

The role of Central Counterparties in a DLT environment

Linklaters

Architects of trusted markets EUREX

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1 Introduction

1.1 Purpose and scope of the whitepaper

The digital transformation of the financial industry is no longer a distant prospect but a present reality. Emerging technologies offer significant opportunities for innovation and efficiency but also require a legal and regulatory framework that adequately addresses these new opportunities. There is an ongoing debate about existing as well as new roles of financial market infrastructures such as Central Counterparties (CCPs) and whether both existing and new market entrants can provide complementary viable alternatives for the financial industry.

In collaboration with market participants and regulators, Eurex Clearing has adopted a pragmatic approach for a smooth transition to a digital ecosystem, where it offers added value for efficiency and client benefits, minimizing risks along the way.

This whitepaper aims to contribute to this process from a practical perspective by focusing on topics related to clearing and settlement that are essential for the transition to a digital financial ecosystem including the role of CCPs. We present an analysis on the implications and benefits of Distributed Ledger Technology (DLT) with a focus on key aspects such as atomic settlement, 24/7 settlement, and efficiency of netting.

The insights and conclusions presented in this paper are derived from our direct experiences in operating under live conditions, rather than theoretical environments, providing a grounded and realistic view of the challenges and opportunities of a DLT financial ecosystem.

1.2 Major conclusions

The role of CCPs in a digital environment, incl. DLT, is multifaceted and essential for the successful digital transformation of financial markets.

By enhancing settlement processes, improving collateral management, strengthening risk management frameworks, and facilitating integration and standardization, CCPs have significantly contributed to a more resilient, efficient, and secure financial ecosystem since their establishment in the 20th century.

In the European Central Bank's recent *Exploratory work on new technologies for wholesale central bank money settlement* ('ECB exploratory work')[1], CCPs demonstrated operational robustness in DLT-based environments, confirming that their clearing processes and risk methodologies remain effective regardless of the underlying technology. This also underscores the critical role of CCPs in maintaining stability within financial markets, ensuring that transactions are processed smoothly, securely, and in a risk mitigating manner.

The role of CCPs in a digital environment, incl. DLT, is multifaceted and essential for the successful digital transformation of financial markets.

[1] See Exploratory work on new technologies for wholesale central bank money settlement for details

The integration of DLT with existing processes of CCPs creates a significant advantage for the market. This adaptability to new technological frameworks allows the market to leverage the benefits of DLT without disrupting established central clearing operations including the integration of centralized and decentralized environments, where appropriate. By integrating digital technology, incl. DLT, CCPs enhance their efficiency and continue to provide reliable clearing and settlement services.

With regards to risk management, the fundamental types of risks managed by CCPs, such as counterparty credit risk, liquidity risk, and market risk, are independent of the underlying technology. However, with the adoption of new technologies, other risks such as cybersecurity risks may become more critical. Risk management and control frameworks must evolve alongside technological developments to ensure the continued effectiveness of CCPs in the changing financial ecosystem.

CCPs also play a crucial role in ensuring delivery reliability. The concept of legal settlement finality is distinct from but connected to the concept of delivery reliability. Eurex Clearing´s experience demonstrated that on the CCP level, the settlement finality provisions of the CCP apply; the delivery obligation becomes irrevocable on the CCP level as soon as trades are novated or in case of open offer after the matching of the respective trade orders.

Operationally, CCPs are uniquely positioned to facilitate the integration of, bridge the gap to and create standards for DLT with traditional financial systems. By acting as a bridge between centralized finance (CeFi) and decentralized finance (DeFi) ecosystems, CCPs can ensure a seamless transition to a newly created digital financial ecosystem. This integration is crucial for leveraging the benefits of DLT while maintaining the robustness and reliability of existing financial infrastructures – thus combining the benefits of both worlds.

By acting as a bridge between centralized finance (CeFi) and decentralized finance (DeFi) ecosystems, CCPs can ensure a seamless transition to a newly created digital financial ecosystem.

This integration is crucial for leveraging the benefits of DLT while maintaining the robustness and reliability of existing financial infrastructures – thus combining the benefits of both worlds.

2 Integration of DLT with CCPs

The advancements in digitization and DLT hold considerable transformative potential for the financial sector. This potential is particularly significant for the industry's market infrastructure, operational processes, legal foundations, and governance frameworks and may further improve the efficiency and effectiveness of financial markets. Eurex Clearing – as an authorized CCP under the European Market Infrastructure Regulation (EMIR) – has recognized the transformative potential and begun its journey of investigating how new technologies, incl. DLT, are enhancing financial market infrastructures like CCPs by participating in several market-wide initiatives to prepare for a smooth digital transition. For example, CCPs being the single source of truth in a DLT environment was recently proven to be valuable, especially ensuring legal certainty, enforceability, and resilience.

2.1 Benefits of DLT for the market and the integral role of CCPs

DLT promises to improve the efficiency, security, and transparency of financial transactions. In this digital transformation, how can a CCP benefit from DLT and contribute to a secure and integral digital financial ecosystem?

By exploring the potential of DLT in several market initiatives, Eurex Clearing has reached several substantial conclusions. Some of the areas identified are described below.

- **Collateral management:** DLT facilitates a more efficient use of collateral by enabling real-time collateral transfers and asset optimization. This capability allows CCPs to manage liquidity more effectively, ensuring that collateral is available precisely where and when it is needed. Consequently, CCPs can respond more swiftly to market changes, thereby enhancing their ability to maintain market stability and mitigate risks.

  In addition, clearing members of CCPs as well as their clients can manage the delivery and withdrawal of their collateral at the CCP more effectively.

  Moreover, on a technical level, DLT has the potential to streamline cross-border collateral transfers across different jurisdictions in a cost-efficient way (see section 2.3 below).

  This capability also significantly simplifies the management of collateral requirements for CCPs, allowing them to oversee the collateral positions of their clearing members more effectively.

  DLT also enables clearing members and their clients to meet their margin requirements in a timely manner and to reduce collateral transformation risks, which may have a positive impact on the clients' risk exposure towards their clearing members. In some instances, this may reduce the need for clearing members to pre-fund client-related margin and/or transfer risk for clients.

  By leveraging DLT, CCPs can achieve greater operational efficiency, improve liquidity management, and enhance their ability to manage collateral on a global scale. This contributes to a more secure and resilient financial ecosystem.

- **Instant settlement:** DLT facilitates near-instantaneous cross-border settlement of transactions, particularly where settlement infrastructures are not interoperable. In those instances, DLT

can significantly reduce the time and costs associated with traditional settlement processes. Settlement between markets with structural differences can take several days to conclude, incurring higher operational costs.

However, it is crucial to note that the benefits of near-instantaneous settlement are contingent upon the availability of the assets involved in the transaction. This requirement is consistent with traditional settlement processes, where the timely availability of assets is also a prerequisite for successful settlement. Therefore, while DLT offers substantial improvements in time and cost-effectiveness in cross-border settlement, the fundamental need for asset availability (i.e. pre-funding and liquid asset reserves) remains unchanged.

That said, a challenge the market is currently facing is how to achieve interoperability between various DLT market infrastructures and systems. While on a technical level the market is working on solutions to achieve such interoperability, several questions remain unanswered, e.g. the liability for data integrity.

2.2 Settlement processes

Instant settlement in a DLT environment requires all parties to have the necessary assets available at the time of the transaction. This leads to higher liquidity demands and operating costs, as pre-funding is necessary. In real-world scenarios, these factors can result in significantly higher expenses. The involvement of a CCP enables multilateral netting efficiencies which decrease liquidity requirements, increase settlement efficiency, and reduce costs.

Engaging with DLT has been instrumental in identifying where clearing and settlement efficiencies can be gained, and importantly, testing whether claims about the potential of these technological developments could be substantiated. By focusing on topics such as near-instantaneous settlement versus exposure netting, Eurex Clearing was able to draw valuable conclusions that contribute to the enhancement of the role of CCPs within a DLT ecosystem.

When the clearing of transactions takes place by using DLT, near-instantaneous settlement necessitates that all involved parties have the requisite assets (both cash and non-cash as applicable) available at the time of the transaction. This requirement imposes higher liquidity demands on clearing members and their end-clients that result in higher operating costs and liquidity constraints, as they must ensure the pre-funding of the transaction to facilitate the immediate settlement on a gross basis. This is particularly evident when compared to established netting processes, which allow for the offsetting of multiple transactions and reduce the overall volume of settlements. While this may not pose significant challenges in use cases and test environments, our experience indicates that, in real-life situations, the costs associated with this type of settlement process can lead to substantially increased expenses, even in centrally cleared scenarios.

In conclusion, while DLT offers significant potential for improving settlement processes, it is essential to carefully consider the implications of near-instantaneous settlement versus the benefits of multilateral netting effects offered by CCPs.

Eurex Clearing's engagement with DLT has highlighted the need for a balanced approach that leverages the benefits of both methods while mitigating their respective drawbacks. By implementing multiple settlement cycles a day, a CCP optimizes liquidity requirements of the clearing

members. This can reduce the costs associated with holding collateral and managing liquidity, ultimately resulting in lower overall transaction costs for market participants. By offering several settlement cycles per day, CCPs enhance their role within a DLT ecosystem, ensuring efficient, secure, and cost-effective settlement processes.

However, implementing multiple settlement cycles requires robust technological infrastructures capable of handling real-time processing and high transaction volumes. CCPs may offer additional benefits to clearing members by selecting DLT platforms that can handle near-instantaneous processing and high transaction volumes.

2.3 Collateral mobilization on DLT for margin purposes

As the risk of clearing members' portfolios changes throughout the day, margin requirements for the portfolio are adjusted regularly. This may lead to intra-day margin calls from the CCP for clearing members to deposit cash or securities or requests from clearing members to withdraw cash or securities from the CCP. Generally, an intra-day margin call must be fulfilled within a matter of an hour. Therefore, clearing members and their end-clients have a requirement for the financial resources and operational capabilities to transfer cash and/or securities at short notice.

The safekeeping of margin securities across multiple eligible collateral locations may pose operational challenges. This includes varying market practices for corporate actions, settlement cycles, and reporting as well as technology differences at the different locations. Manual processing of transfers is often time-consuming and prone to operational risk.

An example of how the transfer of securities for collateralization purposes can be made more efficient was demonstrated by Eurex Clearing in its engagement in market initiatives related to tokenization and DLT. In this example, Eurex Clearing, Clearstream, HQLAx and J.P. Morgan designed and tested a service that facilitates the posting of margin collateral by CCP members through the HQLAx digital ledger to Eurex Clearing's traditional collateral location, Clearstream Banking Luxembourg (CBL).

The service provides for the tokenization of a traditional security in a first step, which is managed through the HQLAx platform. The second step fosters the facilitation of the transfer of collateral from the custodian of choice of the relevant clearing member to CBL as an approved collateral location for Eurex Clearing. The nature of the collateral assets remains unchanged, ensuring compliance with existing CCP regulations. This service has received a regulatory non-objection and is expected to be launched in the second quarter of 2025.[2]

[2] Eurex Clearing does not participate in the HQLAx ledger, nor does it have any legal relationship with HQLAx.

2.4 Risk management

The dynamics of counterparty credit risks remained unchanged in pilots testing the integration of a DLT environment. The methods for managing counterparty credit risk, such as collateral requirements and credit assessments, remain applicable. DLT does not alter the need for those risk management processes.

When exploring the potential of new technologies like DLT, it is important to evaluate the risk methodologies and risk models that CCPs have in place. Eurex Clearing's participation in the ECB exploratory work in 2024 revealed that the technology does not change the fundamental types of risks that CCPs manage, such as counterparty credit risk, liquidity risk, and market risk. However, certain types of risks such as cybersecurity risks, may become more prevalent in a DLT environment.

Counterparty credit risk is inherent in any financial transaction, regardless of the underlying technology used to facilitate the transaction. The dynamics of counterparty credit risk were proven to remain unchanged in a DLT environment. The risk is tied to the financial health and creditworthiness of the counterparty, not to the technology used to record or settle the transaction. The methods for managing counterparty credit risk, such as collateral requirements and credit assessments, remain applicable. DLT does not alter the need for those risk management processes.

The EMIR regulatory framework for the CCP's management of counterparty credit risk is not specific to a particular technology and therefore applies equally to traditional and DLT-based transactions.

The use of DLT did not change the fundamental nature of liquidity risk, as it is tied to the liquidity management capability of the CCP and its clearing members and their clients. Regulatory requirements on liquidity management apply equally to traditional and DLT-based transactions.

Market risk is inherent in the financial markets and is driven by external economic factors, not by the technology used to facilitate transactions. Moreover, certain types of operational risks like cybersecurity risks – although present in both traditional and DLT environments – may become more prevalent in a DLT environment.

In conclusion, the role of a CCP in a DLT environment from a risk management perspective remains fundamentally consistent with its role in traditional financial systems.

"Our experiences demonstrate that the participation of a CCP in a decentralized ecosystem enhances market stability by employing consistent risk management practices and serving as the "golden source". Eurex Clearing will continue to engage with both the market and regulators – fostering market integrity while enabling the adoption of transformative technologies.



Dr. Efthimia Kefalea
Director, Collateral & Repo Clearing Design, Eurex Clearing

2.5 Payment infrastructure on DLT

Payment solutions available for the ECB exploratory work proved to be robust and were successfully integrated into digital environments by Eurex Clearing, showcasing the CCP's ability to incorporate these solutions in the clearing processes.

The need for fast, secure, and risk-free payment for wholesale transactions is acknowledged by central banks aiming to introduce tokenized wholesale Central Bank Digital Currency (wCBDC). Here, the respective central banks act as the issuer and are held liable for the redemption in central bank money.

During the ECB exploratory work, Eurex Clearing engaged with the technical solutions provided by two European national banks, namely (i) Trigger Solution by Deutsche Bundesbank, and (ii) full DLT Interoperability Solution by Banque de France. Both proved to be robust and were successfully integrated into digital environments by Eurex Clearing, showcasing the CCP´s ability to incorporate these solutions in the clearing processes.

It became obvious that the implementation of a digital form of central bank money is a logical and strategic step towards advancing the digital transformation of the financial industry. By fostering innovation, and supporting effective monetary policy, wCBDCs can play a crucial role in shaping the future financial ecosystem. As central banks and financial institutions continue to develop and explore CBDCs respectively, their potential to transform the financial landscape becomes increasingly evident.

Establishing a "Eurosystem Digital Framework (EDF)" is an essential next step that would allow for more innovation and more market participants to build their use cases and establish a successful digital infrastructure in the European Union. The EDF should harmonize private DLT-platforms under a public ecosystem of the Eurosystem, with common rules and standards between the key stakeholders – ECB, national banks, DLT operators, financial market infrastructures, and market participants.

2.6 Operational insights

Clearing of native digital assets

Clearing of native digital assets adheres to the same operational procedures as those used for traditional assets. CCPs acting as the bridge between traditional, centralized finance (CeFi) and decentralized finance (DeFi) ecosystems demonstrated the immediate viability of existing legal and operational frameworks.

Eurex Clearing's active participation in DLT initiatives has provided valuable insights into the clearing processes for native digital assets. During the ECB exploratory work, there were use cases on repos and margining, involving clearing houses such as CBOE Clear Europe and Eurex Clearing.

CCPs acting as the bridge between traditional, centralized finance (CeFi), and decentralized finance (DeFi) ecosystems demonstrated the immediate viability of existing legal and operational frameworks.

One of the significant findings from these initiatives is that the clearing of native digital assets can adhere to the same operational procedures as those used for traditional assets. In particular, clearing can cope with traditional and digital assets seamlessly – flowing into the same margining and reporting processes.

This outcome underscores the robustness and adaptability of existing clearing frameworks, ensuring that they remain effective even as new technologies are integrated into financial market infrastructures.

Integration and standardization

CCPs are uniquely positioned to facilitate the use of traditional and DLT-based financial systems, allowing market participants to adopt DLT at their preferred pace.

As the financial industry evolves with the adoption of DLT, CCPs are uniquely positioned to facilitate the seamless integration between traditional financial systems and DLT ecosystems. This integration is essential for leveraging the benefits of DLT while maintaining the robustness and reliability of existing financial infrastructures. Eurex Clearing's participation in DLT initiatives has highlighted the critical importance of a seamless integration in achieving a cohesive financial ecosystem. CCPs can facilitate the use of traditional and DLT-based financial systems, allowing market participants to adopt DLT at their preferred pace.

This approach facilitates a smooth transition to a fully digitized ecosystem without disrupting existing operations.

In addition, CCPs facilitate standardization of protocols between different DLT and traditional systems. In this way, they mitigate risks associated with fragmented systems and ensure smooth integration with existing infrastructures.

Regarding integration and standardization, the following table provides an overview of conclusions:

Area	Conclusions
Resilience of CCPs	– CCPs' clearing processes and risk methodology are effective in both traditional and DLT-based environments. – Reinforces the importance of CCPs in maintaining stability
Technological integration	– Seamless integration of existing clearing processes with DLT – Adaptability to new technological frameworks
Risk management	– Technology does not influence the types of risks managed by CCPs. – Cybersecurity risks become more critical in a DLT environment.
Tokenization	– No change in the underlying economics of the financial assets – Current regulations for CCPs apply equally to all technologies.
Operational insights	– Clearing of native digital assets adheres to the same procedures as traditional assets. – Importance of integration between DLT platforms and traditional finance. – Standardization of protocols can mitigate risks associated with fragmented systems.

3 Delivery reliability and (legal) settlement finality

Delivery reliability is achieved by the CCP interposing itself between two market participants. This is a fundamental mechanism through which CCPs mitigate counterparty risk.

In addition to the availability of assets set out in paragraph 2.1 above, delivery reliability and settlement finality need to be assessed in connection with DLT-based securities.

There are several benefits in involving a CCP in the delivery of securities, each of which enhances the efficiency and stability of financial markets. One of those benefits for clearing members is that a CCP ensures that securities are available for delivery thereby materially reducing settlement fails which are common in bilateral, non-centrally cleared transactions. **Delivery reliability**, in particular, is achieved by the CCP interposing itself between two market participants. When a trade is executed between two market participants on a trading venue that is connected to a CCP, the CCP legally becomes the counterparty to both sides of the trade. If the transfer or clearing member defaults (i.e., fails to meet its obligations), the CCP is still required to fulfil its respective delivery obligation to the non-defaulting clearing member. This means that the non-defaulting clearing member is not exposed to the defaulting clearing member's risk, thereby ensuring that the relevant transaction (e.g., a repo) completes smoothly. The concept of interposing itself between two market participants is a fundamental mechanism through which CCPs mitigate counterparty risk.

As part of the ECB exploratory work, Eurex Clearing successfully demonstrated that the same benefit, i.e., delivery reliability, can be applied to DLT-based securities, such as electronic securities issued under the German Electronic Securities Act (eWpG). The subject of the test was a native digital commercial paper, issued on Clearstream's D7 platform by ABN AMRO Bank N.V., traded on the Eurex Repo F7 platform and cleared by Eurex Clearing. In addition to delivery reliability, the settlement finality provisions of the clearing conditions of Eurex Clearing applied. The obligation to transfer the commercial paper became irrevocable on the CCP level as of the time of the matching of the respective orders on the Eurex Repo F7 platform.

The concept of **legal settlement finality** is distinct from, but connected to, the concept of delivery reliability. Delivery reliability is about ensuring that securities are available for delivery to the buyer on the effective settlement date. Legal settlement finality, broadly speaking, refers to the legal enforceability and irrevocability of so-called transfer orders which mark the initiation of the transfer of the securities.

In connection with the use of DLT-based securities in a clearing context, the question whether legal settlement finality applies must be assessed on a case-by-case basis taking into account the type of DLT-based securities and their legal nature, the actual custody chain and whether or not netting effects apply. Furthermore, the assessment of settlement finality in connection with DLT-based securities also depends on the technical set-up of the system operator and in particular the underlying technology used for the transfer of the securities (permissioned vs. permissionless blockchains).

4 Regulatory and compliance considerations

A CCP may only accept assets as collateral that meet the specific requirements set out in EMIR and the related regulatory technical standards (RTS). As an underlying principle, a CCP may only accept collateral that is highly liquid.

Assets can be regarded as being highly liquid if they fall within the scope of being either transferable securities, money market instruments or other financial instruments. In each case those instruments must meet additional requirements set out in the RTS.

While some of those requirements do not depend on whether the transferable security, money market instrument or other financial instrument is issued using DLT, e.g., low credit risk of the issuer or low market risk and could therefore generally be satisfied by a DLT-based security, some other requirements may prove more difficult. For example, there is currently no active outright sale or repo market with a diverse group of buyers and sellers with respect to certain DLT-based securities such as crypto securities ("*Kryptowertpapiere*") issued under the eWpG. Accordingly, such instruments currently do not meet the regulatory threshold for margin assets acceptable as collateral by a CCP.

Given the importance of collateral management in connection with the clearing of financial products through a CCP and the possibility that market participants may wish to use as collateral certain types of DLT-based securities which are not deposited with a CSD such as *Kryptowertpapiere*, clarification is required whether or not such securities satisfy the requirements of Article 47(3) EMIR.

"CCPs, as pillars of trust in the financial sector, will continue to play an integral role as FMIs. Through some focused legal regulatory refinements, they can effectively harness the transformative capabilities of DLT, thereby enhancing both efficiency and resilience in the financial sector.



Sebastian Dey
Head of Digital Assets, Linklaters Germany

5 Conclusion

The integration of DLT into the operations of CCPs marks a significant evolution in the financial markets. Eurex Clearing's participation in DLT initiatives like the ECB exploratory work and the Agorá project of the Bank for International Settlements provided valuable insights into how CCPs can adapt in this new technological landscape. The role of CCPs was proven to be important in seamlessly integrating transactions from both DeFi and CeFi environments by applying the same clearing and risk management practices. The fundamental types of risks remain unchanged and were proven to be independent of the underlying technologies. In addition, the learnings underlined the importance of standardization a CCP brings to ensure a smooth integration and interoperability between traditional and DLT-based systems.

The transition to DLT requires a collaborative approach with regulators to develop a comprehensive framework that supports the integration of DLT while ensuring compliance with existing regulations. Eurex Clearing's collaboration with regulators for DLT-supported collateral mobilization demonstrates the importance of regulatory engagement.

In conclusion, the integration of DLT with CCPs presents a transformative opportunity for the financial markets. Eurex Clearing's experiences provide valuable insights into how CCPs can enhance their efficiency, improve risk management, and contribute to a more resilient and secure financial ecosystem. The journey towards a fully digital financial ecosystem will require continued collaboration, innovation, and strategic planning, with CCPs continuing to play an important role in maintaining stability in the financial markets.

6 Appendix A: DLT and its impact on financial markets

6.1 Overview of DLT

DLT means a replication of data in nodes, interconnected and validated amongst the peer participants. A consensus mechanism ensures that the data stored is unified across all running network participants in a so-called ledger. Any deviation, e.g., by fraudulent activity or operational disturbance, is detected and corrected. Cryptographic means ensure practical robustness and create trust out of potentially trustless participants. The nature of DLT is characterized by the unified view of all participants on the same data.

DLT is the overarching classification whilst blockchains in a narrower sense of the word describe public ledgers with permissionless access and public storage of the data. The first blockchain was introduced in a paper in 2008 by pseudonymous Satoshi Nakamoto: "Bitcoin: A Peer-to-Peer Electronic Cash System"[3].

Further evolution is characterized in three dimensions: accessibility (public, private), writability (permissionless, permissioned), and the consensus mechanism (e.g. Proof of Work, Proof of Stake, Proof of Authority). In addition, the programmability by so-called smart contracts complements the versatility of the use of DLT by executing small scripts with business logic. The most common protocol using smart contracts is Ethereum. This might be used in public as well as in private networks with restricted reading access and privileged writing of new data.

Smart contracts might be used to model digital assets in any form combined with certain rules to process, transfer ownership, and interact to conditions of the world outside of the network by using so-called oracles.

Distributed Apps (dApps) may use smart contracts and the benefit of built-in integrity of DLTs to fulfill a purpose even outside of the developer's control in a network. Even Digital Autonomous Organizations (DAO) are possible to model publicly transparent rules supervised by a community without any central control or possibility to influence it other than in consent with the community. This is currently seen as the highest degree of complexity and implementation of peer-to-peer principles introduced by Satoshi Nakamoto.

6.2 Key features of DLT

Decentralization: By the original design of peer-to-peer DLTs, there is no need for a central authority to state the truth and integrity of data. Central structures were replaced by cryptographic principles and consensus algorithms.

Immutability: Usually, data stored in a (public) ledger is considered immutable as any ex-post change to data can be easily detected as a breach of the chaining, the linking of a predecessor block to the successor in a hash, some kind of checksum signed cryptographically. Any fraudster would need the consent of all subsequent writers to the ledger signing any change of preceding blocks. This is practically impossible for larger networks except in case of consent of >50% of the peers (by number or stake). These changes are called fork as the chain is forking into a new branch with documented consent of the network's

[3] See also https://bitcoin.org/bitcoin.pdf

majority. This is mainly used to incorporate evolutionary developments to the network's protocol. A prominent example is the change of public Ethereum from Proof of Work to Proof of Stake consensus mechanism in 2022 (The Merge) which resulted in an efficiency gain by energy consumption in a magnitude of 99.9% of energy saved.

Transparency: Especially public ledgers are transparent as everyone can see any content of a new data item added to the blockchain. This can be restricted in private networks or by cryptographic means. This transparency has potential for operational efficiency as reconciliation between various participants data is protocol imminent.

Security: Due to cryptographic principles applied and its distributed nature, the level of security and robustness against fraudulent modification or data loss is very high. This feature is also a burden when it comes to unintended disclosure or deletion because of enforced data protection rights.

Programmability: Smart contracts as scripts with business logic might implement a certain behavior of data processing on the ledger. Conditional transfer of ownership of digital representation of assets or even cash can be achieved in so-called atomic transactions where all legs of a multi-leg transaction are executed or no single leg at all. This is particularly important for exchanging assets against payment to ensure that any party delivers its obligation if, and only if, all other obligations are fulfilled. A high potential for automation of processes with DLT is offered. Please note, that atomicity does not mean instant execution, as it only refers to consistent end states and avoids any transactions being processed incompletely.

7 Appendix B: Central Counterparty (CCP)

In its paper "The Value Proposition of Central Counterparty Clearing Houses" from September 2010[4], CCPGlobal, the Global Association of Central Counterparties, (previously known as CCP12) gives an overview of the services and benefits of a CCP.

A CCP is a financial market infrastructure that interposes itself between buyers and sellers in financial markets and becomes the buyer to every seller and the seller to every buyer, effectively guaranteeing the terms of the trade.

7.1 Services provided by a CCP

1. **Clearing and settlement:** The primary service of a CCP is to clear and settle trades. This involves the confirmation, matching, and netting of trades, followed by the actual transfer of funds and securities. The CCP ensures that all trades are settled efficiently and accurately.
2. **Risk management:** CCPs manage counterparty credit risk by requiring participants to post collateral (margin) and by maintaining a default fund. This helps to protect the financial system from the impact of a participant's default.

[4] CCP12_Value_of_CCPs.doc

3. **Trade novation:** In the process of novation, the CCP replaces the original trade between two parties with two new trades: one between the CCP and the buyer, and another between the CCP and the seller. This ensures that the CCP is the central counterparty to all trades.

4. **Collateral management:** CCPs manage the collateral posted by participants, ensuring that it is sufficient to cover potential losses. This includes the valuation, optimization, and transformation of collateral.

5. **Default management:** In the event of a participant's default, the CCP has procedures in place to manage the situation, including the use of the default fund and the auctioning of the defaulting participant's positions.

7.2 Benefits of a CCP

1. **Risk mitigation:** A CCP reduces the counterparty risk by stepping in and becoming the buyer to every seller and the seller to every buyer. This ensures that the failure of one party does not lead to a cascading effect on the entire market. In fact, the risk of one party defaulting on its obligations is mitigated, as the CCP guarantees the fulfillment of obligations for the trade.

2. **Default management:** A CCP manages defaults effectively through established procedures and collateral requirements though a waterfall approach. This minimizes the impact of a default on the broader financial system.

3. **Market stability:** A CCP enhances market stability through centralized clearing and settlement processes. By managing and mitigating risks, a CCP helps to maintain orderly markets even during periods of high volatility and is resilient also during stressed market conditions. The likelihood of systemic failures is reduced, and confidence of market participants is increased.

4. **Operational efficiency:** The use of a CCP streamlines trading operations and reduces the need for bilateral agreements by defined rules & regulations which are binding for each participant. Centralized processes support reducing redundancies (e.g., no manual reconciliation) and speeding up transaction times. This will lead to lower operational cost and fewer processing errors.

5. **Transparency:** A CCP improves transparency by providing clear and consistent information on trades, positions, and associated risks. This allows market participants to make informed decisions based on reliable data available for all participants.

6. **Cost reduction:** A CCP lowers transaction costs through multilateral netting and centralized processes. By aggregating trades, a CCP can significantly reduce the number of transactions that need to be settled. The capital that participants need to hold against their exposure can be reduced, so that such freed-up capital can be used otherwise.

7. **Regulatory compliance:** A CCP ensures compliance with regulatory requirements and international standards and reduces systemic risk by applying robust risk management procedures. CCPs work closely with regulators to adhere to stringent financial regulations and oversight.

In summary, central counterparties play a crucial role in the financial markets by providing essential clearing and settlement services, managing risk, and enhancing market stability and efficiency. Their presence ensures that trades are executed smoothly and securely, benefiting all market participants.

8 Glossary

Central bank money
Money issued by a central bank, including physical currency (banknotes and coins) and digital balances held by commercial banks at the central bank.

CBDC
Central Bank Digital Currency, a digital form of fiat currency

Central Counterparty (CCP)
A financial market infrastructure that acts as an intermediary between buyers and sellers in financial markets, reducing counterparty credit risk by guaranteeing the terms of a trade.

Central finance (CeFi)
Traditional financial systems and institutions where financial transactions are managed by centralized entities like banks and exchanges.

Central Security Depository (CSD)
An institution that holds securities in electronic form, facilitating the transfer and settlement of securities transactions as an operator of a securities settlement system as defined in Article 2(1), point (1), of Regulation (EU) No 909/2014.

Clearing
The process of establishing positions, including the calculation of net obligations, and ensuring that financial instruments, cash, or both, are available to secure the exposures arising from those positions for the parties involved in a financial transaction before settlement.

Clearing member
An undertaking that participates in a CCP which is responsible for discharging the financial obligations arising from that participation, often acting on behalf of clients.

Clearstream Banking Luxembourg (CBL)
A major international central securities depository (ICSD) that provides post-trade infrastructure and securities services.

Collateral
Assets pledged by a market participant to secure a risk, which can be utilized for liquidation by the counterparty if the market participant defaults.

Commercial bank money
Money created by commercial banks through lending activities, typically in the form of deposits.

Counterparty credit risk
The risk that a counterparty to a transaction may not fulfill its obligations by defaulting before the final settlement of the transaction's cash flows.

Decentralized finance (DeFi)
Financial systems and services that operate on blockchain technology, allowing for peer-to-peer transactions.

Distributed Ledger Technology (DLT)
A digital system for recording the transaction of assets in which the transactions and their details are recorded in multiple places at the same time.

DLT-based securities
Security that is issued, recorded, transferred, and stored using distributed ledger technology.

European Central Bank (ECB)
The central bank for the eurozone, responsible for monetary policy and maintaining price stability within the Euro area.

European Market Infrastructure Regulation (EMIR)
The European Market Infrastructure Regulation (EU) 648/2012 (EMIR) lays down rules on over-the-counter (OTC) derivatives, central counterparties (CCPs) and trade repositories. It aims to increase transparency in the OTC derivatives market, mitigate credit risk, and reduce operational risk for financial stability.

eWpG
German Electronic Securities Act

Fiat currency
Government-issued currency as legal tender that is not backed by a physical commodity but rather by the government and the central bank.

Full DLT interoperability
Banque de France's solution for tokenized wCBDC used in the ECB exploratory work.

HQLAx
A financial technology firm that provides a platform for the exchange of high-quality liquid assets (HQLA) using distributed ledger technology.

Ledger
A record-keeping system that tracks financial transactions, traditionally in a book or electronically in a database.

Margin
The collateral collected from a clearing member as primary line of defense for a CCP to limit its credit exposures.

Netting
The process of offsetting the value of multiple positions or payments due to be exchanged between parties, resulting in a single net obligation to be settled.

Off-setting
The practice of netting amounts in opposite directions related to risk, securities, or derivatives.

Pre-funding
The practice of depositing funds in advance to ensure that there are sufficient funds available to settle a transaction.

Repo
Short for repurchase agreement; financial transactions where one party sells securities to another party with an agreement to repurchase them at a later date for a predetermined price.

RTS
Regulatory Technical Standards - ESMA Commission Delegated Regulation 153/2013 supplementing EMIR

Settlement
The process of transferring ownership of securities and corresponding funds between parties after a trade has been executed.

Settlement finality
The status at which a transaction is irrevocable and unconditional and legally binding, ensuring that the transfer of funds or securities is complete.

Token
A digital representation of an asset or utility on a blockchain, which can be used for various purposes, including transactions and access to services.

Tokenization
The process of converting rights to an asset into a digital token on a blockchain.

Trigger solution
Deutsche Bundesbank's solution for payment resulting out of DLT settlement used in the ECB exploratory work.

Wholesale central bank digital currency (wCBDC)
Central Bank Digital Currency, a digital form of fiat currency for use by financial institutions and intermediaries, rather than the general public (retail).

About Eurex Clearing

As one of the leading central counterparties globally, Eurex Clearing builds trusted relationships with and amongst market participants, paving their way for efficient risk management via unique clearing models.

By doing so, we assure the safety and integrity of markets while setting standards globally in risk management. By clearing the broadest scope of products under a single framework in Europe – both listed products and OTC across derivatives and securities finance – and accepting the world's widest spectrum of eligible collateral, we deliver unparalleled efficiencies to our clients.

About Linklaters

Linklaters is one of the world's leading law firms. We are a high-performing, diverse team of exceptional, talented and highly motivated individuals who handle the biggest and most transformational mandates for the world's leading corporates, banks and financial sponsors.

Contacts

EUREX CLEARING AG

Jens Janka
Chief Operating Officer
T +49-69-211-1 48 92
jens.janka@eurex.com

Dr. Efthimia Kefalea
Director, Collateral & Repo Clearing Design
T +49-69-211-1 72 75
efthimia.kefalea@eurex.com

LINKLATERS

Dr. Burkhard Rinne
Partner Capital Markets
T +49-69-710 035 14
burkhard.rinne@linklaters.com

Sebastian Dey
Counsel Capital Markets, Head of Digital Assets Germany
T +49-69-710 032 95
sebastian.dey@linklaters.com

Dr. Stefan Gohling
Managing Associate Capital Markets
T +49-30-214 961 22
stefan.gohling@linklaters.com

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Germany

www.eurex.com

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