COLLATERAL MANAGEMENT UNDER NEW REGULATORY REGIMES

Following the 2008 financial crisis and commitments made by G20 countries, a wave of new regulations has demanded new risk management practices and process efficiency. Central among these are **market** regulations, which enforces the adoption of the central clearing for eligible transactions and collateralization of non-eligible ones. Separately, global banks are impacted by **prudential** regulation, which restrict their levels of leverage and balance sheet exposure. As a result of the evolving regulatory framework, dealing banks are becoming increasingly sensitive to the capital impact of clients' derivative activities.

These changes have placed a considerable burden on derivative participants, but present an opportunity for the industry to rethink collateral management processing efficiency and optimization.

Regulatory Challenges

- Collateral type posted increasingly important from capital perspective
- Transition to central clearing is complex due to legacy portfolios
- Overcollateralisation creates capital drag and increase risk exposure
- Inefficient dispersion of derivative portfolio increases Supplemental Leverage Ratio (SLR)

As it stands, market regulation and prudential regulation appear conflictual, in that the move towards trade collateralization as the Basel III CEM (Current Exposure Methodology) for RWA (Risk Weighted Assets) and SLR (Supplemental Leverage Ratio) do not fully consider the collateralised nature of cleared derivatives portfolios. The result is an increasingly capital intensive business that has driven FCMs (Futures Commission Merchants) to reassess their business model and become increasing selective of the clients they wish to serve.

Under the Basel Committee on Banking Supervision's (BCBS) framework for Basel III, banks will be required to set aside much more capital for their derivative exposures. The new framework determines that collateral received in connection with derivatives contracts does not reduce the firm's derivative exposure amount. Where collateral provision has reduced the value of balance sheet assets, with the exception of eligible cash variation margin, firms must gross up their exposure measure by the amount of collateral posted as margin. Clearing providers receiving excess collateral will be conversely penalized for holding additional assets. Banks will have to hold additional Tier 1 capital, for derivatives collateral that Basel has determined increases their derivatives exposure measure, to maintain SLR minimums.

As clearing providers are intermediating between a client and a qualifying central counterparty (QCCP) and guaranteeing counterparty performance, derivative exposures to both QCCP and client are also included towards their total leverage exposure[1]. This requires even more capital to maintain SLR levels. While clearing providers are not held to disclosure requirements today, this will change with the migration to Basel III Pillar 1 requirements, with a disproportionate impact on this business line. Banks providing clearing will have to set aside more capital for cleared derivative trades than bilateral trades. This runs contrary to other regulatory initiatives such as central clearing or collateralization requirements for derivatives[2]. This additional capital takes three forms, 1) Default fund contributions, 2) Intra-day liquidity buffers and 3) regulatory capital.

As a result, the industry is already experiencing a decreasing number of FCMs, despite higher clearing adoption rates. Data published by the U.S. Commodity Futures Trading Commission (CFTC) shows that the number of registered FCMs has more than halved to 73 since 2008, while the amount of client margin required to support cleared derivatives trading has grown by more than 50%.[3] The top 15 FCM's today represent of 90pc of cleared volumes worldwide.

For clients with large directional derivatives portfolios, which have negligible netting benefits, the challenge is exceptionally acute. These directional portfolios are significantly more capital intensive to service, because of the higher directional risks and margin requirements they carry. FCMs would not only have to hold considerable buffers to meet intra-day margin calls, but also raise additional capital to fulfill regulatory requirements. Prudential regulations require that FCMs must maintain a minimum adjusted net capital of equal or to, in excess of, 8% of total risk margin requirements for all positions carried for clients[4]. Market regulations determine that higher risk brought about by directional portfolios would additionally require clearers to contribute more capital to the default fund of the QCCP or CCP; FCMs are then also required to raise additional capital for the exposure to the CCP arising from their default fund contributions under the capital requirement framework of Basel III.[5] The industry has estimated that capital requirement could amount to 100% of the margin contributions.[6] The consequence is that clients who are not capital efficient and conscientious in optimizing their portfolios serviced by their FCM's will find increasingly less choice of providers willing to service them[7].

Operational Challenges

- Quantum of margin calls set to increase significantly
- Capacity constrains in managing increases
- Negligible straight-through-processing
- Fragmented collateral management teams for a converging collateral process

The industry is moving towards a central clearing model and outside of that, mandated collateralization of uncleared trades through the exchange of initial and variation margin. This is increasing operational burden, albeit to different degrees, placing existing infrastructure under considerable strain. Mandating exchange of margin increases margin call frequency and related exception management. This necessitates either an increase in operational headcount or higher levels of automation (STP). Monitoring counterpart relationships subject to differing regulatory requirements, in addition to investor preference and limitation on clearing providers, further increases operational complexity.

For an industry that remains heavily reliant on manual processes today, coping with this change represents a significant challenge. Persistence of manual processes can be attributed to the lack of standardisation on data and file formats as well as difficulty in interfacing between systems carrying out the various steps of the collateral process[8]. As a result, users have to manually bridge and reconcile these breaks using other programmes. Currently many of the collateral functions, including asset valuation and margin calculation, have been developed as standalone systems, hindering STP.

The Deposit Trust and Clearing Corporation (DTCC) estimates that 40% of asset managers rely on manual processes for collateral selection, valuation and posting[9]. ISDA noted that some firms continue to rely on fax, and it is concerning that electronic messaging has yet to become the de facto standard for business communication in certain areas of the derivatives market, especially given the time sensitivity for processes under new margining regulations.[10] Legacy practices are not adaptive enough to help financial firms prepare for upcoming regulations. Only 10% of managers have expressed confidence in their ability to cope with potential volume and complexity of collateral movements.[11] ACUO integrates these collateral functions on a single platform in a cloud environment.

Institutions relying on collateral service providers have been limited by constraints of the service providers themselves. The ability of providers to respond to the needs of clients is hampered as resources are diverted towards coping with the wave of regulations that affect them and the consequent need to upgrade their own processes. These services are either expensive, as service providers in turn generally avail of white-labelled vendor solutions, or rarely out of the box requiring costly integration[12].

Cost of Business

Financial institutions need to improve operational efficiencies and better understand the capital impact of their trading activity and associated collateral when engaging with clearing providers. This is essential to generating adequate capital adjusted returns on their activity.

In a negative interest rate environment, FCMs cannot rely on interest margin to drive profits. Additionally, regulations mandating equity capital to support margins posted by clients is threatening the traditional FCM business model. In their reassessment, many FCM's are taking the painful decision to exit the business entirely. Those that remain are inevitably looking at ways to transmit the higher costs of servicing this business to their clients.[13]

Increased automation and STP will enable market participants to consume less resources. Through a more thoughtful approach to their collateral utilization, clients can effectively help service providers improve capital adjusted returns. Clients who do not adapt and think strategically about what they can bring to the table, concerning operational and capital efficiency, will find the cost of doing business increase.

"Pioneering Real-Time Collateral Optimisation"

The challenge of collateral management to lower the cost of market participation, which we seek to address, is evidently a market need[14]. As previously mentioned, a significant portion of market participants rely on manual processes for the collateral workflow today. ACUO seeks to address this by building a cost effective and fully automated collateral management platform for the derivatives complex.

Additionally, ACUO's Saas delivery model echoes the regulators' and financial industry's increasingly positive stance towards cloud services as a service delivery model[15] [16].

Workflow Automation

While solving for the manual process problematic, our platform also aims to solve for other challenges faced by users of current collateral management platforms. Industry utilities for parts of the collateral management process have been developed, from margin calculation to trade reconciliation. However, there has been a lack of effort in bringing these functions together and simplifying the process. Our solution encompasses the core components of collateral management, and begins with the design of the user interface which delivers a collaborative workflow tool.

Legacy practices consider collateral management as purely an operational function. In the new paradigm, decisions will involve operations, liquidity management, risk and settlement functions of the organization. We begin by bringing these parties together on a single platform, enabling more effective collaboration and eliminating the need for constant status updates.

A single dashboard provides a high-level view of the various components of the collateral process. Each component is represented by a single widget. Widgets are designed to display information most relevant to each user type's objective. Existing collateral solutions fail to assist users in identifying actions which require their attention and assisting them in prioritization of their workflow. We seek to address this.

There is a convergence in treatment of different types of derivatives. Notwithstanding this, derivative types (ETD, OTC Cleared, OTC Bilateral Regulatory and Legacy) are governed by different agreements, regulated by different regulators and subject to differing segregation regimes and capital treatments. Our challenge is to simplify this complexity. We present an aggregate view of collateral assets and liabilities. Through our back-end connectivity we manage the complex workflow, while presenting a uniform interface at the front end. A margin reconciliation by the operations team generates an action for the liquidity management team. A collateral decision by the liquidity team creates an action for the settlement team and so on.

Graph DB Application

ACUO is employing graph database technology as an effective method for deciphering structured and unstructured data, and their relationships to support better, faster and smarter decision making. This is crucial to ensuring latency reduction which is a prerequisite for timely decision making.

The choice of a graph database in our solution is fundamental. By assembling the simple abstractions of nodes and relationships into a connected structure, the graph database will enable us to build a sophisticated model that maps closely to our complex and ever-evolving collateral management problem domain. Unlike relational databases, flexibility of graph databases makes them apt at handling data relationships, especially when those relationships are added or adjusted on an ad hoc basis using nodes. As opposed to NoSQL databases, the connected construction makes it easier to properly harness data relationships. While the ability of graph databases to create and suppress nodes when necessary increases its reliability. For relational databases, each line is interchangeable. In contrast, graph databases are able to discern new and existing items. Additionally, because every trade is in the same space as opposed to several tables, it helps avoiding mistakes and duplicates.

Graph databases are also incredibly efficient in terms of query speeds, even for complex pattern matching queries. With information persisted within a structure of nodes and relationships, queries can easily and quickly traverse through the universe of available information, without computing unnecessary information, allowing for fast execution.
Within the platform, we are providing margin calculations for across all derivative types, enabling users to know their margin requirements ahead of margin calls. Having such knowledge in advance helps widens a firm's settlement window, giving more choice as to the type of collateral that can be deployed and minimizes opportunity costs associated with over-collateralization.

Our proprietary algorithm will provide a selection of cheapest-to-deliver collateral assets to calls, with flexibility to account for user preference. Users can overwrite optimized results and our algorithm will provide a new suggestion based on the previous action.

Each client organization of the platform will define in the system their trading structure (i.e. funds, portfolios, etc) and external providers (i.e. custodians, FCMs, etc). Their assets, exposures and CSA agreements will then be loaded and maintained in the graph database. The database will be linked to a dashboard that will provide status lights of aggregated assets, aggregated exposures and collateral requirements for each client. In respect of exposures, one will be able to drill down a specific fund, counterpart or currency in order to get a more detailed view of the collateral requirements of those exposures.

Why Graph Database

On top of performance benefit over traditional databases, Graph databases offer an extremely flexible data model, and a mode of delivery aligned with today's agile software delivery practices.

Flexibility

Graphs are naturally additive, meaning we can add new kinds of relationships, new nodes, and new subgraphs to an existing structure without disturbing existing queries and application functionality. These attributes have generally positive implications for developer productivity and project risk. Because of the graph model's flexibility, we don't have to model our domain in exhaustive detail ahead of time—a practice that is all but foolhardy in the face of changing business requirements. The additive nature of graphs also means we tend to perform fewer migrations, thereby reducing maintenance overhead and risk.

Agility

We want to be able to evolve our data model in step with the rest of our application, using a technology aligned with today's incremental and iterative software delivery practices. Modern graph databases equip us to perform frictionless development and graceful systems maintenance. In particular, the schema-free nature of the graph data model, coupled with the testable nature of a graph database's application programming interface (API) and query language, empower us to evolve an application in a controlled manner.

Reliability

As a collateral platform, managing large sets of dynamic trade, asset and margin valuations, simplicity and reliability are also key factors. Where a relational database needs to either store trades in different table or tolerate blank fields to account for different trade characteristics, with which important missing values could easily be mistaken, graph databases simplify this process. In a graph structure, similar nodes can have different properties, enabling different trade types to be stored under the same label.

Graph databases also allow the creating and suppressing nodes when necessary. For relational databases, lines are interchangeable. In contrast, graph databases are able to discern new and existing items. Additionally, because every trade is in the same space as opposed to several tables, it helps avoiding mistakes and duplicates. Both features thus make the valuation of new trades and the suppression of old ones more reliable.

Operational performance

In the same way that graph database enable for flexibility and agility as described above, they just as often offer a very significant performance improvement over existing technologies. Some query patterns - like the deep/recursive join or the pathfinding operation - require an enormous amount of hardware/software horsepower in the traditional relational database world in order to deliver the results in a timeframe that users would accept. And even then, we all know cases where the query performance would become brittle and unpredictable under load.

This is where graph databases can really help. The same queries that were causing constant headache in the relational world, would predictably run like a breeze in a graph world. In contrast to relational databases, where join-intensive query performance deteriorates as the dataset gets bigger, with a graph database performance tends to remain relatively constant, even as the dataset grows. This is because queries are localized to a portion of the graph. As a result, the execution time for each query is proportional only to the size of the part of the graph traversed to satisfy that query, rather than the size of the overall graph.

Cloud vs Enterprise

Competitor offerings are enterprise solutions which by definition are limiting, to the extent that each deployment requires multiple and extensive integration. ACUO is leveraging a cloud solution with application-programming interface (API) integration at an aggregated level. The platform will be delivered to the end users in the form of a Software as a Service (SaaS). It is mainly articulated around a web interface sourcing its data from a graph database, and interacting with different service providers via their specific APIs.
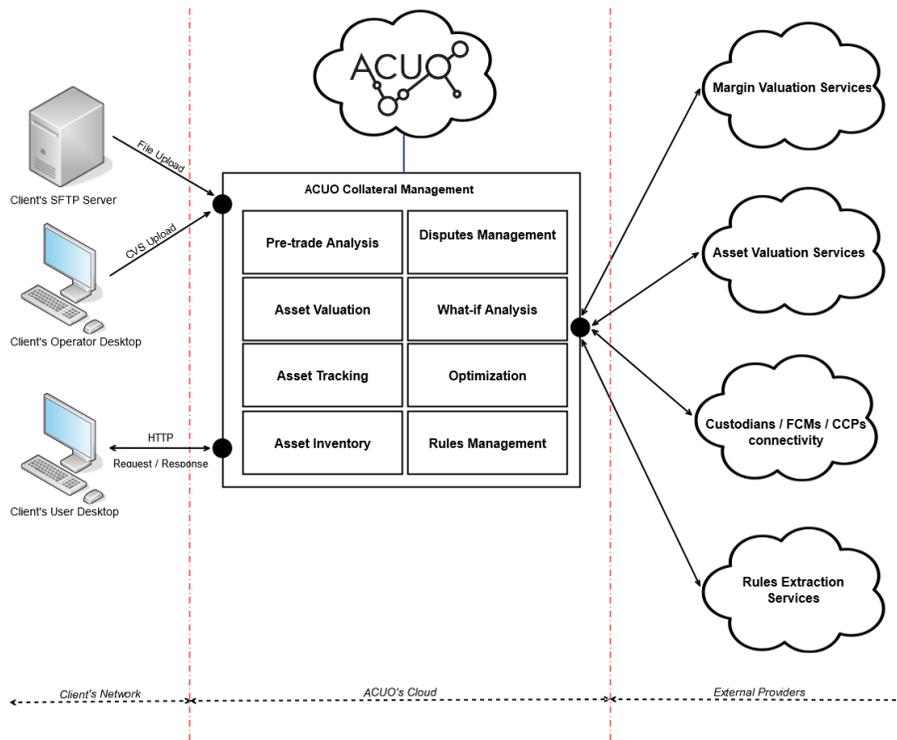
We will offer out of the box connectivity to valuation engines and messaging platforms. APIs from the platform enable easy integration with legacy systems, reducing software onboarding complexity and time. Cloud computing will enable us to scale computing power and storage according to the user's needs, allowing us to provide the platform at a compelling price in comparison to existing collateral solutions

ACUO Architecture

The following diagrams represent ACUO architecture seen from different viewpoints.

The **Context Viewpoint** diagram below describes the relationships, dependencies, and interactions between the system and our environment.

Figure 1: Context Viewpoint

Key Features

Asset Inventory	The ability to manage the asset inventory of the end user, and ability to provide a set of views representing the use and state their assets:
	• **Enterprise-wide view of Eligible Collateral**, the amounts of cash and non-cash eligible collateral asset held in dollars at the given time.
	• **Current Collateral Usage State**, a summary view showing eligible collateral and broken down as: deployed, earmarked, arrival, departure and available.

Trades repository	The ability to view details of the end user's trades repository from different perspectives, including but not limited to: • Derivative Type: Exchange Traded, OTC Cleared and OTC Bilateral • Legal Entity Identifiers
Derivatives Valuation Asset Valuation	The ability to value in real time or end-of-day derivative portfolios and asset portfolios via external services
Margin Calculation	The ability to calculate initial and variation margin by replicating CCP margin methodology and daily trade valuation
Margin Call Management Dispute Management Asset Settlement	The ability to manage and process the main collateral management work-flows: • **Margin Calls work-flow**, involves the reconciliation of principal and counterparty exposure feeds and margin calls received from client's FCM or bilateral counterparties • **Disputes work-flow**, defines the procedure to manage and deal with disputes of margin call. • **Settlements work-flow**, enables manual creation or automatic generation of instructions for cash and security movements to and from custodian accounts; message can be in the form of SWIFT or otherwise
Agreements repository	The ability to extract and manage information contained within clearing and collateral agreements. Those agreements can be of different type: Legacy CSAs, Regulatory CSAs, Futures Agreements or OTC Clearing agreements.
Collateral Optimisation	The ability to find the best fit allocation of the assets to given margin calls depending on eligibility criteria and the client's preferences
What-if Analysis	The ability to run a what-if scenario analysis by adding new trades or removing existing trades from a portfolio and analysing the impact on margin requirements

The **Functional Viewpoint** diagram below describes the system's functional elements, their responsibilities, interfaces, and primary interactions. Those functions are represented by modules with the same name and regrouped by engines.

Figure 2: Functional Viewpoint
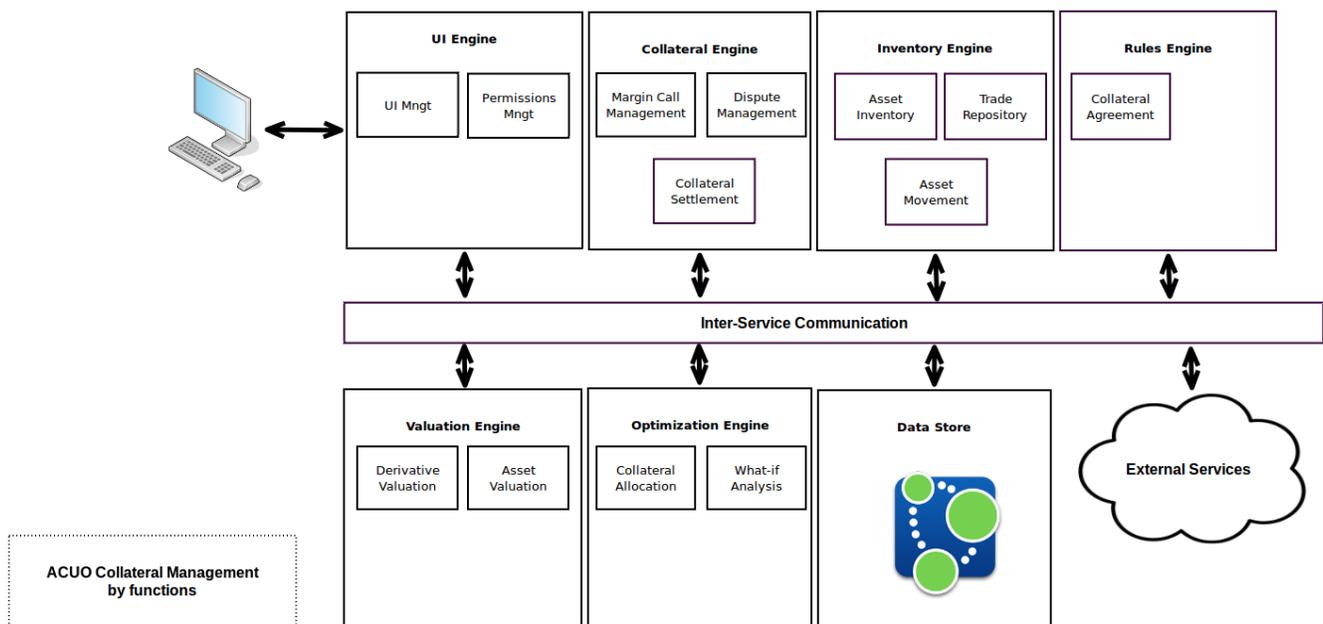
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