

# DIGITALLY TRANSFORMING SECURITIES SERVICES

LEVERAGING DISTRIBUTED LEDGER TECHNOLOGY AND  
DAML SMART CONTRACTS TO LOWER COSTS AND RISK  
ACROSS THE HOLDING CHAIN



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# 1. INTRODUCTION

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## DEFINING SECURITIES SERVICES

Securities services consist of the end-to-end lifecycle for securities trading in domestic and international markets. This undertaking involves several external parties operating across disparate platforms. These data silos delay trades, cause errors across the holding chain, and increase operational cost and risk for market participants.

Securities services are well-positioned for emerging technology in the distributed ledger and smart contracts space due to the multiparty nature of securities trading. The following paper reviews three use cases as it relates to select pre-trade (KYC), settlement, and post settlement (corporate actions) activities. Each use case reviews the business challenge and proposes a solution that uses DAML smart contracts across a distributed ledger to ensure rights and obligations are explicitly outlined, so that transactions are shared and executed across permissioned entities only. The paper examines the collaborative and complex nature of securities services functions and argues for the implementation and integration of a digitally transformative technology.

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## UNDERSTANDING THE COMPLEXITY IN SECURITIES SERVICES OPERATIONS.

Investors invest in many different markets. Intermediaries such as global custodians that are connected to a wide network of local custodians are key enablers for such global reach. This intermediation results into a holding chain which, within the context of high market growth, creates the need for even more scale in cross border securities services. As a consequence, the complexity of individual market components deepens due to each market participant operating their own infrastructure and technology stack. These data silos delay trades, multiply operational expenses from a reconciliation and asset servicing perspective, and increase the overall operational and custody risk. For example, asset managers, custodians and investors all operate on their own system of record with their own process.

**Each trade requires these market participants and intermediaries to communicate through disparate platforms, which causes significant problems and room for error.**

In addition to process complexity and data silos, the lack of interoperability between issuers' processes and market

infrastructures causes significant risk within securities services. For example, at debt issuance, issuers must interact with the investment banks and their agencies via email, and investors and intermediaries must manually extract securities reference data from the security prospectus.

Each action along the debt issuance process involves human intervention, which is ripe for error as information is manually uploaded into separate systems of record. Another similar scenario is the set-up of corporate actions, in which the issuer primarily communicates through documentation in legal language.

Capital markets are also seeing an increased threat of competition from emerging or non-traditional markets, along with heightened pressure to de-risk and meet the demands of regulatory requirements. Advances in technology make the barrier to entry much lower for smaller, more nimble market entrants. Regulatory requirements have also been threatening traditional market participants since the 2008 financial crisis.

Companies must engage in manual reporting to ensure compliance; however, there are more effective and secure ways to share data on a need-to-know basis with the correct parties.

## A CALL FOR INNOVATION

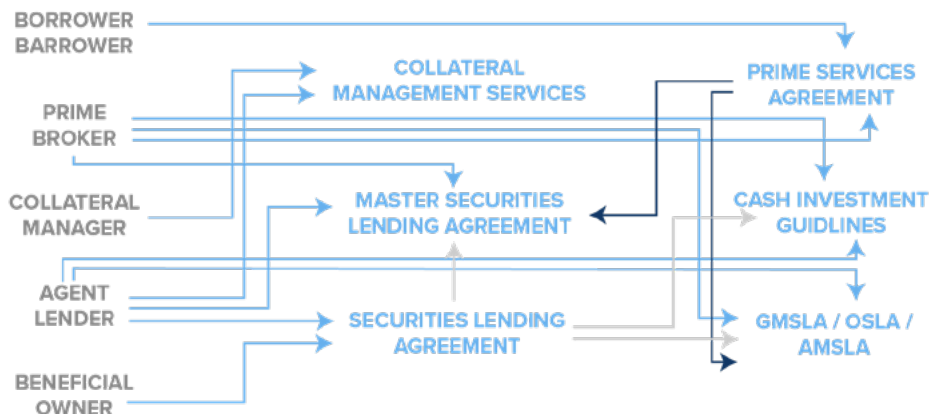
Currently, securities services are bound to legacy technology, limiting the domestic and international markets' ability to perform and support new business models that lower operational costs and de-risk transactions.

**Securities services must evolve and adopt transformative technology that supports a highly-secure and future-proof framework, and establish a common foundation for financial innovation.**

FIGURE 1.0:  
SECURITIES LENDING COMPLEXITY

INTERMEDIARIES / THIRD PARTY  
AGREEMENT OR REGULATORY ITEM

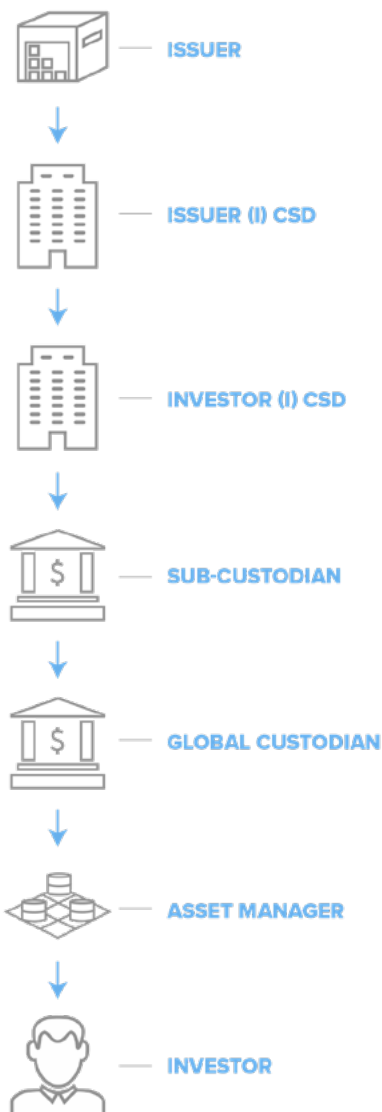
ENGAGING WITH →  
MUST ENGAGE WITH →



## 2. SUBSTANTIAL OPPORTUNITIES FOR WORKFLOW IMPROVEMENT IN SECURITIES SERVICES

### AN OPAQUE HOLDING CHAIN

FIGURE 2.0:  
EXAMPLE OF A HOLDING CHAIN



The holding chain plays a major role in the end-to-end capital markets lifecycle, as many bottlenecks and process complexities originate here. As issuers and investors raise funds and invest in different markets on a global scale, the state of play becomes highly complex, creating a non-transparent holding chain. For example, the use of nominee accounts by intermediaries facilitates access to different markets, but with the consequence of a long, sequential holding chain that distances the issuer from the investor.

This lack of transparency makes investor management more difficult for issuers. For example, when issuers set up and size corporate actions, insight into investor profiles is critical to effectively communicate with external parties; however, long, opaque holding chains complicate direct communication with investors. Additionally, the layers of intermediaries increase the complexity of processing end-investors' elections for corporate actions.

As illustrated on Figure 2.0, global custodians often rely on local sub-custodians which hold accounts at the in-country central securities depository and Central Bank. The local sub-custodians have legal ownership and therefore direct control over client assets which creates substantial costs and risks that are, contractually or regulatorily, very difficult for the global custodian to offset or mitigate. Ultimately, the global custodian has the burden of direct liability (and the associated capital cost and risk) with indirect asset control.

While the holding chain is universal across securities services, any function that involves multiple participants is subject to process complexity. KYC, clearing and settlement, and corporate actions will be analyzed in-depth as each use case has significant opportunity for improvement along the holding chain.

### Pre-Trade

- **KYC** - All intermediaries perform careful “know your customer” (KYC) checks to comply with regulations and tackle risk contagion throughout the holding chain. For example, opening an account at a custodian may take weeks due to onboarding requirements and KYC due diligence. KYC processes usually require gathering information manually from separate sources and systems, information analysis and validation, and may result in duplicative efforts which drive up operational costs and risk compliance across evolving customer data regulations.

### Settlement

- **Clearing** - An issuer (or exchange) may want to shorten the post-trade processing time by several days or enable real-time netting. The clearing process delays the actual exchange of securities by conducting sequential account updates and reconciling account records to ensure proper ownership. This interrupts the trading experience and increases operational costs.
- **Committed Settlement** - The use of control accounts to create and maintain enforceable security interests can help trading entities reduce the risk of bankruptcy or non-performance of their counterparties. However, the modern control account is cumbersome, slow, and expensive. Opening one requires the time and expense of a tri-party negotiation of the securities intermediary’s unique legal agreement. The securities intermediary must then create the account, a process that may take two or more weeks as it must perform all regulatory and other background checks on both the security provider and the secured party, confirm authorized signatories, create and test linkages, and set up reporting. Once operational, the trading parties must monitor the account. Simply reconciling transactions to posted collateral becomes a large operational burden for entities with numerous transactions. Due to the expense, operational burden, and delay, control accounts

#### 1. [DIGITAL ASSET'S COMMITTED SETTLEMENT](#)

are typically only used for highly sensitive transactions or large transactions, and performance protection.

- **Simultaneous Settlement** - In many current market settlement scenarios, delivery risk translates into liquidity, credit and counterparty risk that introduces cost and time into the settlement process: (1) Fails to deliver in cash securities purchases and sales incur significant fees, often as high as 300 bps from custodial agents; when the fail to deliver by the seller results from a fail to receive (where the seller was a buyer in a related transaction), additional operational time and costs are incurred handling claims on fail recovery cost or interest due; (2) Cleared transactions are charged initial margin and variation margin to ensure that the central counterparty (CCP) or Clearing Party is covered for market risk in a buy-in due to a fail; (3) Collateralized transactions, such as repo and securities lending, include haircuts and indemnification charges to compensate for the delivery / settlement risk and the potential need to buy-in.

### Post-Trade

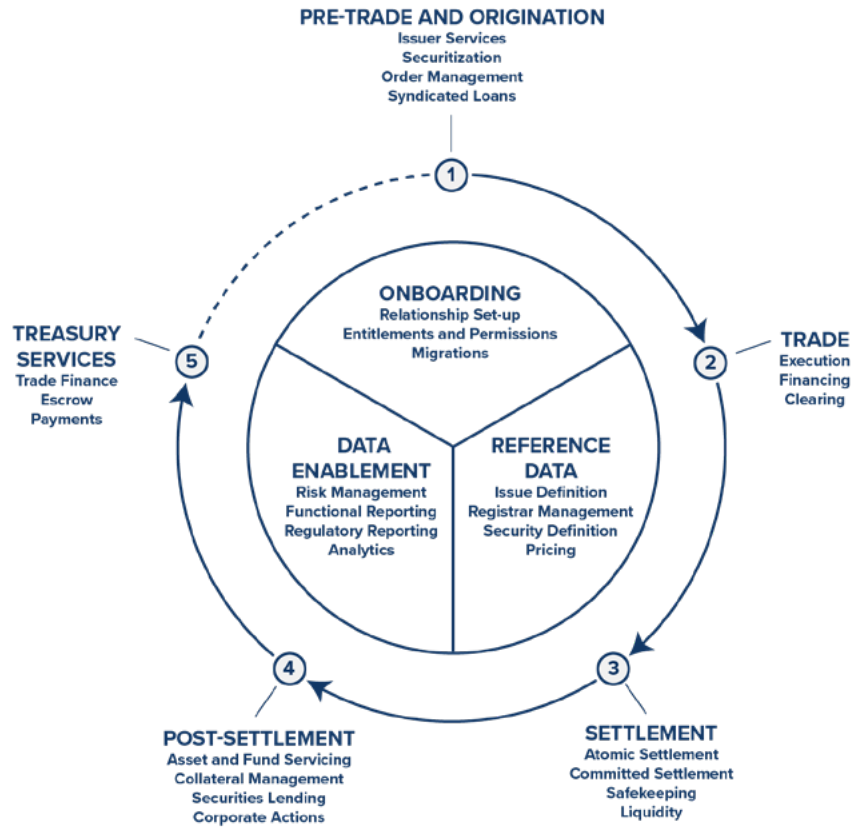
- **Corporate Actions** - Corporate actions processing is duplicated all along the holding chain due to the number of disconnected intermediaries running on siloed systems. These intermediaries make significant IT investments to mitigate risk, scale, and maintain operational teams. However, the complexity of corporate actions makes full interoperability and automation difficult to implement across centralized systems of record especially because of the lack of formatted and harmonized data at source. This results in delayed notification, incomplete or inaccurate data quality and conservative election deadlines. Moreover, it heightens operational risks which worsen with the length of the holding chain.

This list does not address every aspect of the end-to-end lifecycle of financial services functions. See Figure 2.1 for the full list of high opportunity use cases for digital transformation and technological innovation in securities services.



FIGURE 2.1:

END-TO-END LIFECYCLE OF FINANCIAL SERVICE FUNCTION



### 3. **DISTRIBUTED LEDGER TECHNOLOGY & DAML SMART CONTRACTS AS TECHNICAL OPPORTUNITIES FOR SECURITIES SERVICES IMPROVEMENTS**

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#### **LEGACY FINANCIAL SYSTEMS SLOW DOWN INNOVATION AND INCREASE COSTS**

The current infrastructure and applications supporting capital market workflows silo data and create the inefficiencies outlined above. For example, when a market's holding chain involves numerous intermediaries each with their own process operating on a centralized system of record, the risk of losing data and encountering errors increases. Additionally, reconciling disparate systems causes significant delays as most systems sync during end-of-day batch processing.

Current infrastructure also requires complete trust in the central model to distribute the right information to the correct party, such as the proper rights and obligations outlined for each party. For example, a post-trade architecture needs to guarantee a shared state across all members in real-time without revealing information that should remain private to a particular entity.

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#### **PAIRING DISTRIBUTED LEDGER TECHNOLOGY WITH SMART CONTRACTS TO IMPROVE BROKEN PROCESSES**

Distributed ledger technology (DLT), provides a means for capital markets participants to efficiently transact assets across a public, private, or hybrid network of computers in real-time, enabling businesses to react to changes more quickly and eliminate unnecessary overhead. Distributed ledgers support a decentralized model, where trust is no longer placed in a single entity to carry out complex transactions that interact with disparate systems.

A DLT and smart contract solution is particularly well-adapted for setting up and maintaining a shared record of information through workflows involving different stakeholders (e.g. capital market players):

- Distributed ledger technology brings efficiency by eliminating message-based interactions, facilitates the usage of standards, makes updated information and its status instantly available to all involved stakeholders, and provides an immutable audit trail on all actions taken.

- Smart contracts supporting the workflows can bring discipline in the process execution, enable new levels of automation, and implement best practices.
- The shared record becomes a single version of truth where the quality is guaranteed thanks to auditable processes enforced by smart contracts and for which liabilities can clearly be defined (this is particularly interesting if the shared record of information is made accessible to authorized external actors who need this information to support their own processes or decisions).
- There is also an opportunity to integrate the shared record in subsequent capital market workflows (and which could be enforced by smart contracts).

As DLT gains wider adoption within enterprise organizations, securities services providers have more infrastructure options with heightened security measures that ensure data integrity and privacy.

**Previously, distributed ledger technology skeptics were unable to reconcile the open nature of a decentralized, public network; however, a private distributed ledger network that provides sub-transaction level privacy at the infrastructure level paired with a privacy-first smart contract solution that provides sub-transaction level privacy along the API connection will provide the level of security and data privacy necessary to support sensitive transactions.**

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## LEDGER AGNOSTIC SMART CONTRACTS WITH BUILT-IN RIGHTS AND OBLIGATIONS.

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DAML is particularly well-suited for developing multiparty workflows involving privacy sensitivity as contracts (applications) are built solely on business logic with rights and obligations built into the language. DAML also provides sub-transaction level privacy at the API level.

Current programming languages and developer toolchains are designed for traditional development patterns, which are difficult to code against the radically new DLT paradigm because business logic and system code are usually not isolated. This results in the interweaving of infrastructure code in applications causing fragile solutions that lack portability.

Rather than the standard object-oriented languages, DAML is a functional language that operates at the higher level of abstraction with built-in concepts of parties, rights, and obligations, enabling

developers to focus on the application's business logic while the DAML ledger integration manages the underlying complexity of DLT.

**DAML simplifies every aspect of building solutions for multiparty workflows through a comprehensive ecosystem of integrations, APIs, runtime, and sample applications (templates), while also ensuring both data integrity and privacy for users.**

DAML is also ledger-agnostic, so businesses can build solutions for their complex multi-party workflows and pick an infrastructure option later. This is beneficial for businesses that are not fully invested in migrating to distributed ledger technology, as DAML runs across databases and DLT platforms with full application portability. This means that an enterprise can future-proof their investment and solve the complexities of capital markets now.

```

template Funding
with
  issuer: Party -- i.e. treasury
  owner: Party -- Trader
  amount: Decimal
  currency: Currency
  wireLimit: Decimal --wireLimit
  purpose: FundingPurpose
where
  signatory issuer
  ensure amount >= 0.00 && wireLimit >= 0.00
  key (FundingKey with issuer, owner, purpose, currency): Fund-
ingKey
  maintainer key.issuer
  controller owner can
    Spend: (
      ContractId Funding,
      Either (ContractId WireRequest)
              (ContractId Wire))
  with
    spendAmount: Decimal
    recipient: Party
    settlementInstruction: SettlementInstruction
    note: Text
  do
    -- Draw down the funds
    remainingFunds <- create this
      with amount = amount - spendAmount
    --Spell out the wire we (would) want
    let
      wire = Wire
      with
        funding = issuer
        payer = owner
        amount = spendAmount
      ..
    --If the amount is less than the limit, create the wire;
    --Otherwise, create the request for that wire.
    requestOrWire <- if spendAmount > wireLimit
      then Left <$> create WireRequest
      with
        lockedFunding = this with amount = spendAmount
      ..
    else Right <$> create wire
  return (remainingFunds, requestOrWire)

```

## 4. DIGITALLY TRANSFORMING THE END-TO-END LIFECYCLE OF SECURITIES SERVICES FUNCTIONS WITH DLT AND SMART CONTRACTS.

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### CRITICAL AREAS OF SECURITIES SERVICES THAT BENEFIT FROM DLT AND SMART CONTRACTS

Each capital market scenario (such as primary and secondary markets in the context of domestic and international markets) and function (pre-trade, trade, and post-trade activities) is well-positioned for technological innovation and digital transformation through DLT and smart contracts. The immutable nature of DLT, along with its ability to create a secure yet logically shared environment in open or private networks, creates a system for financial transactions where multiple parties can engage simultaneously on processes, rather than waiting for each individual party's centralized system to update. This eliminates duplicative operations while shortening the time between parties along the holding chain.

**Pairing DLT with smart contracts becomes even more advantageous for market participants as smart contracts enforce the rights and obligations required to accurately and privately transact within a market. The duo fosters trust in an emerging technology.**

The following section outlines critical areas of the capital market that benefit from the use of DLT and smart contracts. Each proposed solution aims to lower operational costs, address regulatory challenges, and de-risk complex transactions at a global scale.

### HOLDING CHAIN

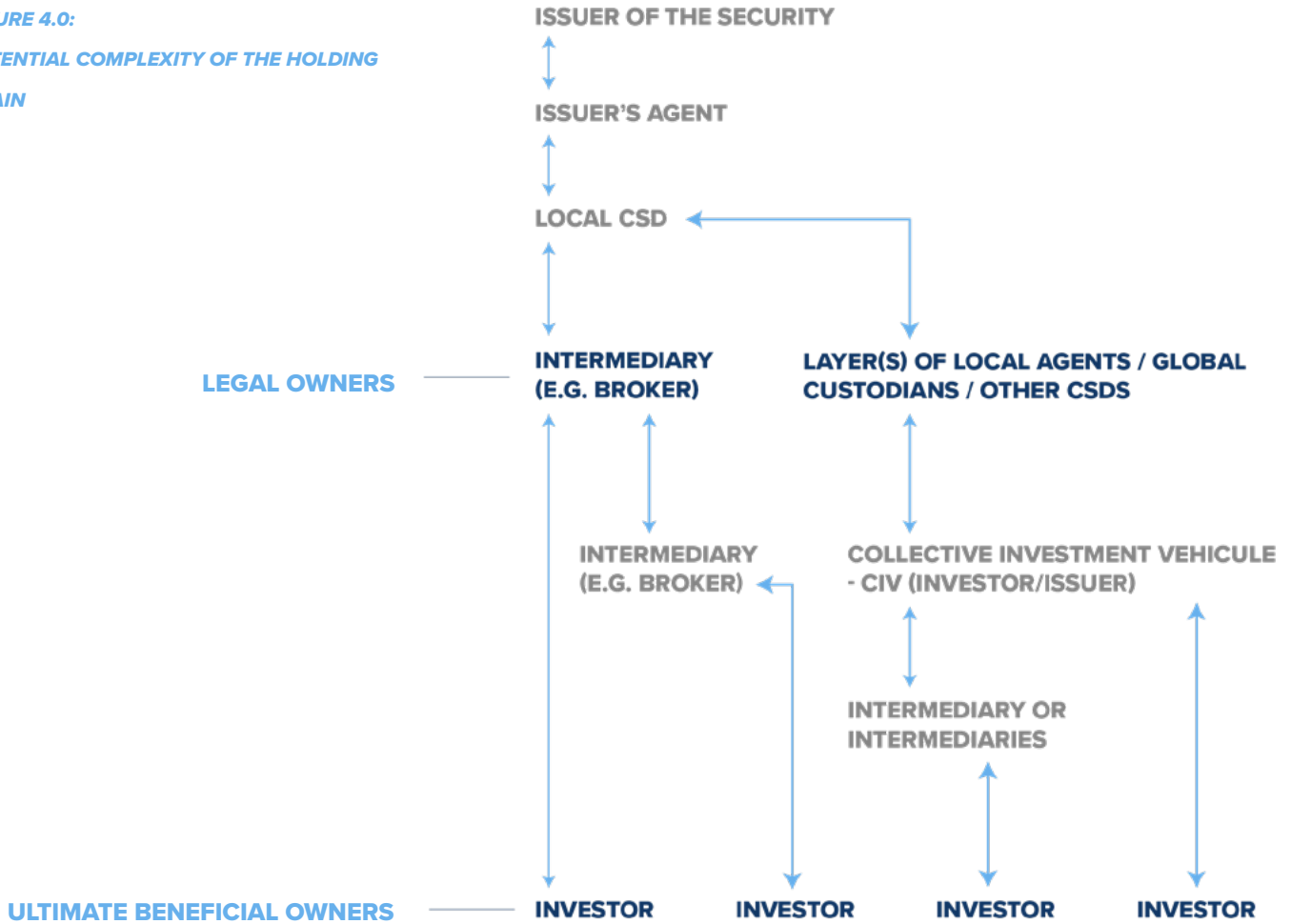
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### APPLYING DLT AND DAML TO CREATE A TRANSPARENT HOLDING CHAIN.

The holding chain applies to each use case described in the following sections. Each proposed solution addresses simplifying functions along the holding chain.

In its essence, the holding chain is a chain of “custody” services. For example, an intermediary (global custodian) in a contractual bilateral relationship with an investor needs the custody services of a local intermediary (local custodian) to reach a targeted market. Similarly, the local intermediary is in a contractual bilateral relationship with

**FIGURE 4.0:**  
**POTENTIAL COMPLEXITY OF THE HOLDING**  
**CHAIN**



the central securities depository (CSD) where it has an account. This holding chain can be very complex, especially for cross-border investors.

If a capital market implements distributed ledger technology paired with smart contracts, each participant along the holding chain would have real-time access to permissioned data to quickly execute transactions without burdensome reconciliation processes. Multi-party applications using DAML operate across the underlying DLT in real-time and designate each holding chain entity's rights and obligations related to any given process/workflow (e.g. KYC, settlement, clearing).

The proposed solution would be to build an application that minimizes delays and errors along the holding chain (primarily in the clearing and settlement use case). Each activity in the pre-trade, trade, and post-trade lifecycle would benefit from a DAML-based application, as DAML is ledger-agnostic and portable so capital market players can solve complex problems, deploy where needed, and migrate to new infrastructure (database or DLT) without breaking or re-writing the application. Every participant along the holding chain will receive the data they have designated rights to and can act on their

obligations in real-time through the application.

**When DLT and smart contracts are in use, the reconciliation between intermediaries is minimized and duplicative processes are eliminated so the focus becomes less about the operation and more about the value-added service provided by the intermediary for the issuer and investor.**

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## APPLYING DLT AND DAML TO EASE ADMINISTRATIVE BURDEN DURING THE PRE-TRADE PROCESS

### 2. INHERENT RISKS WITHIN THE GLOBAL CUSTODY CHAIN

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Within capital markets, the business onboarding process for new market entrants (i.e. buyers and brokers) requires careful assessment of a number of criteria to decrease business risk/exposure and to limit the possibility of risk contagion in the investment lifecycle<sup>2</sup> (e.g. money laundering). In regards to investor onboarding, the due diligence process requires collecting and validating a client's information and has to comply with KYC regulation. It is also important to note that the collected data is evolving over time, which re-initiates the same KYC steps on the updated data. This KYC and due diligence process generates numerous challenges for the onboarding and onboarded parties:

- Redundant processes across individual holding chain participants during investor onboarding, which are subject to repeat as investor data evolves
- Compliance difficulties with evolving investor data (each market subject to international data privacy laws)
- Data inconsistencies across individual holding chain participants
- Delays for onboarded customers

**To solve these challenges, a DAML-based KYC application where data is uploaded to a DLT platform integrated with (or built as an extension of) a legal entity identity (LEI) register and a personal identity register should be implemented across the entire capital market.**

The KYC/due diligence information will be stored, validated, and maintained on a shared record according to defined workflows involving both the onboarded and onboarding parties and enforced via DAML smart contracts. To comply with regulatory requirements, such as the European General Data Protection Regulation, which might impose a right “to be forgotten” for individuals/legal entities, only hashes related to personal data are stored on the distributed ledger. Given these rights, personal data sharing will happen



according to standard methods between parties, with the added capabilities for consent tracking and data consistency and verifiability enabled through the DAML smart contract.

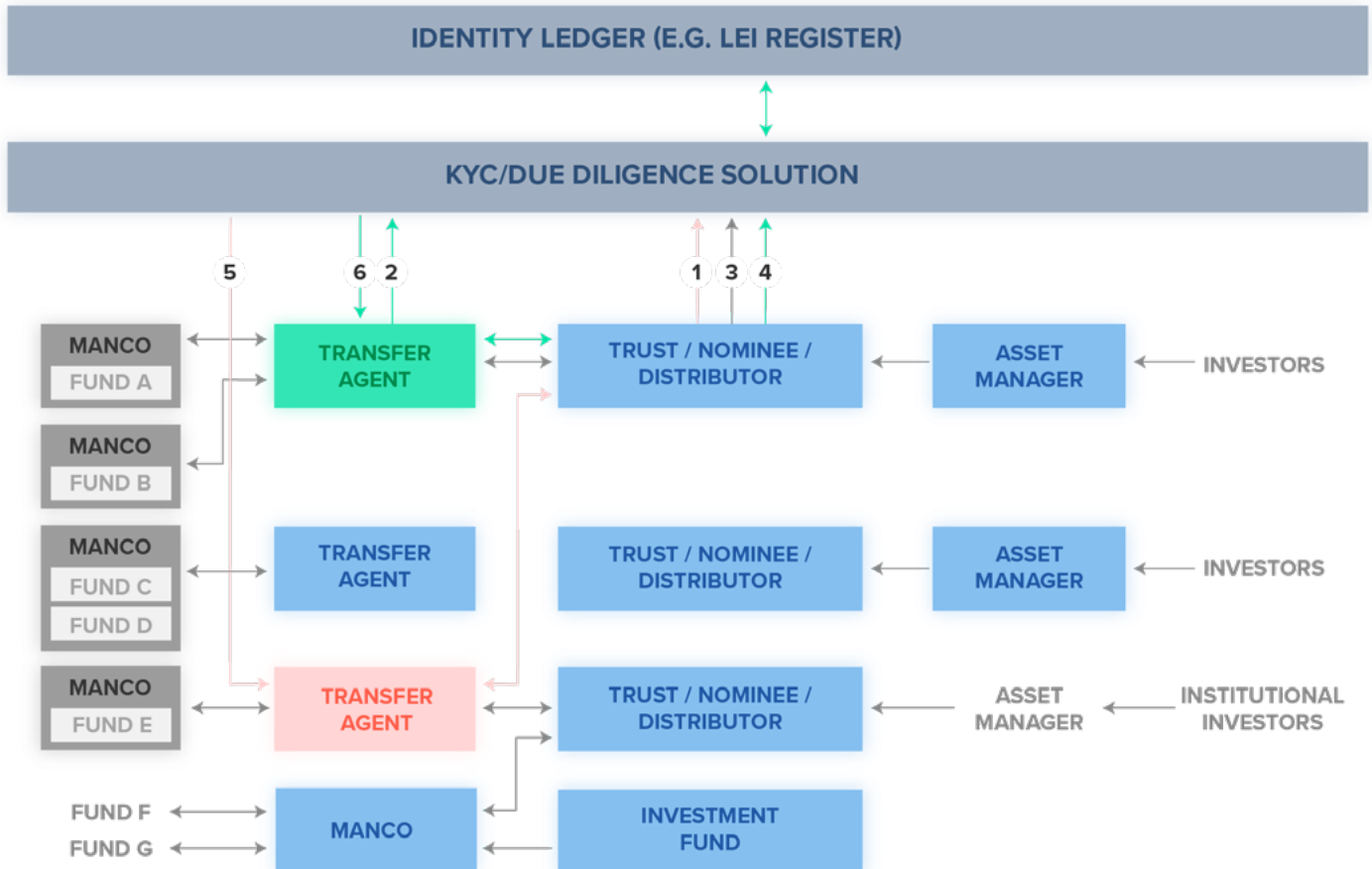
DAML assigns actions to onboarded/onboarding parties such as documentation submission requirements prior to market participation. The DAML smart contract shares that documentation with the permissioned parties on a distributed ledger in real-time. The DLT platform ensures data immutability so parties only have to submit documentation once. Ad-hoc requests for documentation can also be executed using DAML which updates the ledger without losing previous documentation/records from the initial onboarding process.

Once a KYC/due diligence process has been performed by one provider in the capital market, the shared record on the DLT platform can be made accessible to any other capital market provider willing to engage with the same entity. A new onboarding party will run its own KYC process from the shared record and will confirm, correct, or add information to the shared record. Financial services providers/intermediaries must still perform their own KYC checks when onboarding new clients, but the solution drastically accelerates the process.

This KYC shared record could even be integrated with tax automated processes (related to income/corporate events), specific disclosure automated processes, or regulatory reporting/oversight activities. Access to the shared record can only be done under strict consent provided by the onboarded company through the smart contract.

As each market, service type, or financial product type has its own specificities and risks, the solution will enable different standardized, but customizable data templates and workflows.

1. Provide requested information for KYC process.
2. Validate KYC data.
3. Consent to the second or to any Transfer Agent to access own data. Complement / refresh KYC data.
4. Validate KYC data
5. Updated KYC data made available to any TA / ManCo having received a consent.
6. received a consent.



**FIGURE 4.1:**  
KYC WORKFLOW APPLYING TO THE  
INVESTMENT FUND INDUSTRY.

**TABLE LEGEND**  
**DISTRIBUTED LEDGER.**  
**STAKEHOLDER HOLDING A NODE.**  
**STAKEHOLDER INTRAGRATING WITH CODE.**

This KYC/due diligence solution is a logical next step of the wider LEI implementation. It is also a founding step to enable the set-up of beneficial ownership registers and to create a fluid, but risk-controlled access to a wide variety of markets.

The advantages it generates in terms of cost reduction and customer experience for both the onboarding and onboarded organizations should push its adoption.

## CLEARING AND SETTLEMENT

### APPLYING DLT AND DAML TO SIMPLIFY THE TRADE PROCESSING WORKFLOW IN CLEARING AND SETTLEMENT

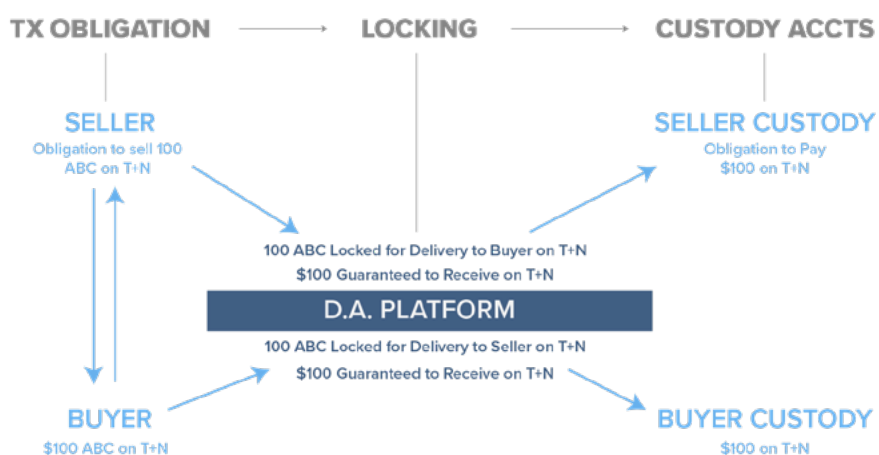
Today, market infrastructures involve highly specialized actors to facilitate trading. As an example, the clearing house acting as the central counterparty enables anonymity in trading, transactions netting, and addresses part of the settlement risk. However, the usage of a clearing house generates significant trading costs and delays trade settlement (currently T+2), while still not completely removing settlement risk.

If, for a given market, the central securities depository, the clearing house, and trading venue integrate on the same DLT infrastructure, different trade processing workflows can easily be designed and implemented to better fit the needs of various market participants. For example, a clearing house is no longer required if the traded assets are locked at order matching time before confirming the trade. The trade settlement cost will be reduced by the clearing house fee, there will be no more settlement risk and it will now be possible to settle the trade on the date of the trade.

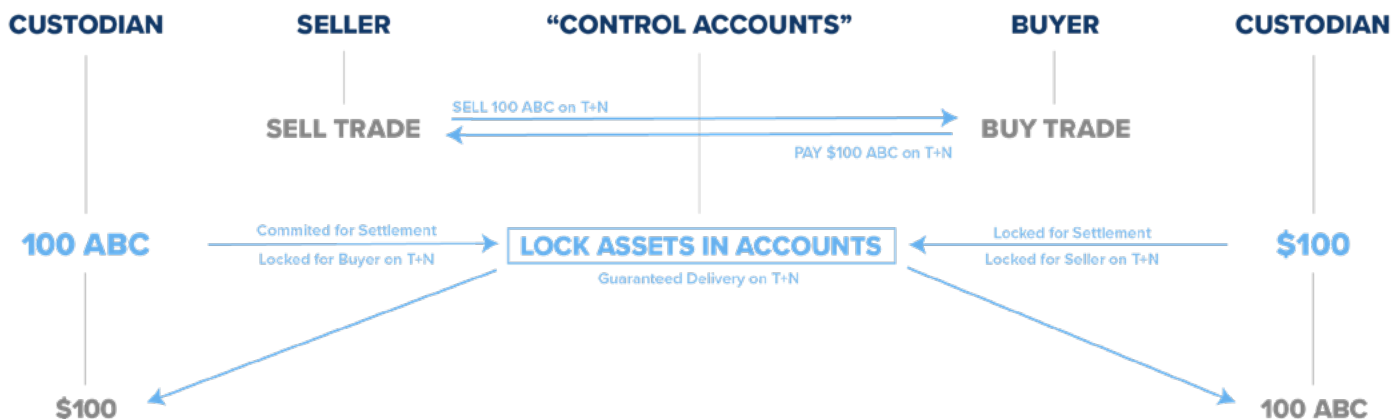
In regards to current settlement scenarios, there are many industry practices to improve settlement certainty and minimize delivery risk; however, many of the practices employed to date, such as security pledges, custodial account memo pledges, and control account agreements, are rarely used because they create operational and cost-related challenges. Digital Asset developed and tested in a joint analysis conducted with Linklaters<sup>3</sup> referred to as “committed settlement”, a workflow using DAML that would evidence certainty of settlement finality, lower margin requirements between counterparties, and reduce associated capital. This “committed settlement” method instantly creates control accounts, custodial account memo pledges, or security pledges on a distributed ledger. This solution was later termed the DA Locking Library

### 3. COMMITTED SETTLEMENT: DIGITAL ASSET'S DLT-BASED COLLATERAL MANAGEMENT TOOL

FIGURE 5.0:  
DIGITAL ASSET LOCKING LIBRARY FOR  
COMMITTED SETTLEMENT WORKFLOWS



The Locking Library solution commits available inventory for a delivery on T, defines ownership and actions over the inventory under predefined conditions, and instructs a locking of the inventory so only the T+N delivery for the settlement can be executed on that inventory. For example, with bilateral transactions the Locking Library would guarantee asset delivery obligations between bilateral trade counterparties, by locking available assets in an account in which DAML executes actions for delivery and receipt on T+N.



**FIGURE 5.1:**  
**BILATERAL TRANSACTION EXAMPLE**

Committed settlement reduces operation costs associated with margin, cash, and custody management, eliminates counterparty risk and capital costs, provides an immutable record of all transactions across all accounts at the ultimate beneficial owner (UBO) level (internal audit groups also have access to transaction information at the UBO level), and can ultimately open up new revenue generating opportunities. For example, beneficial owners could receive low-risk lending revenue from conditionally committing their inventory.

Another area in which DAML and DLT can optimize trade processing activities is in the context of simultaneous settlement, a workflow that would atomically settle inbound and outbound cash and securities movements. This would eliminate the need for central clearing parties to extend credit or incur additional risk.

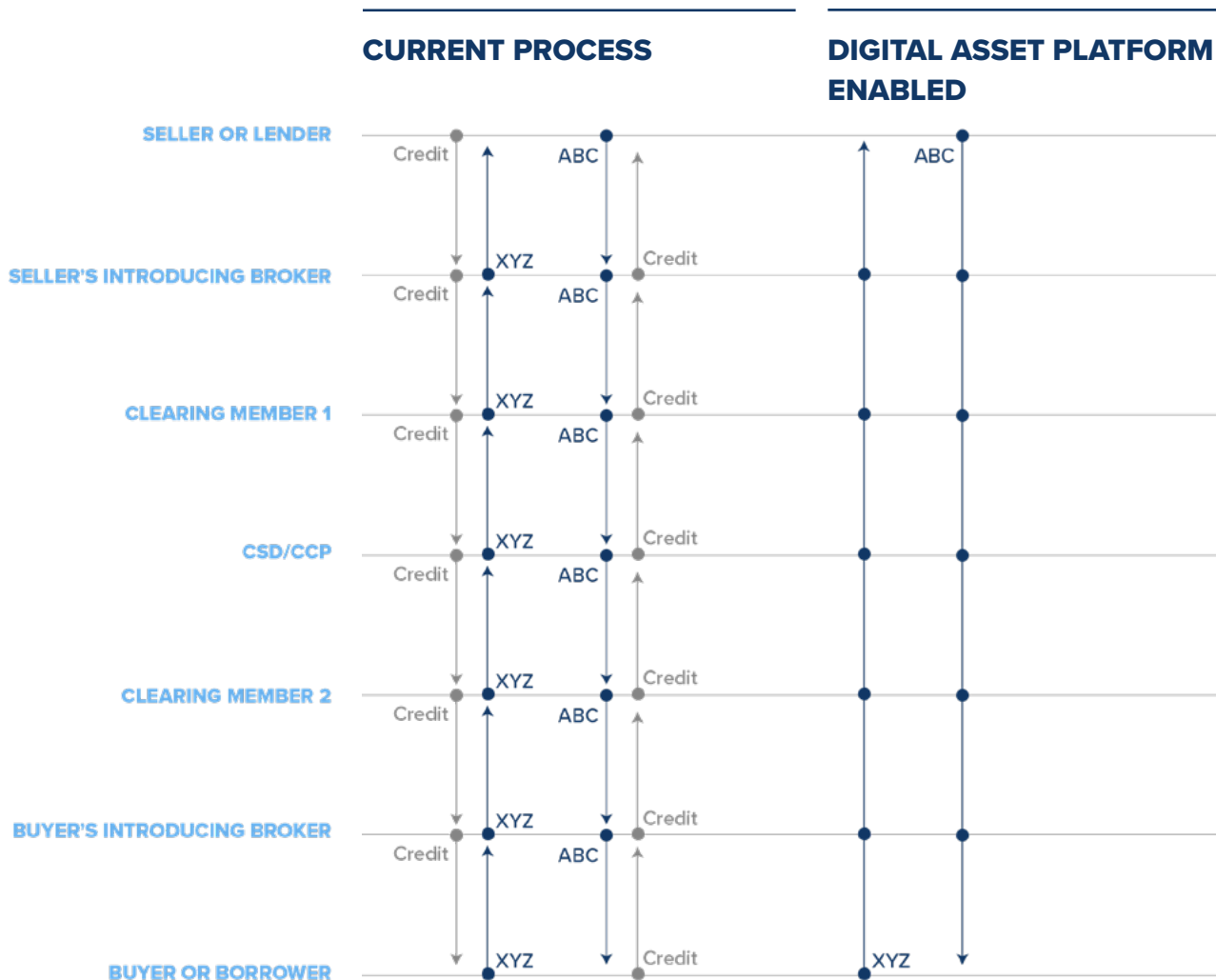
**A DAML-driven simultaneous settlement solution would enable parties to net settle transactions (single-leg or multi-leg) in a way that guarantees settlement of all legs at the same time.**

Cash securities and sales, collateralized transactions, securities auctions and issuance, and money market fund sweeps and purchases are all high-opportunity examples in which simultaneous settlement would benefit the capital market holding chain.

Through DAML and DLT, DAML structures are built to determine whether each participant to the transaction has sufficient assets to meet its obligations and process all component transactions simultaneously or not at all.

**Through DAML-driven simultaneous settlement, inefficiencies and risk are reduced by simultaneously completing all component transactions, risks between interim counterparties are minimized, and settlement times are improved due to the replacement of sequential settlement along the holding chain (see Figure 5.2 to reference sequential holding chain activities).**

The use of DAML on distributed ledger technology not only



**FIGURE 5.2:**  
**SIMULTANEOUS SETTLEMENT VIA DAML**

simplifies the clearing and settlement trade processes, but it also enables capital market participants to envision a solution where beneficial ownership information is maintained without cumbersome reconciliation processes. Trade processing workflows (simultaneous settlement and committed settlement) maintain the legal and

beneficial ownership data in real-time at settlement.

If a market were to build a beneficial ownership ledger to track ownership titles, issuers would be able to more easily connect and manage relationships with their investors. Through the use of DAML, this ledger would be able to interoperate with the KYC ledger to sync data living on that ledger. The settlement ledger would also be a place where ownership titles could live, and through DAML smart contracts, parties with the designated rights would be able to access that information more freely. Theoretically, this would create a more streamlined holding chain by reducing the complexity of information gathering and sharing between parties.

Furthermore, the immutable audit trail at the core of the DLT design enables full transparency on trade execution, transaction history or any service operated on the ledgers. This transparency answers the regulation requirements by facilitating compliance control, creating transparency on trade best execution, and easing regulators' oversight.

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## APPLYING DLT AND DAML TO SET UP AND PROCESS CORPORATE ACTIONS

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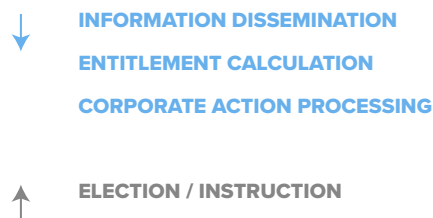
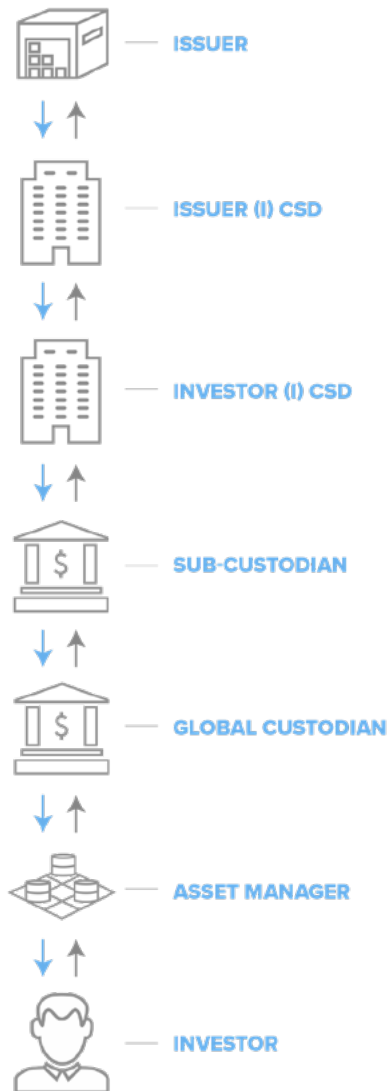
Corporate actions are events in the life of security. They can be as simple as an interest or dividend payment or much more complex such as a large capital structure reorganization. In the ISO 20020 SWIFT messaging standard, there are around 70 different types of corporate actions.

Even the most simple corporate action can be a challenge from a processing perspective. It demands highly accurate event details to be received in a timely manner combined with accurate (fully reconciled) holding records to ascertain a controlled and risk-free processing in current holding chains.

Some corporate actions require securities holders to instruct one of the options made available (e.g. an optional dividend) or to exercise them on a voluntary basis (e.g. a put option). Such events contain instruction deadlines that increase the operational risk.

The corporate action processing has to be performed and executed at each step of the holding chain. This results in a global cascaded process from the issuer (and its agent) to the investors. This global cascading also works from the bottom-up when processing investors' elections.

**FIGURE 6.0:**  
**THE CURRENT CORPORATE ACTION**  
**CASCADED PROCESSING**



This processing is encompassed in three main steps being performed at predefined dates or during predefined periods:

1. Information dissemination / collection including eligibility assessment.
2. Eligible balance determination and entitlement calculation.
3. Corporate action processing including investors' instructions processing, execution of cash and securities movements and respective confirmation.

The proposed DLT/DAML solution implements a single place of processing built on a "corporate action" distributed ledger. To avoid a processing multiplication along the holding chain, the solution integrates with the "committed settlement" and "simultaneous settlement" solution mentioned in the previous section "Applying DLT and DAML to simplify the trade processing workflow in clearing and settlement".

**DAML fits particularly well within the implementation of corporate action workflows as DAML has been primarily designed to develop smart contracts supporting the performance of the rights and obligations defining the securities.**

This language facilitates a clear definition of the involved stakeholders and role enforcement. Thanks to the DLT, the stakeholders actions will be traced in an immutable audit trail to ensure clear liabilities on actions taken by the stakeholders in this highly complex and sensitive area.

The solution is based on two main workflows:

- A first workflow to set-up the corporate action as a shared record ("the golden record").

The corporate action creates rights and obligations for the issuer, investors and/or offeror. These rights and obligations are described in binding legal documents (either the security prospectus if known at security issuance or specific corporate action terms and conditions). As most of the corporate actions combine known and standard features that are easy to parameterize, it is possible to establish a "data driven" process in place of the current "document driven" process. The key data/parameters defining the corporate action can then be used to generate the related legal

documentation. Technologies such as the general-purpose legal mark-up language (GLML) enables automatic legal documentation generation from a set of constituent data<sup>4</sup>.

4. [CONSORTIUM FORMED TO PUSH  
MACHINE-READABLE TRADE  
LANGUAGE](#)

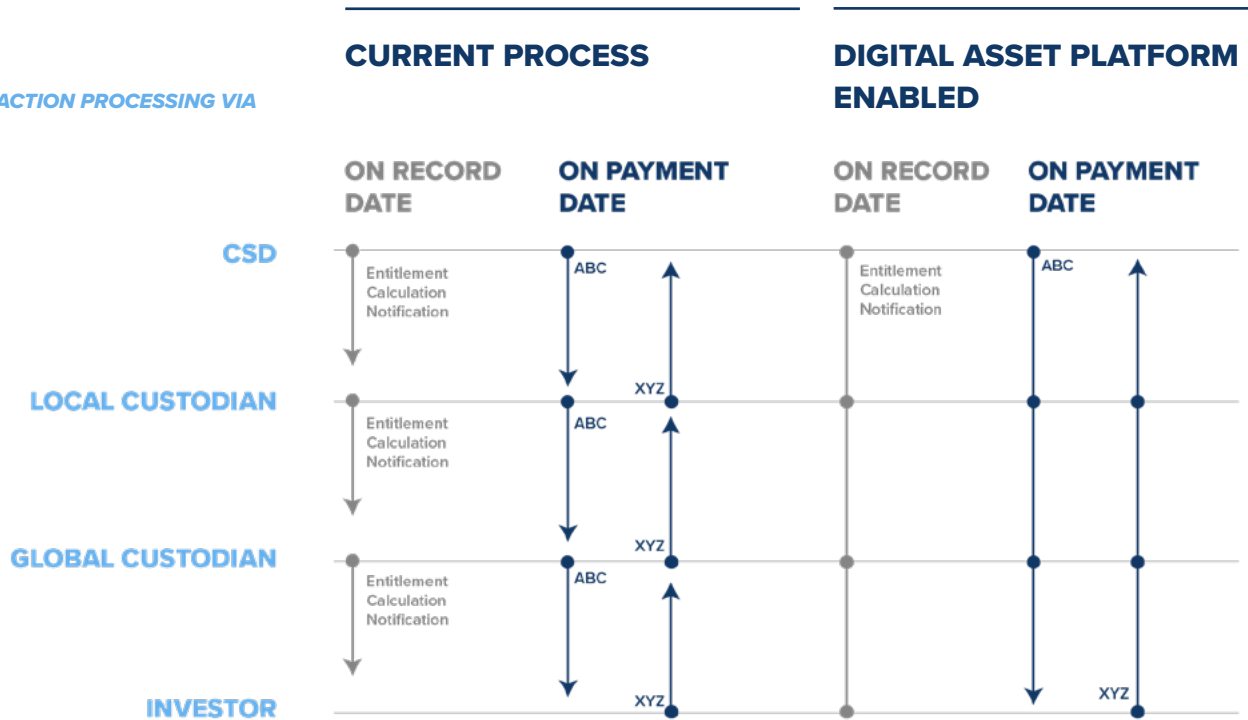
By implementing this process on a distributed ledger, all the stakeholders involved in the set-up of a corporate action (e.g. issuer, agencies, lawyers, central securities depository, investment banks) will be able to contribute to the shared record as per responsibilities. This shared record becoming the single source of truth, will be instantly available to the market participants. Importantly, the liability of each stakeholder will be clear as all contributions will be traced in the DLT immutable audit. Moreover, by design, it will always be consistent with the legal documentation of the security if the shared record is used to generate the legal documentation (as proposed above). Market participants will then have the advantage to instantly access the information whether it is preliminary, incomplete, or complete and confirmed. The ability to have earlier access to corporate action information might be crucial for investors.

- A second workflow to process the corporate action. - The corporate action processing workflow starts with the entitlement calculation. This calculation will be performed simultaneously throughout the holding chain according to the same principles used in the “simultaneous settlement”. This mechanism relieves the intermediaries from calculating the entitlement themselves and by de facto implements one place of processing for the corporate action. In case of elective corporate action, the beneficial owner instruction will be made in direct interaction with the corporate action processing workflow. On the payment/effective date, the asset movements will be performed using the “simultaneous settlement” mechanism. Investors will be immediately aware of the corporate action processing completion as the DLT made the process progress fully transparent to all authorized stakeholders.
- Tackling interoperability between markets. - The following figure (Figure 6.2) illustrates the end-to-end workflow (set-up and processing) for a “redemption in cash or shares at the issuer’s option” on the international market. The figure is sourced from the ISMAG market practice book<sup>5</sup>. This workflow has been modeled and developed in DAML by IntellectEU as a proof-of-concept<sup>6</sup>.

5. [INTERNATIONAL SECURITIES  
OPERATIONAL MARKET PRACTICE  
BOOK](#)



**FIGURE 6.1:**  
CORPORATE ACTION PROCESSING VIA  
DAML



**6. DAML DRIVEN DEVELOPMENT:**  
INTELLECTEU

The example in Figure 6.2 (Next Page) illustrates an additional level of complexity that can be met for some corporate actions: a bond issued in the international market is redeeming in shares to deliver in a domestic market (the market where the Issuer’s shares are traded). In the proof-of-concept developed by IntellectEU, the corporate action processing workflow has been integrated with IntellectEU’s Catalyst solution to enable interoperability with external markets using either a communication network such as SWIFTnet or by connecting another DLT market infrastructure.

Most of the investors will not run a node, but will integrate via APIs (or through their custodian user interface) to access the corporate action shared record and their entitled position, to elect and to follow-up on the corporate action processing.

**FIGURE 6.2:**  
**A BOND ISSUED IN THE INTERNATIONAL**  
**MARKET IS REDEEMED IN CASH OR SHARES**  
**AT ISSUER'S OPTION**

**CCB:**  
**CASH CORRESPONDANT BANK**

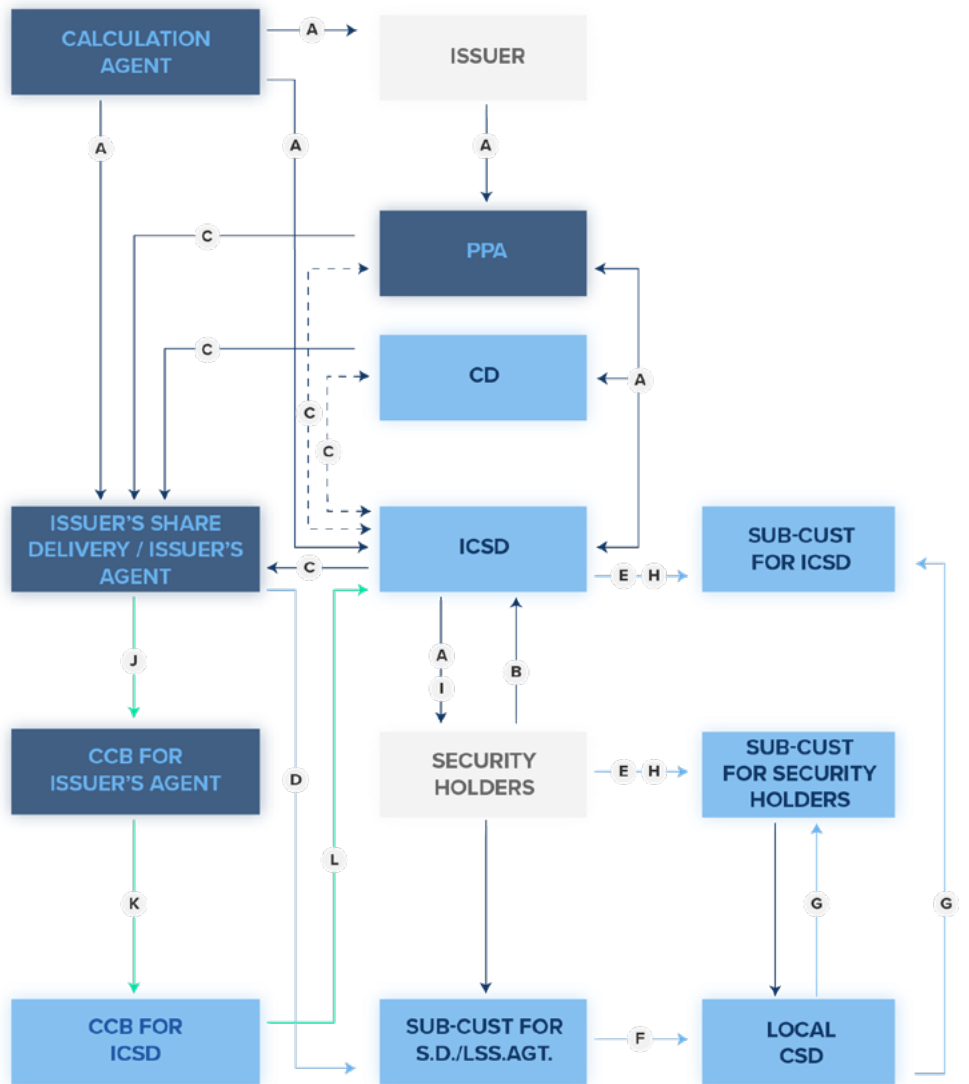
**CD:**  
**COMMAN DEPOSITARY**

**ICSD:**  
**INTERNATIONAL CENTRAL SECURITIES**  
**DEPOSITORY**

**S.D. AGENT:**  
**SHARE DELIVERY AGENT**

**ISS. AGENT:**  
**ISSUER'S AGENT**

**PPA:**  
**PRINCIPAL PAYING AGENT**



—————→  
**ELECTRONIC INSTRUCTIONS**

- - - - -→  
**INSTRUCTIONS SOMETIMES OCCURING**

—————→  
**CASH FLOW**

—————→  
**PROCEEDS FLOW**

- A. Notification on fixing in shares with cash fraction
- B. (Some) Investor instructs securities delivery outside the ICSD
- C. Settlement instruction for share delivery with delivery details in local market
- D. Settlement instruction for share delivery via CSD for ICSD and direct holder settlement(s) with delivery details in local market.
- E. Settlement instruction for share receipt expected from share delivery agent (Matching D.)
- F. Settlement instruction for shares delivery to CSD
- G. Settlement occurs in local CSD
- H. Confirmation of the local receipt with ICSD instruction reference
- I. Credit proceeds shares
- J. Instruct cash fraction transfer to ICSD
- K. Transfer cash fraction amount to ICSD
- L. Confirmation of Cash fraction transfer to ICSD. Execute cash fraction transfer within ICSD to credit securities holders.

The benefits achieved can be summarized as follows:

- Accurate corporate action golden record instantly available
  - Single version of the truth; no more need for data cleansing and scrubbing; no more time gap
  - An API integration enables investors to access directly the corporate action golden record
- No intermediaries imposing conservative deadline for instruction
  - The investors can integrate directly with the corporate action processing workflow
- The elimination of the corporate action processing multiplication along the holding chain drastically reduces the asset servicing cost and risk:
  - No more costly corporate action engine at each chain link, but rather a single place of processing across the holding chain
  - No more reconciliation required at each chain link thanks to the simultaneous settlement mechanism
  - No more complex message based processes

## 5. CONCLUSION

### OPPORTUNITIES TO INNOVATE IN SECURITIES SERVICES

Holding chain bottlenecks create a lack of transparency that widens data silos and makes investor communication nearly impossible. The proposed solutions address the pain points many capital market participants encounter. These issues require a distributed ledger where transactions and agreements are stored. The ledger would maintain all the information along the holding chain (i.e. intermediary parties, investor profiles, KYC process information, nominee accounts, etc.) to create a more operationally efficient and risk-free environment for transactions.

A distributed ledger for the entire holding chain would permit the development of new settlement solutions, like simultaneous settlement and committed settlement, bringing new levels of efficiency to the market while lowering risk. It would also enable a single place for progressing corporate actions, decreasing the cost and operational risk as the entitlement calculation and asset movements can be performed through similar mechanisms as the simultaneous settlement (avoiding each intermediary along the holding chain that duplicates corporate action processing).

This holistic solution would require a clear identification of actors involved in the holding chain, beyond the account structure. This is only possible if a universal unique identity is created for each investor (see the legal entities ledger example in the KYC section). The unique identifier in combination with the KYC DLT-based solution would permit more fluid access to markets and investments while mitigating risk contagion in the investment cycle. With DAML smart contracts, data along the holding chain ledger would only be viewed by authorized actors. It also means that privacy would be managed with clearly defined rights and permissions. For example, a sub-custodian would not have access to ultimate beneficial ownership information, while an issuer should be able to know who the ultimate beneficial owners are.

Through distributed ledger technology and DAML smart contracts, financial institutions are entering an era of digital innovation that will connect global economies and provide a wealth of opportunities for market expansion.

Learn how IntellectEU is transforming business models in the financial services industry with DLT and DAML-driven solutions at <https://intellecteu.com/digital-asset>

## Digitally Transforming Securities Services

Claude-Henri Convent, Consultant, IntellectEU Published: October 2020

### About IntellectEU

IntellectEU is an international technology company focused on digital finance and emerging technologies. They deliver end-to-end DAML development services ranging from strategy & discovery to design & delivery. IntellectEU's Catalyst Blockchain Platform allows users to easily deploy DAML applications to different persistence layers (SQL, Corda, Fabric).

### About Digital Asset

Digital Asset helps companies of all sizes and across industries get distributed applications to market faster, and stay there longer. At the core of their service offering is DAML, an open source and platform-independent smart contract language that enables developers to write an application once and deploy it anywhere. The Digital Asset global team of professionals is composed of experts and innovators from technology, engineering, and enterprise domains.