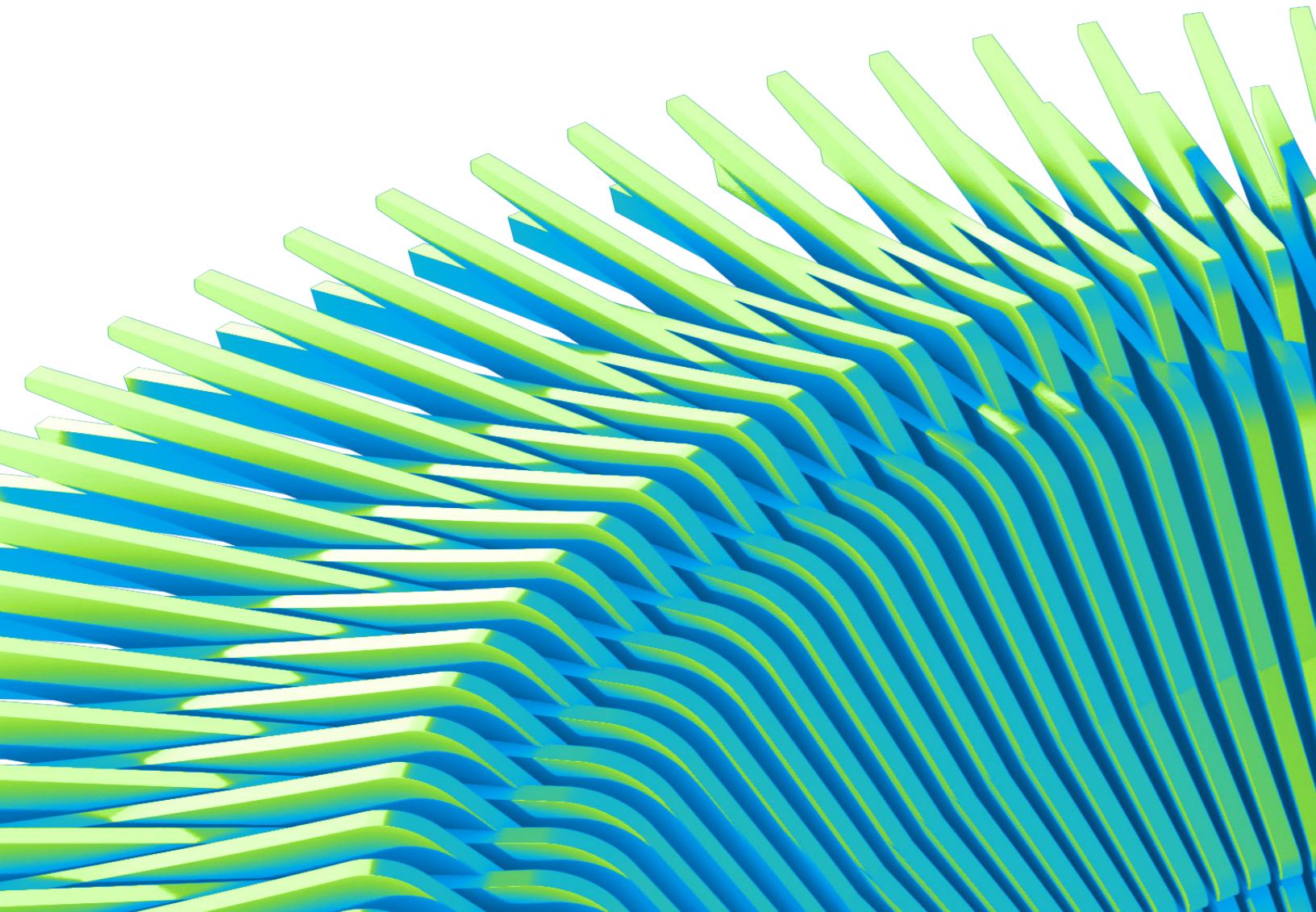




DTCC

MAY 2020

PROJECT ION CASE STUDY



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EXECUTIVE SUMMARY

The U.S. financial industry's clearance and settlement model has evolved to be among the most cost-effective and efficient in the world. Since its creation almost 50 years ago, the mission of The Depository Trust & Clearing Corporation (DTCC) has been to help the industry mitigate risk and reduce cost in clearing and settlement by driving out operational and capital inefficiencies.

Fulfilling that mission has been a key driver behind DTCC's long-standing commitment to advancing fintech initiatives such as automation, robotics, artificial intelligence, and more recently, distributed ledger technology (DLT) and digitization of assets.

This paper describes DTCC's latest advancements with digital processing to shorten the time between trade and settlement – and the potential to leverage DLT as a pivotal piece of technology that may help bring about new efficiencies in clearing and settlement.

ACCELERATING AND OPTIMIZING SETTLEMENT

For many years, the markets operated on a T+5 settlement cycle – trade date plus five days to settlement. In 1995, U.S. regulators reduced the settlement cycle from five business days to three business days. In 2017, after many years of a wide-reaching, extensive technology and operational effort – coordinated and harmonized across global markets and regulatory bodies – another day was removed from the settlement cycle. Today, the industry effectively completes settlement for trades in equities and certain debt securities on the second day after a trade is executed, T+2.

Even after achieving T+2, DTCC continued an aggressive examination of its own core clearing and settlement processes, with an eye to further modernizing the capital markets infrastructure across the entire post-trade lifecycle. Although DTCC's current infrastructure supports T+1 and limited T+0 settlement cycles, market behavior, legacy infrastructure and operational processes at client firms make it difficult to accelerate further without a lengthy industry effort – one can only move as fast as the slowest adopter.

Recent market events – and especially the unprecedented volatility experienced in March 2020 resulting from the COVID-19 pandemic – have reaffirmed DTCC's position that there are still opportunities for industry improvements, which could provide additional operational efficiencies and reduce industry-wide risk and cost. DTCC believes the timing is right to further explore the impact and benefits of accelerated and optimized settlement for the U.S. equities market. To that end, working with our industry clients, DTCC has developed a proof of concept: Project Ion.

Introducing new and more efficient settlement processes underpinned by advancements in technology provides the best opportunity to modernize the existing capital markets infrastructure and continue DTCC's mission of helping the industry mitigate risk and reduce cost in clearing and settlement by driving out operational and capital inefficiencies.

- **Project Ion explores new and**
- **alternative settlement models,**
- **leveraging the digitization of**
- **cash and re-representation**
- **of securities, and assesses a**
- **potential new accelerated**
- **settlement service option.**

DTCC'S DIGITAL ACCELERATED SETTLEMENT SERVICE

Leveraging years of settlement experience, DTCC is exploring the potential development of a new Digital Accelerated Settlement Service as part of the suite of services offered by DTCC's subsidiary, The Depository Trust Company (DTC). This potential new service could introduce optimized settlement processes and accelerate settlement to T+0, while retaining the core benefits of DTC's centralized netting and risk management.

To validate the proposed design and vet the potential future service with the industry, DTCC developed a working proof of concept (POC), designed to help clients visualize key business workflows and novel implementations. Through a rapid and iterative approach, DTCC is partnering with the industry to collectively validate the most effective model that brings the broadest industry benefits, identify potential barriers and explore the feasibility of moving the markets towards accelerated settlement, employing a modern platform, underpinned by DTC's proven infrastructure.

ASSESSING THE OPPORTUNITY

The purpose of this paper is to validate concepts and assess market demand for several new settlement enhancements to DTC's settlement capabilities, including an optional accelerated settlement service. Industry input will be instrumental in furthering discussions on how to model, develop, and test a potential new Digital Accelerated Settlement Service and assess whether more modern technology can offer unique advantages to achieving this end.

DTCC welcomes feedback from those who are interested in driving fundamental improvements in the DTCC settlement process and helping shape the future of the global capital markets infrastructure. DTCC encourages the industry to join DTCC in the exploration of these proposals and contribute to the case for change.

Questions or comments on this case study should be sent to settlement_optimization@dtcc.com.

ADVANCING THE INDUSTRY TOWARDS ACCELERATED SETTLEMENT

As the backbone of the U.S. financial industry, DTCC operates the most cost-effective and efficient settlement system in the world. Centralized netting, clearing, and settlement of nearly every equity trade have contributed to making the U.S. markets the deepest and broadest in the world. Last year, DTCC, through its wholly owned subsidiaries Fixed Income Clearing Corporation, National Securities Clearing Corporation (NSCC) and DTC, processed securities transactions valued at more than U.S. \$1.85 quadrillion.

In 2012, DTCC commissioned a ground-breaking industry study assessing the costs and benefits of accelerated settlement for the U.S. capital markets.¹ In 2017, DTCC was proud to partner with industry colleagues to shorten the U.S. settlement cycle from trade date-plus-three days (T+3) to trade date-plus-two days (T+2), an historic achievement that delivered significant benefits to market participants. By removing an entire day from the settlement cycle, the average daily capital requirements for clearing trades through NSCC was estimated in 2017 to be reduced by approximately 25 percent, saving the industry \$1.36 billion in margin requirements.² This multi-year effort marked the most significant change to the U.S. market's settlement cycle in more than 20 years.

However, even at T+2, one of the last remaining exposures in the settlement system is still time. Time increases the risk of an unpredictable event that could significantly affect the transfer of cash or ownership of securities from the point of execution through settlement.

BENEFITS OF ACCELERATED SETTLEMENT

DTCC believes that continuing to build on efforts achieved to date – and further accelerating settlement – can render even greater benefits to the industry.

In order to continue to move the markets forward and drive out inefficiencies for clients, DTCC proposed two innovative initiatives in a white paper to the industry in early 2018: settlement optimization and accelerated settlement.³

These initiatives were focused on enabling members of NSCC and DTC to improve workflows, optimize capital and reduce risk, further reducing settlement processing inefficiencies through automation. In January 2020, DTCC implemented some important changes to the settlement night cycle, further increasing processing efficiencies.

¹ Cost benefit analysis of shortening the settlement cycle (October 2012) - https://www.dtcc.com/~/_/media/Files/Downloads/WhitePapers/CBA_BCG_Shortening_the_Settlement_Cycle_October2012.ashx

² UST2 Press Release, Financial Services Industry Shortens Trade Settlement Cycle in the U.S., Marking the Most Significant Change in Two Decades (September 5, 2017) - <https://ust2.com/pdfs/T2-Steering-Committee-Joint-Release-on-Launch.pdf>

³ Modernizing the US Equity Markets Post-Trade Infrastructure (January 2018) - [https://perspectives.dtcc.com/assets/img/equities-structure-whitepaper-jan2018-\(1\).pdf](https://perspectives.dtcc.com/assets/img/equities-structure-whitepaper-jan2018-(1).pdf)

DTCC also spent considerable time with industry representatives refining several other settlement optimization concepts including:

- **intraday settlement;**
- **integrated DTC/NSCC settlement; and**
- **risk management control modifications.**

In many cases, these enhancements would provide benefits similar to shortening the settlement cycle – and when combined with accelerated settlement, the enhancements could drive significant benefits for members and the industry more broadly.

REDUCTION IN RISK	The elimination of a market day for a substantial percentage of trades would significantly reduce the risk capital required by NSCC to guarantee trades.
CAPITAL REQUIREMENTS	The elimination of a market day reduces NSCC clearing fund requirements creating capital efficiencies for members.
RELEASE OF “TRAPPED LIQUIDITY”	NSCC would have fewer settlement obligations, potentially reducing the liquidity resources required to guarantee settlement activity.
LESSEN THE RISK OF INSOLVENCY	Improvements in the settlement process, would produce a significant reduction in U.S. market risk without the elimination of the massive benefits of centralized netting, striking the optimal balance between netting and capital efficiency.

During high stress/high volatility periods, buy-side counterparty exposure and NSCC’s Clearing Fund requirement both increase considerably. For example, during the recent volatility of March 2020, margin increased dramatically by more than 300 percent over historical averages. A shortened settlement cycle would significantly lower margin requirements for clearing agency members and reduce both pro-cyclical margin and liquidity demands by an order of magnitude. The reduction of liquidity demands and lessening the amount of money that needs to be collected at any one time is a key benefit that will strengthen our financial markets, especially during critical market events that result in periods of significant market volatility.

Today, DTC and NSCC can process trades with shortened settlements based on client request. Retail clients can request shortened settlements to meet the demands of large purchases and tax payment, and investment managers occasionally request shortened settlements for portfolio securities to align the sale of portfolio assets with mutual fund share redemption transactions. While DTCC’s systems can already support T+1 and T+0 settlement, legacy operational industry processes and other factors have prevented the industry from moving beyond T+2.

DTCC continues to closely collaborate with the industry on evaluating opportunities to move the markets towards accelerated settlement, without forcing operational and technical change or fragmenting the clearance and settlement ecosystem.

DTCC'S DIGITAL TRANSFORMATION JOURNEY

DTCC's Digital Transformation has closely mirrored the industry's own era of digitization, turning traditional and physical interactions, communications, business functions and business models into more digital ones – and using that new technology to change social, business and economic behaviors, driving greater collaboration and efficiencies with systems, processes and people.

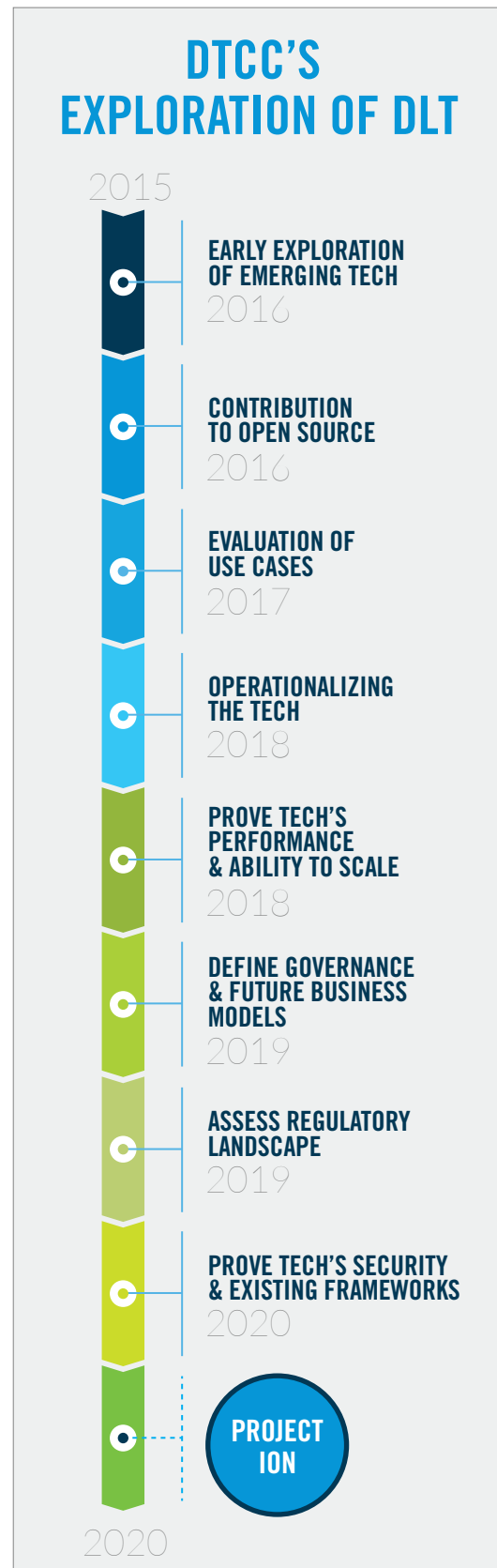
Technology has been a long-standing catalyst for change, innovation and the emergence of new business models. DTCC continues to invest in research and experimentation with emerging technological advancements, understanding their potential of being an enabler for new and existing opportunities. As technology evolves and matures, DTCC revisits current processes and capabilities to assess if leveraging more modern technologies can drive additional client and business value.

Since the immobilization of securities for book entry, DTCC and the industry have come a long way. DTCC is now leveraging cloud processing for distributed computing, Artificial Intelligence (AI) and Machine Learning (ML) for data insights, and most recently launching an Application Programming Interface (API) Marketplace to provide clients, partners and internal developers with a single, central location for APIs. DTCC has also been leading the industry in its evaluation of DLT as a potential persistence layer for the future capital markets ecosystem.

AN ASSESSMENT OF DISTRIBUTED LEDGER TECHNOLOGY (DLT)

Initially portrayed as technology that could disintermediate the entire financial industry, DTCC and other financial institutions recognized the value inherent in the shared DLT platform that built security, privacy and auditability into every financial transaction and could potentially eliminate costly reconciliation. After an initial evaluation, DTCC and the broader financial industry agreed that DLT presents an opportunity to shape the future vision of capital markets. That vision is a more integrated, peer-to-peer data synchronization network that acts as a foundation for capital markets infrastructure, enabling the automation of post-trade activities for digital assets, both natively issued and re-represented.

DLT, like any emerging technology, must be thoroughly vetted through thorough testing. Since DTCC's first whitepaper on blockchain in 2016, DTCC has been closely evaluating distributed ledger technology to assess its maturity and potential timeframe for mass market adoption, across several key dimensions.



PROJECT ION

As technology evolves and matures, DTCC believes it is important to revisit current practices and processes to assess if additional client and business value can be derived. Given DTCC's recent initiatives in accelerated and optimized settlement, and with the current state of DLT, the timing was right to converge the two journeys.

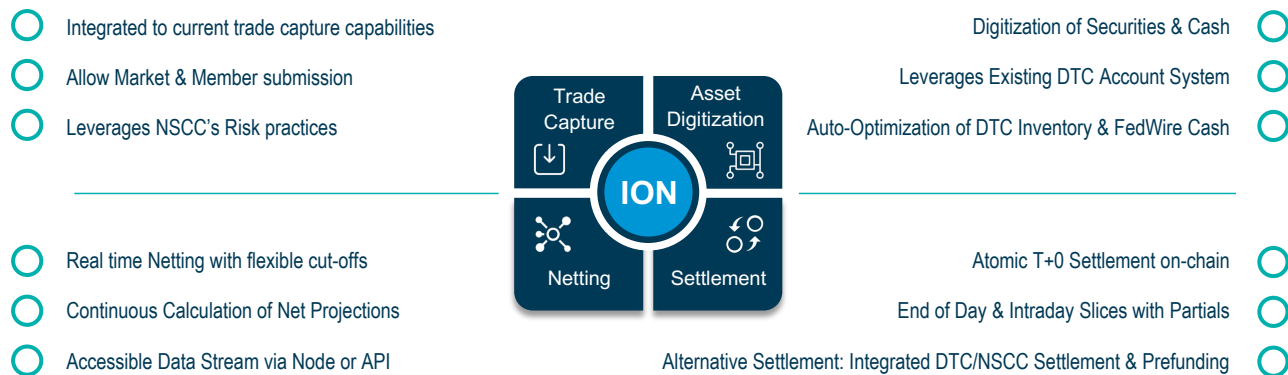
Project Ion was formed through partnership between DTCC's Clearing & Settlement Product Management and the Business Innovation Group, to evaluate the impact and benefits of DLT on accelerated settlement for the U.S. equities market, and namely to explore a hypothesis: Can the digitization of assets on DLT reduce cost and risk for the industry while paving a path to modernizing the capital markets infrastructure and facilitating accelerated settlement?

-
- **Can the digitization of assets on**
- **DLT reduce cost and risk for the**
- **industry while paving a path to**
- **modernizing the capital markets**
- **infrastructure and facilitating**
- **accelerated settlement?**
-

POTENTIAL DIGITAL ACCELERATED SETTLEMENT SERVICE

The proposed design of a Digital Accelerated Settlement Service at DTC was inspired by key concepts from the Settlement Optimization and Accelerated Settlement initiatives but modelled around a T+0 settlement cycle.

Underpinned by DTCC's years of settlement experience, a potential Digital Accelerated Settlement Service has the promise of offering the industry an accelerated settlement option that does not compromise on the core benefits of DTCC's centralized netting and risk management.



Common Interface via Front End, Node & API abstracting **between existing and new** infrastructure

Backward compatibility to Settlement Web for **ease of adoption**

Full Synchronization between the ledgers **for redundancy and resiliency**

KEY DESIGN CONCEPTS INCLUDED IN THE PROPOSED DIGITAL ACCELERATED SETTLEMENT SERVICE:



TRADE CAPTURE

NSCC's Universal Trade Capture (UTC) serves as a primary interface and trade capture system for all exchanges and qualified special representatives (QSRs) in the U.S. A Digital Accelerated Settlement Service would be designed to fully integrate with current trade capture capabilities and leverage UTC's common input format to lessen the burden of change to exchanges, QSRs and the broader industry.



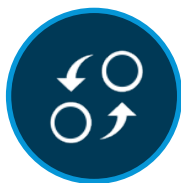
ASSET DIGITIZATION

In evaluating models for digitization of both cash and securities, a Digital Accelerated Settlement Service would be designed to leverage current DTC and NSCC accounting structures, ensuring continuity and interoperability with clients' systems and processes. This interoperability would be fully integrated with DTC's current settlement platform, thereby minimizing the client impact. To ease the operational burden of managing obligations between two settlement services, a Digital Accelerated Settlement Service could also offer auto-optimization capabilities, enabling a DTC client to seamlessly move assets between settlement systems to fulfill its settlement obligations.



NETTING

A Digital Accelerated Settlement Service would include a newly-designed netting service that supports real-time netting with flexible cut-off times. This would enable the settlement service to support multiple settlement slices, allowing clients to consume projections data on a continuous basis through APIs. Real-time access to netting projections would allow DTC clients to better optimize their inventory throughout the day and render greater efficiencies.



SETTLEMENT

Enabled by a new netting engine, a Digital Accelerated Settlement Service would be designed with flexibility in mind, offering an end-of-day settlement cycle, as well as intraday settlement slices. This flexibility would deliver settlement finality earlier in the day, while retaining the benefits of netting. A Digital Accelerated Settlement Service would support both netted and bilateral settlement and incorporate a new integrated DTC/NSCC Settlement model as well as a pre-funding option for both netted and bilateral settlements.



INTERFACES

A Digital Accelerated Settlement service would offer a new API interface that would be fully compatible with DTC's current systems and settlement service. This backward compatibility would allow clients to easily adopt the new interface when they're ready and abstract the clients from the underlying infrastructure.

PROOF OF CONCEPT (POC)

DTCC believes that real impact and true transformation is only achievable in unison. DTCC is committed to working with the industry and regulators in the evaluation and assessment of Project Ion. To accelerate the evaluation of a proposed Digital Accelerated Settlement Service, DTCC has developed a POC, which will serve as a critical tool in engaging the industry in meaningful discussions. The POC incorporates a subset of key concepts proposed in the potential new Digital Accelerated Settlement Service.

IMPLEMENTATION DECISIONS:

- To effectively convey proposed business concepts, UI/UX was prioritized over a scalable architecture
- Settlement smart contracts were programmed in DAML to evaluate the atomic nature of smart contracts
- Cloud-based Netting engine was developed off-chain for centralized execution
- DTC integration was simulated in the POC for ease of implementation
- Simulated data was used in the re-representation of DTC Eligible Securities & cash

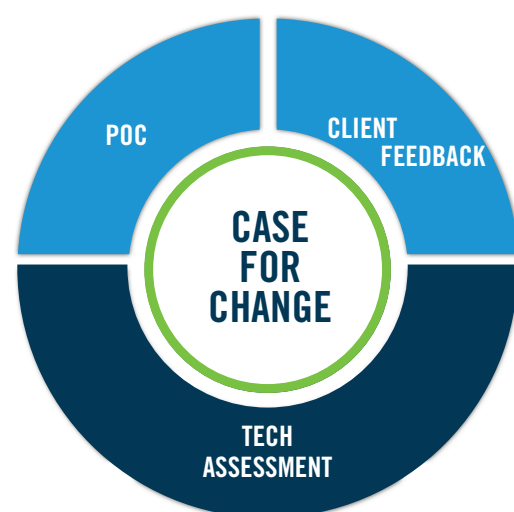
CONCEPTS IN SCOPE:

- Mechanism for immobilization & re-representation of Securities & Cash
- Re-designed Netting Engine with real-time projection capabilities
- A pre-funding settlement model
- Intraday and End of Day Settlement Slices
- Atomic transfers for Bilateral Delivery vs. Payment (DvP) and Free of Payment (FoP)
- API integration for Trading Venues to submit market orders
- API integration for clients to consume real-time Net Projections and manage inventory

NEXT STEPS

DTCC is now engaging the broader industry to demo the proposed concepts and gather feedback that will further inform the design and assess the market demand for a potential future accelerated settlement option. In parallel, DTCC is conducting a comprehensive technical assessment to determine an appropriate technical stack for a more scalable implementation. In its review, DTCC will select a technical stack that is best positioned to meet the business requirements without any compromise to DTCC's security and resiliency standards. DTCC is committed to the safety and soundness of markets and waiting for technology to mature will not be an impediment to driving business value.

DTCC welcomes feedback from industry representatives who are interested in driving fundamental improvements in the DTCC settlement process and helping shape the future of the global capital markets infrastructure. DTCC encourages the industry to join DTCC in the exploration of these proposals and contribute to the case for change.



Questions or comments on this case study should be sent to
settlement_optimization@dtcc.com.

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