infrastructure using containerized workloads in Amazon Web Services, Microsoft Azure and Google Cloud off the shelf. This means organizations can keep their legacy infrastructure such as on-premises servers, but securely plugin to their blockchain implementation. Further, SettleMint's BPaaS comes with a distributed API and connectors, effectively providing a zero configuration API layer that enables seamless integration of the blockchain implementation with legacy systems. Finally, SettleMint's BPaaS includes an intuitive user interface that makes it easy for systems admins and developers to build, deploy, integrate, and operate distributed applications.

SettleMint

THE #1 LOW-CODE PLATFORM FOR ENTERPRISE BLOCKCHAIN APPLICATIONS



YOUR BLOCKCHAIN APPLICATION IN PRODUCTION IN → 2 ← MONTHS!

- One-click deployment
- Zero-config admin UI
- No-code Integration Studio
- Ready to use APIs
- Smart contract templates
- Integrated Development Environment

Matthew Van Niekerk
Founder & CEO SettleMint
matthew@SettleMint.com

"The potential of DLT to support and enhance capital markets is growing clearer by the day, so it's no surprise that forward-thinking organisations are looking for ways to leverage the technology - or find themselves left behind. However, as is the case with any disruptive technology, it can be difficult to develop solutions in-house and safely integrate them with legacy systems. This is the problem that SettleMint's Blockchain Platform-as-a-Service solves. If you know what you want to build in the DLT space, SettleMint makes it easy. What the low-code movement brings to software development in general, SettleMint brings to development of DLT solutions."

Works cited

1. www.fsb.org/wp-content/uploads/P090818.pdf
2. newsroom.accenture.com/news/blockchain-technology-could-reduce-investment-banks-infrastructure-costs-by-30-percent-according-to-accenture-report.htm
3. www.oliverwyman.com/content/dam/oliver-wyman/global/en/files/insights/financial-services/2015/March/The_Capital_Markets_Industry.pdf
4. www.swiftinstitute.org/wp-content/uploads/2016/05/The-Impact-and-Potential-of-Blockchain-on-the-Securities-Transaction-Lifecycle_Mainelli-and-Milne-FINAL.pdf
5. For example see: https://digital-assets-custody.com/custodian-comparison
6. www.theblockcrypto.com/data/decentralized-finance/dex-non-custodial/dex-volume-monthly
7. www.theblockcrypto.com/data/decentralized-finance/dex-non-custodial/dex-to-cex-spot-trade-volume
8. https://defipulse.com/defi-lending
9. www.mas.gov.sg/development/fintech/sandbox-express
10. www.europarl.europa.eu/RegData/etudes/STUD/2020/652752/IPOL_STU(2020)652752_EN.pdf
11. www.sebi.gov.in/legal/circulars/jun-2020/framework-for-regulatory-sandbox_46778.html
12. www.greenwich.com/equities/blockchain-adoption-capital-markets-2018
13. www2.deloitte.com/ie/en/pages/technology/articles/Global_Blockchain_survey.html
14. www.metaco.com/press_releases/metaco-launches-silo-allowing-banks-to-take-secure-custody-of-crypto-assets
15. www.coindesk.com/deutsche-borse-swisscom-team-up-to-build-digital-asset-ecosystem
16. www.coindesk.com/standard-chartered-participates-in-jammed-18m-round-for-crypto-custodian
17. As quoted in www.coindesk.com/standard-chartered-to-launch-institutional-crypto-custody-solution
18. www.coindesk.com/standard-chartered-participates-in-jammed-18m-round-for-crypto-custodian
19. www.straitstimes.com/business/banking/singapore-trading-platform-istox-raises-66m-in-round-led-by-japanese-state-backed
20. www.prnewswire.com/news-releases/istox-enhances-its-bond-program-to-fractionalize-sgx-listed-wholesale-bonds-301131895.html
21. techcrunch.com/2021/01/20/digital-securities-platform-istox-closes-50-million-series-a-to-make-private-equity-accessible-to-more-investors
22. news.fintech.io/post/102gp7c/istox-raises-50m-in-series-a-funding
23. www.duke.lu/hqlax
24. www.commerzbank.com/en/hauptnavigation/presse/pressemitteilungen/archiv1/2019/quartal_19_04/presse_archiv_detail_19_04_85450.html
25. www.hqla-x.com
26. www.finextra.com/newsarticle/34884/first-transactions-executed-on-deutsche-bourses-blockchain-based-securities-lending-platform
27. www.securitieslendingtimes.com/securitieslendingnews/article.php?article_id=223547
28. www.securitieslendingtimes.com/securitieslendingnews/article.php?article_id=224080
29. https://marketplace.r3.com/solutions/fusion-lendercomm
30. www.euromoney.com/article/b1fhngp1lr8sxz/lendercomm-brings-loan-servicing-on-blockchain
31. www.euromoney.com/article/b1fhngp1lr8sxz/lendercomm-brings-loan-servicing-on-blockchain
32. https://marketplace.r3.com/solutions/fusion-lendercomm

33. www.fintechfutures.com/2019/05/finastras-fusion-lendercomm-on-blockchain-signs-up-three-new-big-banks

34. www.fintechfutures.com/2019/05/finastras-fusion-lendercomm-on-blockchain-signs-up-three-new-big-banks

35. www.ledgerinsights.com/natwest-blockchain-syndicated-lending-finastra

36. www.bbva.com/en/bbva-and-madrids-government-close-the-first-blockchain-powered-sustainable-schuldschein-loan

37. www.ledgerinsights.com/wetrade-blockchain-trade-finance-automated-payments

38. https://we-trade.com/index

39. www.calastone.com/news/calastone-goes-live-with-worlds-largest-financial-services-community-on-blockchain

40. www.prnewswire.com/news-releases/jp-morgan-asset-management-partners-with-calastone-to-power-money-market-funds-301066307.html33. www.fintechfutures.com/2019/05/finastras-fusion-lendercomm-on-blockchain-signs-up-three-new-big-banks

Recognized by industry leaders

Gartner COOL VENDOR 2019

Everest Group®


SettleMint