International Journal of Computer Trends and Technology
ISSN: 2231–2803 / https://doi.org/10.14445/22312803/IJCTT-V74I5P103

Volume 74 Issue 5, 15-19, May 2026
© 2026 Seventh Sense Research Group®

Original Article

Block Chain: Corda Architecture in Supply Chain

Sivamurugan Perumal

Nous Infosystems Pvt Ltd, OR, United States of America.

Corresponding Author : sivamurugan.perumal@gmail.com

Received: 17 March 2026 Revised: 22 April 2026 Accepted: 13 May 2026 Published: 28 May 2026

Abstract *- Blockchain Technology is a Distributed Ledger Technology (DLT) where the data (digital information) is stored in multiple computers and not in a centralized one [1]. Each system would store a copy of the distributed ledger to avoid pitfalls. The information persists as blocks and gets updated simultaneously on all environments after being validated. Four main types of Blockchain, as described: private/permissioned, public/permissionless, hybrid, and consortium [2]. Corda is an open-source platform of a distributed ledger founded by R3 Consortium (R3CEV LLC). DLT is based on peer-to-peer connections with an agreement, and it is not part of the public. Corda architecture is non-native to cryptocurrencies. The platform is based on top of the Java Virtual Machine (JVM), written in Kotlin. Overall, it explains how Corda can be implemented in a wide range of industries with private/permissioned networks. Earlier, blockchain technology was public and permissionless, which posed a little challenge to many industries to adapt, even in the Supply Chain Management system (SCM) and healthcare. Corda is an open-source and DLT concept with private and permissioned features that make it easy to use in industries like SCM, and how that can be achieved.*

Keywords *- Blockchain, Distributed Ledger, Corda, Financial Markets, Digital Identifications, HealthCare, Telecommunications, Government, Supply Chain and Finance Trading, Java Virtual Machine (JVM), Advanced Messaging Queuing Protocol (AMQP), Unspent Transactions Output Ledger model (UTXO).*

1. Introduction

Corda is one of the advanced technology platforms to enable and implement in an enterprise, and it is an open-source platform. It supports the industry standard Advanced Messaging Queuing Protocol (AMQP) and Java Database Connectivity (JDBC) for communications. Messages are exchanged with TLS encryption over AMQP 1.0. The sender should be aware of the recipients for secure transactions. The Conesus mechanism plays a vital role in this architecture. Validation occurs between the parties that are involved instead of a pool of parties. Scalability is drastic as the transaction's details are maintained privately. Data gets transferred on a need-to-know basis as uniqueness is maintained with peer-to-peer [5] communication. Messages do not get broadcast, and there is no native support for cryptocurrency.

Supply Chain system is rigorous with complex operations, managing the process and the data flow from various sources and many distribution centers, multiple suppliers, and planning [3]. It is time sensitive, and the volume of data is huge, and the expansion of networks [4].

Equivalence of Blockchain is a ledger maintained as an established book-based ledger. In an established book-based methodology, the pages are identified by page numbers, and they are in sequential order. Traditional methodology is linked as follows: a book is a blockchain, data on a page is the transactions, pages are equivalent to blocks, and in turn, that is linked to the page number. In the established methodology, it is easy to identify the pages missing, and it is tough to manipulate without a noticeable reference to Figure 1. Blockchain definition according to blockchaincouncil.org is "Blockchain is a consensus-based secure decentralized public/private database which stores information immutably over a peer-to-peer network" [5]. Challenges on SCM with blockchain technology: Legal, Cost to implement, Performance, Privacy, Integration complexity. Integration with other systems and other SCM technologies was a big challenge, but with CORDA and JVM /API support, integration is not that complex. Privacy earlier blockchain tech stacks, the privacy was challenged, and transparency, with Corda, it is private / permission-based. Proof-of-Work (POW) requires more energy consumption, as Corda is NOVEL-based, comparatively more sustainable than other blockchain approaches. Corda is not public, so scalability, as it is private/permissioned, is not that complex. Performance is also not a challenge compared to the earlier blockchain approach. Blockchain networks face challenges on scalability, as it is public/permissionless due to the growth rate, whereas with private/permissioned, it is not that complex. This article dives deep into the entire

This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/)

architecture of Corda and how that can be accomplished in supply chain industries. We explain how it is done in furniture SCM industries and resolve the earlier challenges of blockchain implementation.

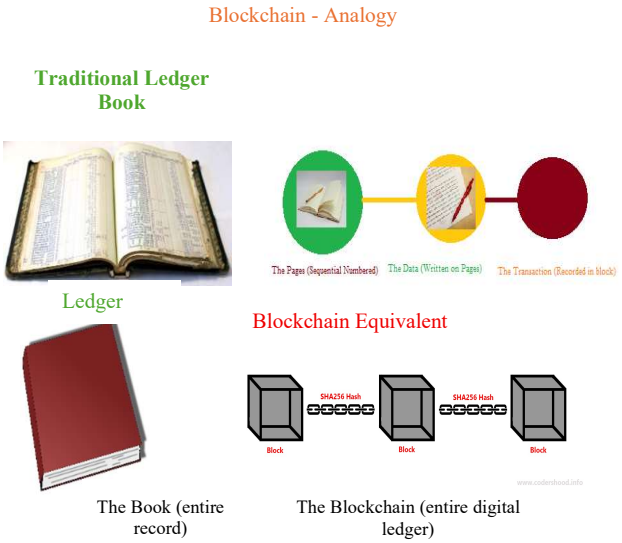

Fig. 1 Blockchain – Analogy

2. Corda Features

Corda scalability can be achieved by running new nodes, which can be added; this is one of the vital features. With partial visibility of data, key randomization and tear-off are the major concerns for privacy. Framework [7] removes the double transaction spending, so that transactions can be predictable. Legitimacy is enabled, so the receiver knows the sender as the connection is peer-to-peer. Earlier transactions cannot be modified, but a new version of that can be published, making old transactions historical, and this is immutable. With all the above features, Corda supports smart contracts [8, 9].

2.1. Advantages and Disadvantages

Data is not globally broadcast and shared on a known basis, as it supports peer-to-peer [5] communication. On a need basis, it supports consensus algorithms by creating a state of provenance [10]. Transactions can be completed as they run in parallel and use the unspent one by the Unspent Transaction Output Ledger (UTXO) model [5, 10]. With this model, the transactions depend on the previous transactions. Primarily solves the financial problem rather than the general ones. Resources are limited as they are the latest and new technology stacks. It never supports cryptocurrency.

Time to market will increase as it must start from the beginning; it does not use robustness. It is permissioned because it requires permission to join from doorman which makes it centralization and that is purely not the nature of blockchain. Corda allows multiple groups of associated applications to exist and interoperates on the same open network. Private messages are shared securely as they are not broadcast globally or publicly. It is a point-to-point shared link specific to the node.

2.2. Blockchain Platforms Comparison

Bitcoin, which is the first decentralized currency payment platform, has a ledger that is maintained publicly by blockchain. It is an open-source platform founded in 2009. Without any intermediation, the transactions happen between the users, point to point. These transactions are verified by the network node and stored in the public ledger of the blockchain [12]. Hyperledger Fabric is a cross-industry blockchain hosted by the Linux Foundation. It has strong complaints and privacy features with permissioned. It acts as an operating system for micro currencies, data-sharing networks, and marketplaces [13]. Ethereum is a strong smart contract system initiated by Vitalik Buterin in late 2013. Funded by a public crowdsale during July-August 2014 by buying Ethereum value token (Ether) [11]. Corda is an open-source platform for a distributed ledger. It is not a blockchain and has no public message, no currency [10]. Solana is known for its high speed and scalability, specially designed for cryptocurrencies and decentralized applications. Stellar utilizes the Federated Byzantine [14] Agreement, which enables nodes to select which node or trust rather than relying on Proof-of-Work (POW) or Proof-of-Stake (POS) mechanisms.

Table 1. Blockchain Comparison

Blockchain	Public/Private	Consensus	Ledger	Smart Contract
Bitcoin	Public	POW	Blockchain	C++
HyperLedger	Private	BFT	UTXO	GoLang & Java
Corda	Private	Novel	Distributed	Kotlin, JVM
Ethereum	Public	POS	UTXO	Solidity, Python, and JS
Solana	Public	POS	UTXO	RUST

3. Corda Architecture

It is a distributed ledger software for recording and processing shared data such as contracts. Key components are CorDApp, Flow framework, Notary Services, Custom Service Loader, Node, Message Broker, RPC, Service Hub, Vault, Identity, Transactions, Time-window, Key Management, Network Map, Consensus, Storage, and States.

States immutable objects that represent one or more nodes at a given time. Vault holds the data extract from the ledger relevant to the owner as relational model. Double-spending can be avoided by providing a unique consensus attestation, which is the primary activity of Notary services. A network map is a document that is cached and gets distributed across the network. The published index of IP addresses is registered in nodes. Node's owner is getting interacted with by RPC. A rich set of services in nodes is presented in the Service Hub.

The CorDApp application is built on the Corda platform and runs in nodes. Identity, which represents the legal identities or service identities. Doorman enforce rules that the node should provide the information before admitting to the network, and KYC (Know-Your-Customer) should be completed.

Once it gets the necessary information from the node, the permission service provides the root-authority-signed TLS certificate. The network is a peer-to-peer network of nodes, each node hosts the CorDapp and services. Each network consists of a Doorman, who is primarily responsible for the identity management protocol to authorize joining the network.

TLS encryption on messages, which uses AMQP/1.0. protocol for transferring. Two services of Network are Notary and Oracle. Notary services can run on a network or node, and it can be one or more; it is a pluggable service.

Oracle's primary activity is to sign the transactions after the confirmation of the state fact and treat it as true. Pluggable service helps privacy, scalability, geographic, and legal-system compatibility, along with algorithm agility.

3.1. Concepts

It contains a single reliable resource with the idea of a global ledger. With this model, both transactions and the ledger are globally visible, and the transactions are visible only to the agreed-upon parties.

The primary foundational object in the concept is the state object, which is a digital document recording the existence, content, and current state of an agreement between one or more parties.

In the supply chain, the various parties include the source supplier, manufacturers, distributors, retailers, and service providers. Figure 2 shows the various parties of the SCM Figure 2.

Transactions would be visible based on the Agreement. It heavily relies on cryptographic hashes to identify the parties and data; the chain of provenance is formed by linking the state to the previous version.

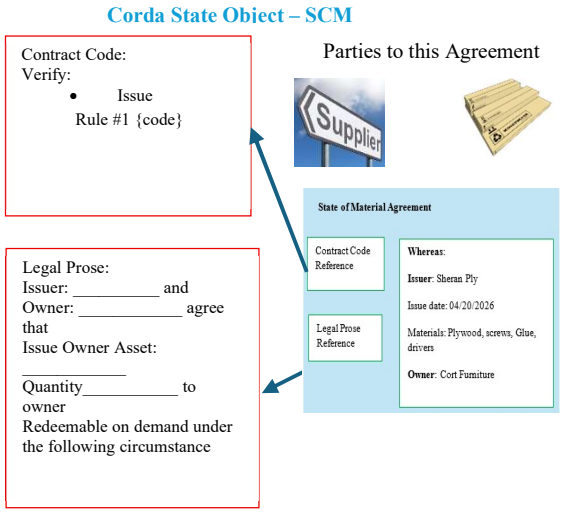

Fig. 2 SCM – Corda State Object

3.2. Identity

Corda implements its core identity through X.509 certificates. It expects uniqueness in mapping, which is achieved by legal name, i.e., a unique human-readable entity, along with public key and IP address. The software assumes identity infrastructures between the participants and the network, and makes no assumptions. Corda enables a wider range of identities to participate in transactions as individuals or organizations.

3.3. Business Logic

As Corda supports smart contract code, its primary function is to accept or reject a proposed transaction. Each state object specifies the function that can be executed by a transaction that either seeks to consume or create a state. The transaction is valid only when the contract code associated with the contained states agrees.

Java Virtual Machine (JVM) [15] is used for contract validation and execution. The reason is that it is a large skill base and contains many libraries and adheres to industry standards, which can be leveraged in contracts. It is deployed on custom sandboxes, which are more restrictive, not on regular JVM sandboxes.

3.4. Consensus

It is an agreement that allows notary clusters to choose which algorithm based on their need in terms of privacy, scalability, legal system compatibility, and algorithmic agility. Updates are done by transaction, consuming existing state objects and producing new states. Types of consensus: Validity consensus and Uniqueness consensus. Validity consensus is checked before signing the transactions by each required signer. Uniqueness is checked by Notary services. Validity consensus Figure 3. ran for proposed transactions and each transaction in the chain, which

generates the input for the proposed transactions. The following conditions are validated, and contracts of every input and output state accept the transactions. The transaction will have the necessary signature. Uniqueness checks the problem of double-spending and is provided by Notaries—Figure 4.

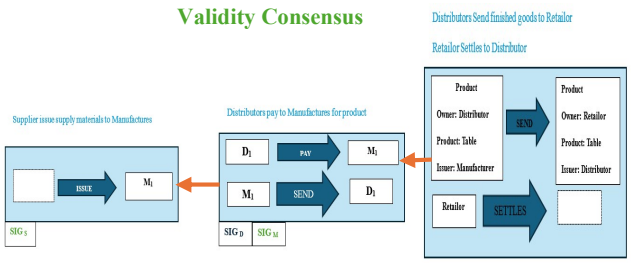

Fig. 3 Validity Consensus

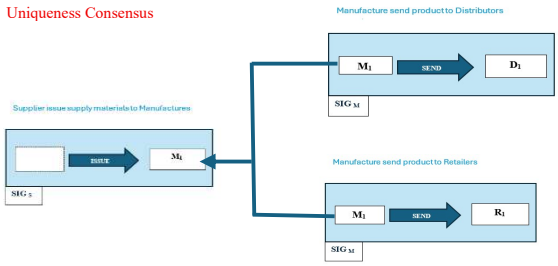

Fig. 4 Uniqueness Consensus

4. Node Architecture

Primary components of Node Database, Storage services, Network Interface, RPC Interface, Service Hub, and CorDapp interface providers. Node Database subcomponents are the Persistent Layer and Vault. Node Database holds the node owner information in the SCM system. It will hold suppliers, manufacturers, distributors, retailers, and service providers. Data are stored as a relational model, so it is easy to query and work on it; this is part of the subcomponents' persistence layer. Each node stores the relevant data extracted from the ledger in Vault. Vault also stores in relational models for easy query ability. Three major components of storage services are transactions, attachments, and flow checkpoints.

Communications throughout the network are handled by network interfaces. Owner nodes never interact with other nodes directly. Nodes handle communication by themselves with other nodes.

Service Hubs' rich set of services is primarily used during flow execution to update the ledger. Primary key services are information for other nodes in the network and services offered by them, able to access the content of vault and storage services, current time tracking, generation of and access to the node's public-private key pairs, and finally, the information of the node itself. The behavior of nodes can be extended with the Cordapp provider.

Node itself consists of many Cordapps installed by default to handle common tasks like Contracts upgradation, Transaction retrieval, and attachments from counter parties, broadcasting the ledger updates for recording the counter parties.

Draining mode is when nodes are set for shutdown, making sure no nodes are in flight and no checkpoint persistence. Common tasks are when trying a new node flow through RPC will get rejected.

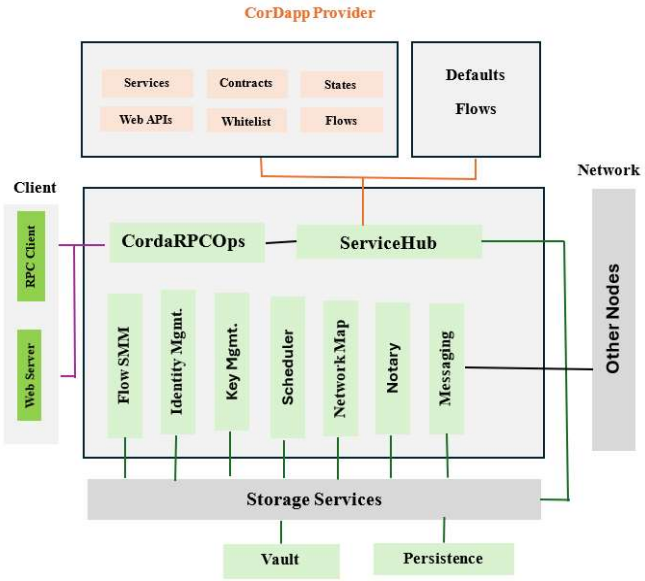

Fig. 5 Node Architecture

4.1. Requirements for Corda

Repositories needed for Corda are Corda Repo, Gradle, Wrapper, and Cordapp Repo. Tools needed are Oracle JDK 8 JVM [15], IntelliJ IDEA, and Git. Gradle is an open-source build automation system, a Groovy domain-specific language instead of XML for project configurations, which uses a Directed Acyclic Graph (DAG) in which the order of the tasks can be run. Plugins are wrappers that are scripts that invoke the declared version of Gradle, and Apache Maven is a software project management tool based on the project object model. Primary language is Java, the write once and run anywhere WORA concept, and Kotlin statically typed programming.
A language that runs on Java Virtual Machines.

5. SCM Adaptation Factors

Transparency and traceability, as Corda architecture records cannot be manipulated, are the primary factors for data integrity and transparency. All stakeholders are able to

track the movements of goods in real time, which helps with fraud detection and prevention. Transaction costs can be reduced as data can be changed instantly, reducing transaction times and human errors.

Immutability can be achieved by smart contracts, as Corda is supported by digital signatures. All transactions and records are timestamped once recorded so that they can eliminate fraud and tampering. Culture and use with Corda architecture is not public and private, which makes collaboration and trustworthiness in adopting it.

6. Conclusion

Cord architecture, which is a private /permissioned Blockchain that can be added as part of SCM. Each stake holders are added along with notary services and digital signature. Only allowed IPs can be part of the network, and with that, tampering and fraud detection are easily identifiable. The challenges with the current approach are when multiple suppliers' costs of material are exposed to competitors' future work, and how secure that can be isolated. Future work: this can be used in other FinTech industries and Healthcare with privacy /permission.

References

[1] Ziyuan Wang et al., "Distributed Ledger Technology for Document and Workflow Management in Trade and Logistics," *Proceedings of the 27th ACM International Conference on Information and Knowledge Management*, Torino, Italy, pp. 1895-1898, 2018. [CrossRef] [Google Scholar] [Publisher Link]

[2] Yawen Tan et al., "Blockchain-Assisted Distributed and Lightweight Authentication Service for Industrial Unmanned Aerial Vehicles," *IEEE Internet of Things Journal*, vol. 9, no. 18, pp. 16928-16940, 2022. [CrossRef] [Google Scholar] [Publisher Link]

[3] Valeria Jannelli et al., "Agentic LLMs in The Supply Chain: Towards Autonomous Multi-Agent Consensus Seeking," *International Journal of Production Research*, pp. 1-31, 2025. [CrossRef] [Google Scholar] [Publisher Link]

[4] Sara AlMahri, Liming Xu, and Alexandra Brintrup, "Automating Supply Chain Disruption Monitoring via an Agentic AI Approach," *SSRN*, 2025. [CrossRef] [Google Scholar] [Publisher Link]

[5] Satoshi Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System," pp. 1-9, 2008. [Google Scholar]

[6] Blockchain: Council. [Online]. Available: https://www.blockchain-council.org/category/blockchain/

[7] Hongdan Han, Radha K Shiwakoti, and Weifeng Chen, "Unlocking Enterprise Blockchain Adoption: A R3 Corda Case Study," *Journal of General Management*, pp. 1-12, 2024. [CrossRef] [Google Scholar] [Publisher Link]

[8] Christopher D. Clack, Vikram A. Bakshi, and Lee Braine, "Smart Contract Templates: Foundations, Design Landscape and Research Directions," *arXiv:1608.00771*, pp. 1-15, 2016. [CrossRef] [Google Scholar] [Publisher Link]

[9] Vitalik Buterin et al., A Next-Generation Smart Contract and Decentralized Application Platform, 2014. [Online]. Available: https://ethereum.org/content/whitepaper/whitepaper-pdf/Ethereum_Whitepaper_-_Buterin_2014.pdf

[10] Richard Gendal Brown, "The Corda platform: An Introduction," 2018. [Google Scholar]

[11] Vitalik Buterin, *On Public and Private Blockchains*, 2015. [Online]. Available: https://blog.ethereum.org/2015/08/07/on-public-and-private-blockchains/

[12] Alex Hughes et al., "Beyond Bitcoin: What Blockchain and Distributed Ledger Technologies Mean for Firms," *Business Horizons*, vol. 62, no. 3, pp. 273-281, 2019. [CrossRef] [Google Scholar] [Publisher Link]

[13] Elli Androulaki et al., "Hyperledger Fabric: A Distributed Operating System for Permissioned Blockchains," *The 13th EuroSys Conference*, Porto Portugal, pp. 1-15, 2018. [CrossRef] [Google Scholar] [Publisher Link]

[14] Caiqin Dong et al., "Privacy-Preserving and Byzantine-Robust Federated Learning," *IEEE Transactions on Dependable and Secure Computing*, vol. 21, no. 2, pp. 889-904, 2024. [CrossRef] [Google Scholar] [Publisher Link]

[15] Tim Lindholm et al., *The Java Virtual Machine Specification Java SE 8 Edition*, 2015. [Google Scholar]