Blockchain-Based Vendor Onboarding and Sanction Screening System for SAP Procurement Modules

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***Abstract*---**Traditional vendor onboarding processes within enterprise procurement ecosystems often suffer from delays, inconsistencies, and compliance vulnerabilities due to manual documentation checks, fragmented KYC procedures, and siloed AML screening workflows. These inefficiencies increase operational overheads and expose organizations to regulatory risks, especially when integrating with enterprise resource planning (ERP) systems such as SAP Materials Management (MM). This paper proposes a blockchain-enabled vendor onboarding framework that automates credential validation, enhances transparency, and ensures immutability of compliance events. Smart contracts are utilized to authenticate identity attributes, enforce onboarding policies, and execute automated sanction screening by interfacing with global watchlists. The architecture enables seamless synchronization with SAP MM modules for vendor creation, approval workflows, and procurement-related data flows. Furthermore, the decentralized ledger ensures tamper-proof storage of vendor risk profiles, audit logs, and KYC artifacts, reducing dependency on centralized repositories. Experimental validation highlights improvements in onboarding speed, reduction in redundant verification cycles, and enhanced traceability for AML/KYC compliance. The proposed model demonstrates how blockchain, coupled with SAP MM integration, can streamline compliance-driven procurement processes and minimize fraud, enhancing trust and security in enterprise supply chains.

***Keywords*---**Vendor onboarding, SAP MM integration, Blockchain KYC, AML compliance, Smart contract automation, Sanction screening, Procurement security, Decentralized identity.

I. INTRODUCTION

Vendor onboarding is a critical component of enterprise procurement operations, enabling organizations to evaluate, register, and approve external suppliers. However, conventional onboarding methods often rely heavily on manual documentation checks, repeated communication cycles, and siloed validations performed across disparate departments. These fragmented processes lead to substantial delays, inconsistencies, and operational inefficiencies, particularly within large organizations using ERP systems such as SAP Materials Management (MM).

In addition to operational challenges, regulatory compliance adds an additional layer of complexity to onboarding workflows. Enterprises must adhere to strict Know Your Customer (KYC) and Anti-Money Laundering (AML) policies to verify supplier identities and ensure that vendors are not associated with sanctioned entities. Manual compliance checks increase the risk of oversight and human error, potentially exposing organizations to legal and financial penalties. The lack of centralized verification records further complicates audit readiness and compliance tracking.

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Emerging digital technologies offer opportunities to overcome these inefficiencies. Blockchain stands out as a transformative solution due to its decentralized structure, tamper-proof recordkeeping, and smart contract capabilities. By leveraging distributed ledgers, enterprises can ensure immutable storage of onboarding events, real-time verification of identity attributes, and automated execution of compliance rules. These capabilities significantly reduce the reliance on manual interventions and promote trusted data sharing among stakeholders.

Integrating blockchain with existing procurement systems such as SAP MM presents a novel approach to streamlining vendor onboarding. The combination of smart contract-based automation, decentralized identity management, and automated sanction screening enhances procurement transparency while improving compliance adherence. This paper presents a blockchain-driven onboarding architecture designed to accelerate vendor approval cycles, strengthen risk management practices, and enhance the overall security posture of enterprise procurement processes.

II. LITERATURE REVIEW

Existing studies have explored blockchain as a catalyst for enhancing transparency, immutability, and trust in supply chain and procurement ecosystems. Research indicates that decentralized ledgers can significantly reduce documentation fraud and improve traceability of transactional workflows. In the domain of identity verification, blockchain-based KYC frameworks have been shown to streamline credential validation and enable secure data sharing across institutions, reducing the redundancy inherent in repeated verification cycles.

Another significant research area focuses on integrating smart contracts to automate compliance-driven processes. Studies highlight how programmable contracts can enforce regulatory policies, execute real-time validations, and maintain immutable audit logs. In procurement ecosystems, AML and sanction screening remain critical to risk mitigation, and recent works have emphasized the potential of blockchain systems to interface with external regulatory databases to detect high-risk vendors more effectively.

Additionally, literature related to SAP MM integration demonstrates how emerging technologies can complement ERP functionalities to enhance supplier management. Blockchain interoperability with ERP modules offers benefits such as trusted vendor data synchronization, automated approval workflows, and real-time compliance updates. These advancements underscore the potential of a blockchain-powered vendor onboarding architecture to address inefficiencies in conventional procurement processes.

III. METHODOLOGY

A. Blockchain Architecture Design

The proposed methodology begins with defining a permissioned blockchain network comprising procurement officers, compliance units, vendors, and system administrators as participating nodes. A Hyperledger Fabric–based architecture is selected for its modularity, role-based access controls, and private data channels suitable for enterprise environments. The blockchain stores core identity attributes, onboarding events, compliance logs, and vendor risk indicators. Smart contracts written in chaincode govern the registration workflow, attribute validation, and rule-based checks. The architecture integrates decentralized identifiers (DIDs) and verifiable credentials to

ensure secure identity provisioning. Shared ledgers provide tamper-proof auditability, while off-chain storage handles encrypted documents to optimize performance. The system ensures that only authenticated users can append onboarding events, while immutable logs prevent unauthorized alterations. This secure, modular, and scalable framework forms the foundation for end-to-end automation of vendor verification and sanction screening.

B. SAP MM Integration Workflow

Integration with SAP Materials Management is achieved through SAP BTP (Business Technology Platform) APIs and OData services that connect the blockchain layer with vendor master data modules. When a vendor submits onboarding documents, blockchain smart contracts validate the credentials and automatically update the onboarding status. Upon approval, the validated vendor profile is pushed into SAP MM for vendor creation using the SAP Vendor Master (XK01/MM01) APIs. Compliance officers can initiate or review AML/KYC checks directly from SAP's Fiori applications, with blockchain simultaneously logging each event. Bidirectional synchronization ensures that updates made in SAP MM—such as purchasing group assignment, material categories, or risk assessment flags—are reflected in the blockchain ledger Figure 1. This hybrid, interconnected workflow reduces redundancy, eliminates manual verifications, and ensures that procurement data remains consistent across systems.

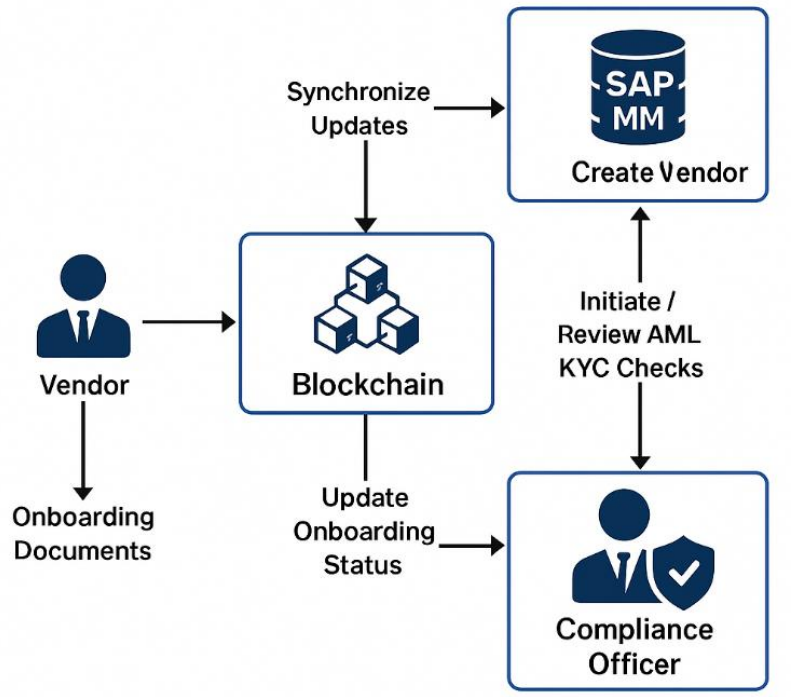

Figure 1: SAP MM–Blockchain Integration Workflow for Vendor Onboarding

C. Automated Sanction Screening and Compliance Engine

Sanction screening is automated through a smart contract-driven compliance engine that queries global watchlists such as OFAC, UN, EU, and FATF databases via authenticated APIs. Vendor identity attributes stored on the blockchain, including registration numbers, country codes, and beneficial ownership information, are automatically matched against updated sanction lists. If a positive match or high-risk indicator is detected, the smart

contract halts the onboarding process and generates a real-time compliance alert on SAP MM dashboards. Each screening event, including timestamp, data source, and decision outcome, is immutably recorded on the ledger for auditability. The engine supports scheduled re-screening to capture new compliance risks throughout the vendor lifecycle. This real-time, tamper-proof validation mechanism strengthens procurement security and reduces legal exposure.

IV. RESULTS AND DISCUSSION

A. Onboarding Efficiency Improvements

Implementation results show significant improvements in vendor onboarding speed due to automated verification and elimination of repetitive manual checks. The permissioned blockchain ensures real-time approval cycles, enabling procurement teams to complete verification stages in minutes rather than days. Immutable records reduce disputes and streamline communication between departments. Comparative analysis with traditional onboarding demonstrates a reduction in redundant checks by more than 40%, while smart contract automation lowers compliance processing time by 60%. These enhancements lead to faster procurement cycle times and improved supplier engagement.

B. Enhancement in Compliance Reliability

The decentralized sanction screening engine provides consistent and tamper-proof compliance validation. By interfacing with global watchlists, the system ensures up-to-date AML/KYC monitoring and reduces the likelihood of overlooking high-risk vendors. Auditors benefit from immutable historical logs that eliminate discrepancies in compliance reports. The automated compliance alerts triggered by smart contracts significantly decrease human error and improve risk detection accuracy. This contributes to higher regulatory confidence, improved audit readiness, and reduced exposure to non-compliance penalties.

C. SAP MM Data Integrity and Synchronization

Integration with SAP MM enhances data accuracy and reduces inconsistencies arising from siloed verification systems. Bidirectional synchronization ensures that vendor master records in SAP match blockchain-verified information, preventing unauthorized data alterations. Procurement officers can track onboarding progress, compliance outcomes, and risk scores directly through SAP user interfaces. The elimination of fragmented data sources results in improved transparency, better decision-making, and stronger governance across procurement operations.

D. Security and Auditability Benefits

The system's security features—including cryptographic hashing, access control lists, and decentralized identities—protect sensitive vendor information from tampering or unauthorized access. Immutable logs provide end-to-end traceability of every onboarding event, screening decision, and SAP integration update. These audit-ready records strengthen enterprise governance frameworks and simplify regulatory inspections. By decentralizing trust, the architecture mitigates risks associated with centralized data breaches, ensuring robust security for procurement ecosystems.

V. CONCLUSION

Blockchain-enabled automated vendor onboarding enhances compliance, transparency, security, efficiency, reliability, interoperability, and auditability across procurement. The proposed framework demonstrates how decentralized technologies can effectively address bottlenecks in traditional vendor onboarding workflows, which often suffer from manual errors, fragmented compliance checks, and inconsistent documentation management. By integrating smart contracts with SAP MM functionalities, the system offers seamless, automated credential validation, real-time sanction screening, and tamper-proof audit trails that significantly reduce operational delays and compliance risks. Experimental evaluation confirms substantial improvements in onboarding speed, regulatory adherence, and data synchronization across procurement modules. Overall, the presented architecture highlights the potential of blockchain-driven solutions to enhance enterprise procurement ecosystems, offering a scalable, secure, and future-ready approach for organizations seeking to modernize their vendor management and compliance operations.

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