BCDV-4025

Enterprise Blockchain

(world bank-documentation)

By-

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1. Introduction / Understanding the Problem statement

A blockchain is an immutable transaction ledger, maintained within a distributed network of peer nodes. Each of these nodes maintain a copy of the ledger by applying transactions that has been validated by a consensus protocol, grouped into blocks that include a hash that bind each block to the preceding block.

Cross border transaction

The increase of international trade, internationalization of production, and cross-border e-commerce suggest that demand for cross-border payments will continue to grow. But payments sent from one country to another are often costlier, slower, and less transparent than domestic payments. This may be partly because cross-border payments are more complex, involve more risk, and more rules than domestic payments.

Blockchain technology promises to facilitate fast, secure, low-cost international payment processing services and other such transactions through the use of encrypted distributed ledgers that provide trusted real time verification of transactions without the need for intermediaries such as correspondent banks and clearing organization.

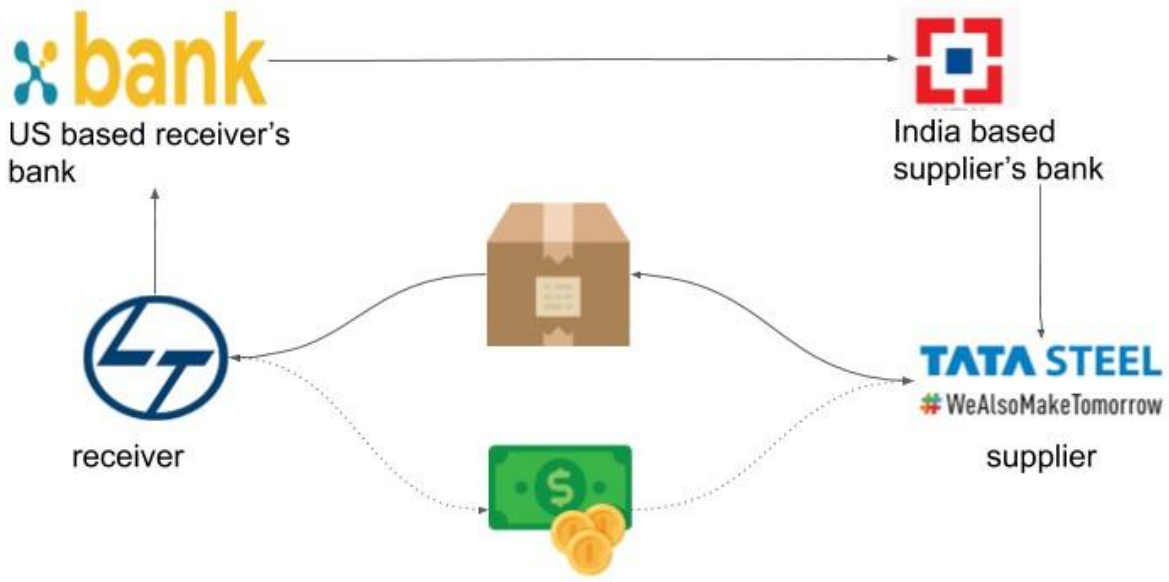


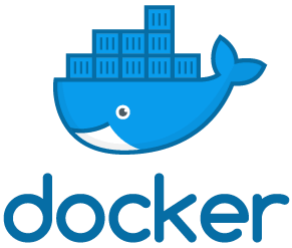
Fig 1: cross border transaction scenario

We took one scenario to simulate cross border transaction, where L&T located in Atlanta, US wants to request for a stock of steel products to Tata Steel located in Kolkata, India. As this deal involves so many asset transfer (money and product) and their provenance between the countries, they need to rely on banks to handle all the financial and legal transactions.

In this solution, we tried to create a blockchain based system to handle such transactions and records for the same in a common distributed ledger.

2. Details of Technology Used

HYPERLEDGER FABRIC	**Hyperledger Fabric** is an open source enterprise-grade **permissioned distributed ledger technology (DLT)** platform, designed for use in enterprise contexts, that delivers some key differentiating capabilities over other popular distributed ledger or blockchain platforms.

	**Docker** is a set of platform-as-a-service (PaaS) products that use OS-level virtualization to deliver software in packages called containers. Containers are isolated from one another and bundle their own software, libraries and configuration files; they can communicate with each other through well-defined channel.
	**Hyperledger Fabric SDK** for Node.js provides a powerful API to interact with a Hyperledger Fabric blockchain. The SDK is designed to be used in the Node.js JavaScript runtime. **Express Js** is a Node Js web application server framework, which is specifically designed for building single-page, multi-page, and hybrid web applications. It provides a robust set of features for web and mobile applications.

3. Required Software /Hardware

Hardware

- i7 8th generation+ processor
- 8+ GB RAM
- 1 TB Storage

Software

- Ubuntu 16.04 + (LTS)
- Hyperledger fabric binaries
- Hyperledger Fabric Node SDK
- Docker (for virtualization)
- NPM

4. Achieved Cost Saving

Reduced complexity will reduce the cost

In conventional approach every banking organization have their own software platforms, so in this case collaborating with other organizations will increase the software complexity a lot more, but in blockchain because of single software architecture, it will reduce this complexity which leads to reduced cost.

Automation of key Services

Organizations can lower overhead costs with blockchain as in the automation of key services like legal costs such as lawyers to draft contracts, and other expenditures such as accounting. By using smart contracts, stakeholders can save on payroll, invoicing, and reduce the need for external services.

Cost of ownership

As Hyperledger is an open source platform governed by Linux Foundation, it will eliminate the cost of ownership to use such platforms for various blockchain based use cases.

Reduced Clearance and Settlement charges

Distributed ledgers technology (DLT) will help to reduce operational costs of clearance and settlement process and bring us closer to real-time transactions between financial institutions.

5. Architecture

a. Node level architecture

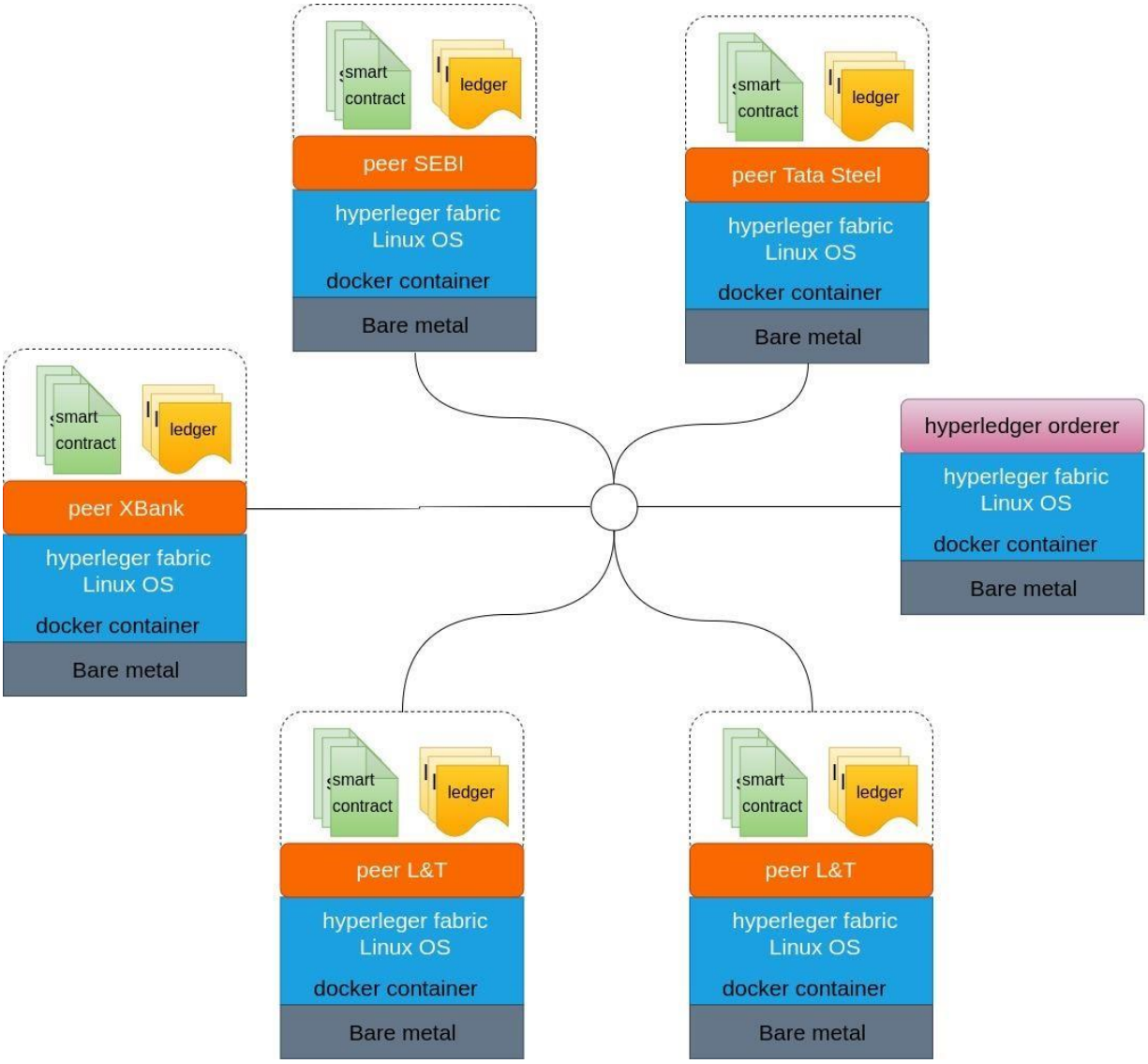


Fig 2: node level architecture

b. blockchain network architecture

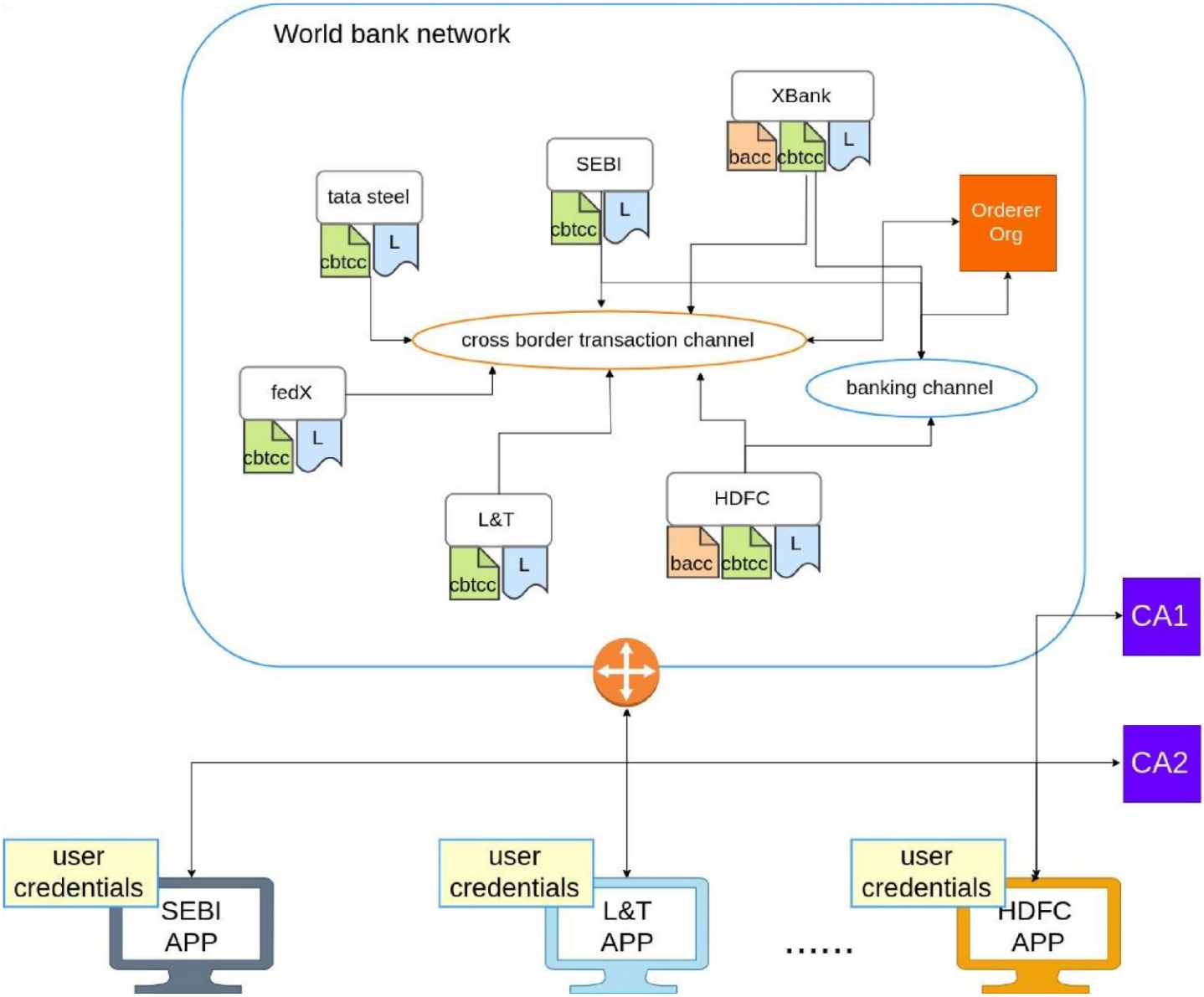


Fig 3: blockchain network architecture

c. End-to-end integration architecture

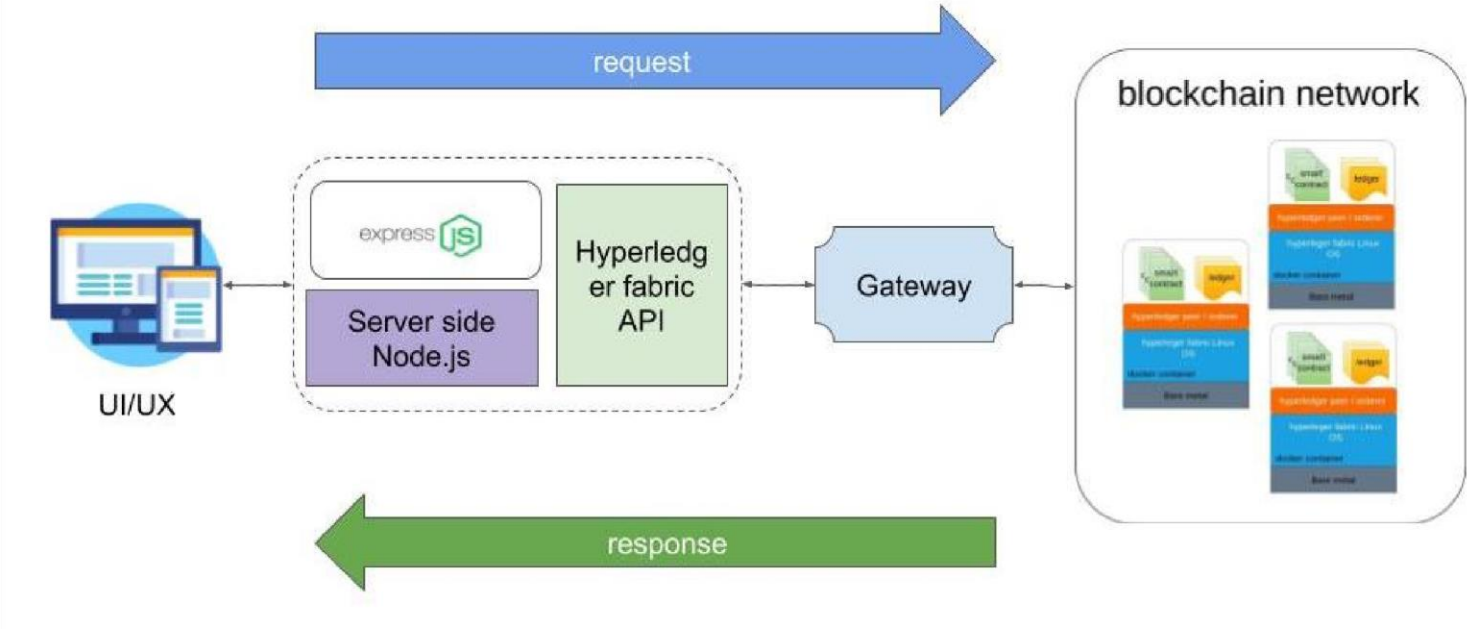


Fig 4: end-to-end integration architecture

6. Solution brief description

Through this solution we tried to simplify the cross-border transaction and data validation and verification process. Each organization will be storing updated record related to the business operations into the Blockchain in real time. All stakeholders will have instantaneous access to the data without being able to modify it. The blockchain ledger becomes the single source of truth, which allows them to access and verify different processes and requests in real-time. It eliminates the need for clearing houses and makes the simple resolution and settlement process.

Cross border transaction process

1. Create a new transaction

   Through requestTransaction() function user can request for new transaction which will create a new record with initial values and it will get added into the blockchain state database.

2. Set supplier approval

   SetProductSupplierApproval() function will be used by the supplier of that particular transaction to accept / reject that request

3. Set receiver's bank approval

   With setReceiversBankApproval() function receiver's bank will verify that transaction with a financial perspective i.e. whether the receiver have the sufficient fund to purchase that product / not. According to the situation, bank will update the status.

   To do that bank will perform following tasks:

   i. Bank will transfer money from requesters a/c to their pool account for trust
   ii. Bank will update the status of money transfer into blockchain record

4. Transfer product

   Using productTransfer() function transporter can update the live location of product into the same transaction record.

5. Update deliver status

   With the help of updateProductDeliveryStatus() requester can update product delivered status into his transaction record

6. Fulfillment of order

   If all above steps get successful then bank will fulfill the order by transferring the amount from its pool account to supplier's bank's pool account.

Finally, supplier's bank will transfer money from their pool account to supplier's bank account.

In this solution we tried to achieve following key features

a. One transaction one record
b. Information isolation through channels
c. Less ambiguity in the whole process
d. Fast processing of transactions

7. Scope of Automation

a. Automated transaction filtering and monitoring

With the help of predefined rules and policies which are accepted by all organizations, we can achieve automatic transaction filtering and monitoring which will help to reduce overhead of regulators in banking system.

b. Validation of accounts

Through integrated channels in the same network, we can easily validate and verify user accounts in the deployed system.

8. Conclusion

Blockchain can take the decentralized system to another level with more trust and reliable network which will leads to make unbreakable and least vulnerable systems. With further enhancement and scaling in current blockchain based system, it is really possible for banking service to migrate from the current banking system to the more secure and trustworthy system with reduced complexity. The same network structure can also be used to implement the loan financing system, retirement benefit program and other government welfare schemes as well.