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GLOBAL FINANCE & TECHNOLOGY NETWORK

Programmable compliance

The future of integrating policy and regulation into tokenized assets and money.

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Contents

Executive Summary

In late 2024, the Bank for International Settlements (BIS) and central bank partners concluded an experimental project, Project Mandala, which aimed to show that regulatory compliance can be embedded within cross-border payments. In particular, the project demonstrated that programmable compliance can be incorporated into cross-border payments, reducing costs and increasing transaction speed while automating compliance procedures.

At the GFTN Insights Forum, the BIS Innovation Hub hosted a roundtable on programmable compliance. The roundtable convened experts from the public and private sectors and academia to discuss existing challenges related to cross-border payments compliance and the potential of programmable compliance for streamlining cross-border financial transactions.

Key areas of discussion included existing challenges for compliance issues, the role of privacy-enhancing technologies and smart contracts in the automation of compliance processes, and the need for collaboration across sectors to address evolving regulatory demands.

Key insights highlighted the need for programmable compliance solutions that are adaptable, interoperable, and privacy preserving as well as the need for knowledge exchange between stakeholders.

Introduction

Regulatory requirements for cross-border transactions are important but present challenges for the financial sector players, particularly as technological innovation and regulatory standards evolve rapidly.

At this roundtable, an interdisciplinary group of stakeholders, including representatives from central banks, financial institutions, technology firms, and regulatory bodies, gathered to discuss the transformative potential of programmable compliance in enhancing regulatory compliance while protecting privacy.

The roundtable explored how programmable compliance-automating regulatory compliance checks within financial transactions using innovative solutions such as smart contracts and privacy enhancing technologies (PETs)-could help alleviate the complexities of disparate regulatory frameworks.

The discussions centred on the challenges of disparate regulations across jurisdictions, the need for interoperable compliance solutions, and practical approaches to integrating PETs into cross-border transactions.

The roundtable participants drew insights from experimentations such as Project Mandala developed by Bank for International Settlements Innovation Hub (BISIH) together with the central bank project partners Reserve Bank of Australia, Bank Negara Malaysia, Bank of Korea, and Monetary Authority of Singapore.

They explored the possibilities and limitations of programmable compliance. These insights contribute to a broader conversation on creating compliance systems that are efficient, secure, and adaptable to the needs of an increasingly digital global economy.

Discussion Insights

Challenges in Cross-Border Compliance

Regulatory Complexity

The discussion highlighted the challenges posed by layered and fragmented regulatory frameworks. This "layered cake" of regulations spans international standards, national laws, and institutional policies, resulting in a complex compliance landscape that can hinder transaction efficiency.

Geopolitical shifts and the resulting increase in sanctions and AML/CFT measures further complicate the regulatory environment. Participants underscored the need for a cohesive approach to managing these multi-layered regulatory demands.

Interoperability Gaps

Another critical challenge discussed was the lack of interoperability among compliance systems, both within and across institutions. Current compliance processes are often fragmented and limited to individual transaction checks, which restrict the seamless flow of compliance data across the entire transaction chain. This siloed approach hinders comprehensive compliance and increases operational burden on financial institutions engaged in cross-border activities.

Data Privacy Constraints

Data privacy regulations impose strict limitations on information sharing, even within the same jurisdiction. These constraints can increase difficulties with compliance in cross-border transactions, as institutions must balance the need for transparency with privacy obligations.

Participants discussed the importance of tapping on privacy-enhancing technologies to enable safe data sharing without compromising sensitive information.

Technological Innovations in Programmable Compliance

Smart Contracts for Compliance

Programmable compliance leverages smart contracts to embed regulatory checks directly into transaction processes. By automating compliance, institutions can reduce manual intervention, improve transaction speed, and minimize errors.

In Project Mandala, smart contracts were used to verify sanctions screening and capital flow management checks in real-time, highlighting how programmable compliance can efficiently support regulatory adherence within transactions.

Privacy-Enhancing Technologies (PETs)

Privacy-enhancing technologies (PETs), such as multi-party computation (MPC) and zero-knowledge proofs, were identified as essential tools for balancing regulatory compliance with data privacy.

PETs allow compliance checks to be conducted without revealing sensitive data, thus facilitating cross-border information sharing while upholding strict privacy standards. This technology helps mitigate the risks associated with data exposure in compliance processes.

On-Chain and Off-Chain Integration

For practical implementation, not all compliance checks can be conducted on-chain due to privacy and data computational intensity concerns.

Participants suggested integrating on-chain and off-chain processes, allowing intensive compliance checks to be performed off-chain, with attestations or proofs recorded and verified on-chain. This hybrid approach preserves the efficiency and transparency of blockchain transactions while supporting comprehensive compliance checks.

Data Quality and Standardisation

Standard Identifiers (LEIs)

The roundtable emphasized the importance of standardized unique identifiers, like Legal Entity Identifiers (LEIs), for enhancing the accuracy of compliance checks.

LEIs provide unique identification across jurisdictions, reducing false positives and improving data matching. Adoption of such identifiers could improve data quality and standardisation.

Standardised Data Formats

Inconsistent data standards and inaccurate information often hinder compliance efforts. To address these challenges, participants highlighted the need for data quality improvement and standardisation across institutions. Establishing standardised data formats can improve interoperability and reduce the risk of errors, especially in sanctions screening and other sensitive compliance areas.

Collaboration and Ecosystem Development

Cross-Disciplinary Engagement

Effective programmable compliance requires the collaboration of regulators, technologists, industry practitioners, and legal experts. Cross-disciplinary engagement helps ensure that compliance solutions are both technically feasible and aligned with regulatory requirements. Participants emphasised the value of open communication and shared knowledge to accelerate innovation and develop practical solutions for complex compliance needs.

Capacity Building and Inclusivity

For programmable compliance to achieve global adoption, solutions must be scalable and accessible, particularly for smaller financial institutions and emerging markets. Participants recommended building inclusive ecosystems that support compliance efforts across diverse economic contexts, helping to bridge the gap between advanced economies and developing regions.

Policy and Governance Frameworks

Clear governance frameworks are essential for guiding the development of programmable compliance systems.

Participants stressed the need for policies that address data ownership, access rights, and accountability, which are critical for maintaining trust among stakeholders. Inclusive governance models also ensure that control is not overly centralized, allowing a fair representation of interests across sectors.

Balancing Compliance with Data Privacy

Privacy-Preserving Compliance Techniques

Advanced cryptographic methods enable institutions to perform compliance checks without disclosing sensitive information, a key consideration in balancing compliance with privacy.

Techniques like secure multi-party computation allow multiple parties to jointly verify compliance while keeping data private. This approach addresses the privacy challenges traditionally associated with compliance processes.

Regulatory Support for Privacy-Enhancing Technologies

The roundtable highlighted the need for regulatory frameworks to evolve alongside technological advancements. Regulators are encouraged to support PETs within compliance frameworks, enabling institutions to adhere to regulations without compromising privacy. By providing clear guidelines, regulators can facilitate the adoption of PETs in compliance processes.

Case Studies and Experimental Implementations

Project Mandala

Project Mandala, an experimental proof of concept (PoC) developed by the BIS Innovation Hub (BISIH) together with central bank project partners explored programmable compliance in cross-border financial transactions.

This PoC embeds regulatory compliance checks directly into transaction protocols through smart contracts and PETs, illustrating how automated compliance could streamline cross-border transactions. Although not yet deployed in real-world settings, Mandala offers valuable insights into the technical feasibility and regulatory considerations of programmable compliance.

Additional Experimental Applications

Participants discussed other experimental use cases that showcase the potential of programmable compliance. These included blockchain-based payment systems designed to integrate compliance checks and the use of verifiable credentials to streamline real-time transaction settlement. These PoCs illustrate the feasibility and limitations of programmable compliance, providing a foundation for understanding its application in real-world scenarios.

Conclusion

The roundtable revealed significant potential for enhancing cross-border compliance through technological innovation and collaboration. While programmable compliance offers opportunities for greater efficiency, scalability, and privacy, it will also have to reckon with challenges in data quality, interoperability, and regulatory alignment.

By embedding compliance checks into transaction processes, leveraging privacy-enhancing technologies, and fostering collaboration, programmable compliance can help establish a more resilient and inclusive global financial system. Through careful integration with regulatory frameworks and ongoing dialogue among stakeholders, programmable compliance solutions can play a pivotal role in the evolution of financial compliance.

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