

Traceability Of Shipping Industries In Supplychain using Hyperledger Fabric

Mini Project(Semester - II)

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A MINI PROJECT REPORT

on

**Traceability Of Shipping Industries in Supplychain
Using Hyperledger Fabric**

Submitted by

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Muhammed Jazeel K T**

Under the guidance of

Dr. Asharaf S

Bonafide Certificate

This is to certify that this project report entitled ***“Traceability Of Shipping Industries in Supplychain Using Hyperledger Fabric”*** submitted to Indian Institute of Information Technology and Management -Kerala , Thiruvananthapuram, is a bonafide record of work done by **“Muhammed Hassan And Muhammed Jazeel”** under our supervision from “January 2018” to “April 2018”

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Declaration

We, Muammed Hassan and Muhammed Jazeel K T are students of course Master of Science in Computer Science specialising in Machine Intelligence, hereby declare that this report is substantially the result of our own work, except, where explicitly indicated in the text and has been carried out during the period January 2018 – April 2018

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Abstract

Supply Chain Management(SCM) span many geographies, modes and industries and involve several phases where data flows in both directions from suppliers, manufacturers,distributors,logistics retailers, to customers.This data flow is necessary to support critical business decisions that may impact product cost and market share. Current supplychain information systems are unable to provide validated, pseudo real-time shipment tracking during the distribution phase. This information is available from a single source, often the carrier, and is shared with other stakeholders on an as-needed basis. This paper introduces an independent, crowd – validated, online shipment tracking framework that complements current enterprise-based supplychain management solutions. The proposed framework consists of a set of private distributed ledgers and a single blockchain public ledger.Each private ledger allows the private sharing of custody events among the trading partners in a given shipment. Privacy is necessary, for example, when trading high-end products or chemical and pharmaceutical products. The second type of ledger is a blockchain public ledger. It consists of the hash code of each private event in addition to monitoring events. The latter provide an independently validated immutable record of the pseudo real-time geolocation status of the shipment from a large number of sources using commuters-sourcing.

Our main objective is to provide suppliers and customers with validated, near real-time visibility during the physical distribution phase of the supply chain (SC). The each block of supplychain network is validated using the hash key of previous block in the network.Then,this phase is concerned with the transport of the goods from the supplier to the customer. These solutions are often populated with tracking information from a single source, the carrier, and suffer from a restricted visibility to other stakeholders. Indeed, information is shared through updates provided by the carrier as and when deemed necessary. Moreover, the information being shared is not validated by an independent source. These trust

and transparency issues may not affect trading among large businesses with fully integrated inbound and outbound logistics networks . However, the model fails when either the customer or supplier are small or medium businesses and have to rely on load sharing and multiple carriers during shipment. This paper introduces a framework that delivers online shipment tracking information to all stakeholders during the distribution phase of supplychain.



Table of Contents

<u>Introduction</u>	<u>1</u>
<u>A Brief on Blockchain</u>	<u>1.1</u>
<u>Benefits Of Blockchain</u>	<u>1.2</u>
<u>Outline</u>	<u>2</u>
<u>Proposed System</u>	<u>3</u>
<u>Hyperledger</u>	<u>3.1</u>
<u>Fabric</u>	<u>3.1</u>
<u>Chain Code</u>	<u>3.1</u>
<u>Assets</u>	<u>3.2</u>
<u>Consensus</u>	<u>3.3</u>
<u>Result And Discussion</u>	<u>4</u>
<u>Building Our Network</u>	<u>4.1</u>
<u>Bring Up Network</u>	<u>4.2</u>
<u>Bring Down Network</u>	<u>4.3</u>
<u>Hyperledger Composer Playground</u>	<u>4.4</u>
<u>Process Flow Diagrams</u>	<u>5</u>
<u>Hyperledger Composer</u>	<u>5.1</u>
<u>Supplychain Network(Fabric)</u>	<u>5.2</u>
<u>Blockchain Technology Driven Solution</u>	<u>5.3</u>
<u>Conclusion</u>	<u>6</u>
<u>References</u>	<u>7</u>

1.Introduction

1.1 A Brief On Blockchain

Blockchain is a rapidly growing new technology across the world . All the IT companies are turn research field as blockchain technology .The term blockchain is the compination of block & chain it mean that cryptographically secured chain of block , it first implimented by satoshi nakamoto in 2008 ,the main idea of blockchain is that transaction handling without any central authority and highly secure with help of cryptographical hash function ,cryptocurrencies are the application of blockchain .bitcoin is well known crypocurrency .

1.2 Benefits of Blockchain

Blockchain focusing on three terms trustability , transpancy and distributed .It also provide trustability throught the permission of participants in the network ,currently every system has a central or contoroling authority,they are storing the data so they have force on data or money , by the help of blockchain we can remove central authority , every one can saw their own data&transaction and storing this trasaction with network people.

Main features of Blockchain are:

- Consensus :All participants agree on the transaction made
- Provenance:There is a single place of origin all transaction
- Immutability:Records can not be changed or removed

2. Outline

Transportation is the backbone world economics so, globally transportation and shipping has an importance, every time all us are connecting with transportation directly or indirectly. By the presence of the the block chain we make more efficient manner, blockchain storing the every data of product (transporting object) each transaction and permanently storing in ledger so that customer can also check history of product from the initial stage. currently we don't know any thing about product upto reach in our hand. our aim is provide maximize the trustability in the the shipping.

3. Proposed System

The main goal of this project is to find an optimal method to track the Shipping industries on supplychain network in blockchain using hyperledger Fabric platform. It aims to real-time tracking of every participants, assets and Transaction carried on the network. Our system is very vast and more efficient, we created a supplychain network, in this network we have many participants like supplier, manufacturer, logistics, retailer and customer. Each participants have a specific membership in the network, otherwise no one can join the network. And also every one can generate transaction and others will validate the transaction using the transaction logic called chain code. It is also called smart contract.

In our network we can define all Assets like commodity, participants and Transactions like customer place order etc. So, our proposed system can solve the challenges phasing the supplychain currently. Here we are only create a model for tracking the shipping industries in supplychain network.

The Problem Of The Current Supply chain system is unauthenticated shipment traceability of the product from the manufactures to the consumer. Its because of trustability among the distributors, producers and retailers and also the large amount of document verification between participants in the supplychain. The inherent cost involved in supplychain intermediaries, their reliability, traceability and transparency further complicate the supplychain. The solution to such complicated problems lies in improving supplychain transparency. This now possible with the concept of blockchain and the decentralised distributed ledger validates the authentication through digital verification (Digital Signature) and smart contracts in the supplychain network. And Each participant have a copy of distributed public ledger to know the real-time status of the product. Then the ledger helps to trace the product locality.

Supply chain is defined as the line of various points involved in producing and delivering goods, from the procurement stage to the end customer. Nowadays, the supply chain can consist of various stages and locations. Consequently, it has become more difficult to trace events in the entire chain. Moreover, due to the lack of transparency in the supply chain, buyers and customers cannot be sure in the true value of the products or services. Also, there are several elements related to the supply chain that cannot be tracked, such as environmental incidents. It is hard to investigate the accountability of illegal events associated with the supply chain. Because of these challenges, today the world faces following problems of counterfeiting, forced labor and poor conditions in factories.

Blockchain, as an insurer of transparency and security, can be a good solution for fixing supply chains. Even the simplest application of the blockchain technology could bring the supply chain great benefits. Registering the transfer of products on the digital ledger as transactions allows to identify the main data relevant to manage the supply chain.

The main features of blockchain could be very useful for application in the supply chain:

- Public availability gives the opportunity to track products from the place of origin to the end customer.
- Decentralized structure gives the ability for participation for all parties in the supply chain
- Cryptography-based and immutable nature gives the assurance of security.

To this day, there have been made several efforts to use blockchain for improving Supply Chain Management. IBM is a pioneer in this sphere they have endeavored to streamline the leverage of blockchain in the supply chain. And also our system is looking for further implementation of Blockchain and IOT supply chain management. It increase more and more efficiency in supply chain network. Because of the user customer can view the real status of ordered product.

3.1 Hyperledger

Hyperledger is a blockchain platform implemented by The Linux Foundation in 2015. The Linux Foundation aimed to develop blockchain and distributed ledger technology for supporting global business network as that of cryptocurrency. We know blockchain has different platforms like Ethereum, Hyperledger, etc., but Hyperledger differs from these due to some characteristics like their own consensus and storage routines and identity services. The main point is that it never builds its own cryptocurrency. The Fabric, Iroha and Sawtooth are frameworks developed by IBM, Soramitsu and Intel respectively for Hyperledger.

3.2 Fabric

Fabric is a permissioned framework developed by IBM for Hyperledger. It also gives the infrastructure to exchange our digital assets using chaincode, consensus and membership services. Order nodes make the transaction; peer nodes will confirm this transaction and MSP is validated by certificate authority. Mainly for transaction, 3 sets of people participate:

- 1) Endorser :- Transaction starting person (node)
- 2) Committer :- Transaction receiving person (node)
- 3) Consenter :- Transaction validating people (nodes)

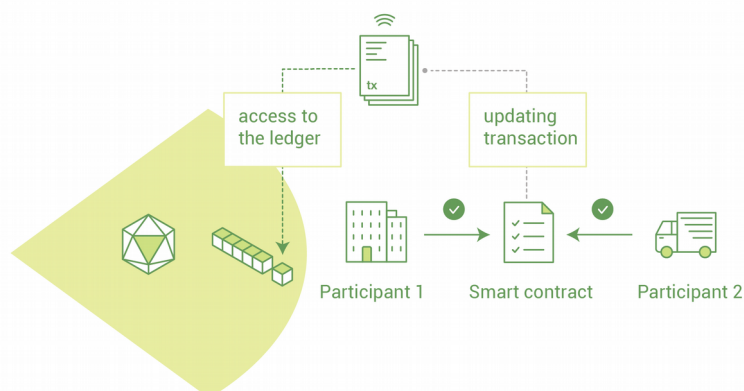
Hyperledger Fabric is a distributed permissioned framework. So, there are so many use cases like certificate validation, business level, shipping, etc.... Each and every node should enroll MSP (Membership Service Provider) for entering a network. No specific cryptocurrency. Such type of condition makes it better for business level applications.

3.3 Chain Code

It is the logic of the transaction takes place in a blockchain fabric network. In Hyper ledger ,it is called Chain Code. It includes Transaction logic and it run ,when the transaction is started with each peer include in the transaction.

Chaincode is software defining an asset or assets, and the transaction instructions for modifying the asset(s); in otherwords, it's the business logic. Chaincode enforces the rules for reading or altering key-value pairs or other state database information. Chaincode functions execute against the ledger's current state database and are initiated through a transaction proposal. Chaincode execution results in a set of key-value writes (write set) that can be submitted to thenetwork and applied to the ledger on all peers.

Hyperledger Fabric smart contracts are written in chaincode and are invoked by an application external to the blockchain when that application needs to interact with the ledger. In most cases, chaincode interacts only with the database component of the ledger, the world state (querying it, for example), and not the transaction log.



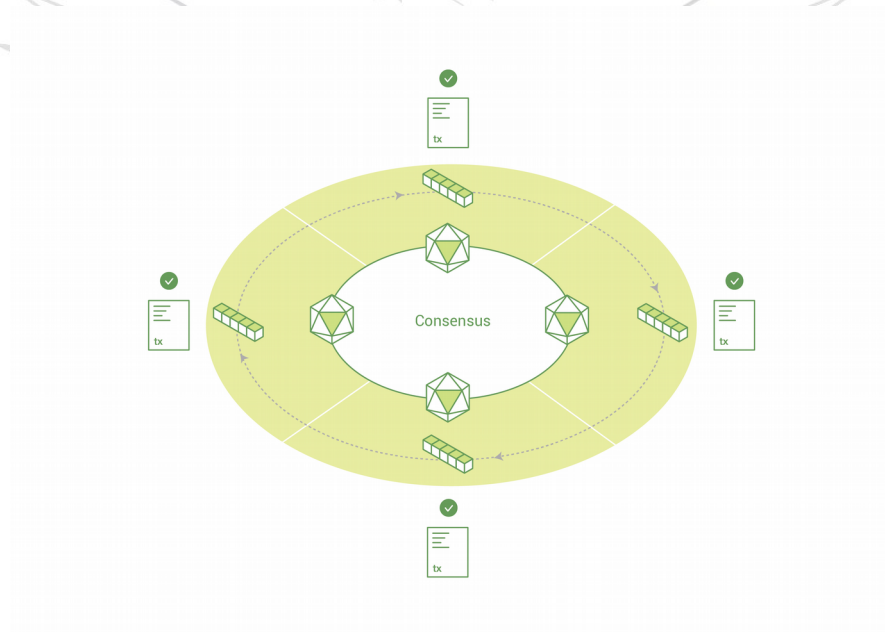
3.4 Assets

Assets can range from the tangible (real estate and hardware) to the intangible (contracts and intellectual property). Hyperledger Fabric provides the ability to modify assets using chaincode transactions.

Assets are represented in Hyperledger Fabric as a collection of key-value pairs, with state changes recorded as transactions on a Channel ledger. Assets can be represented in binary and/or JSON form. We can easily define and use assets in your Hyperledger Fabric applications using the Hyperledger Composer tool.

3.5 Consensus

The process of keeping the ledger transactions synchronized across the network – to ensure that ledgers update only when transactions are approved by the appropriate participants, and that when ledgers do update, they update with the same transactions in the same order – is called **consensus**.



4. Results And Discussion

After a lot of research and Discussion we created a basic sample supplychain network and wrote the smart contract to satisfies the transaction. In this network, we have a single model file that describes the Assets like commodity or product, participants like manufacturer, supplier, distributor, retailer and customer and transactions like transfer the product, initiate place order. After that we created the transaction logic, which includes commodity registry, commodity transfer registry. Mainly it starts with Fabric shim API. It starts with the chaincode while transferring the asset between the participants.

4.1 Building Our Network

We have the fabric-samples directory, which includes the skeleton of fabric blockchain network. It provides all things to create a blockchain network. We can generate a channel using the following command:

- hassan@hassan-X553MA:~/fabric-samples/first-network\$./byfn.sh generate

```
byfn.sh down
hassan@hassan-X553MA:~/fabric-samples/first-network$ byfn.sh generate
byfn.sh: command not found
hassan@hassan-X553MA:~/fabric-samples/first-network$ ./byfn.sh generate
Generating certs and genesis block for with channel 'mychannel' and CLI timeout of '10' seconds and CLI delay of '3' seconds
Continue? [Y/n] Y
proceeding ...
/home/hassan/fabric-samples/first-network/./bin/cryptogen

##### Generate certificates using cryptogen tool #####
##### cryptogen generate --config=./crypto-config.yaml #####
org1.example.com
+ res=0
+ set +x

/home/hassan/fabric-samples/first-network/./bin/configtxgen
##### Generating Orderer Genesis block #####
+ configtxgen -profile TwoOrgsOrdererGenesis -outputBlock ./channel-artifacts/genesis.block
2018-04-08 11:02:47.435 IST [common/tools/configtxgen] main -> INFO 001 Loading configuration
2018-04-08 11:02:47.507 IST [common/tools/configtxgen] doOutputBlock -> INFO 002 Generating genesis block
2018-04-08 11:02:47.509 IST [common/tools/configtxgen] doOutputBlock -> INFO 003 Writing genesis block
+ res=0
+ set +x

##### Generating channel configuration transaction 'channel.tx' #####
+ configtxgen -profile TwoOrgsChannel -outputCreateChannelTx ./channel-artifacts/channel.tx -channelID mychannel
2018-04-08 11:02:47.552 IST [common/tools/configtxgen] main -> INFO 001 Loading configuration
2018-04-08 11:02:47.574 IST [common/tools/configtxgen] doOutputChannelCreateTx -> INFO 002 Generating new channel configtx
2018-04-08 11:02:47.639 IST [common/tools/configtxgen] doOutputChannelCreateTx -> INFO 003 Writing new channel tx
+ res=0
+ set +x

##### Generating anchor peer update for Org1MSP #####
```

4.2 Bring Up the Network

$\overline{f} \overline{g} \overline{h} \overline{i} \overline{j} \overline{k} \overline{l} \overline{m} \overline{n} \overline{o} \overline{p} \overline{q} \overline{r} \overline{s} \overline{t} \overline{u} \overline{v} \overline{w} \overline{x} \overline{y} \overline{z}$
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 $\overline{a} \overline{b} \overline{c} \overline{d} \overline{e} \overline{f} \overline{g} \overline{h} \overline{i} \overline{j} \overline{k} \overline{l} \overline{m} \overline{n} \overline{o} \overline{p} \overline{q} \overline{r} \overline{s} \overline{t} \overline{u} \overline{v} \overline{w} \overline{x} \overline{y} \overline{z}$
 $\overline{a} \overline{b} \overline{c} \overline{d} \overline{e} \overline{f} \overline{g} \overline{h} \overline{i} \overline{j} \overline{k} \overline{l} \overline{m} \overline{n} \overline{o} \overline{p} \overline{q} \overline{r} \overline{s} \overline{t} \overline{u} \overline{v} \overline{w} \overline{x} \overline{y} \overline{z}$

4.3 Bring Down the Network

```
Stopping with channel 'mychannel' and CLI timeout of '10'
Continue? [Y/n] y
proceeding ...
WARNING: The CHANNEL_NAME variable is not set. Defaulting to a blank string.
WARNING: The TIMEOUT variable is not set. Defaulting to a blank string.
Removing network net_byfn
468aaa6201ed
...
Untagged: dev-peer1.org2.example.com-mycc-1.0:latest
Deleted: sha256:ed3230614e64e1c83e510c0c282e982d2b06d148b1c498bbdcc429e2b2531e91
...
```

4.4 Hyperledger Composer Playground

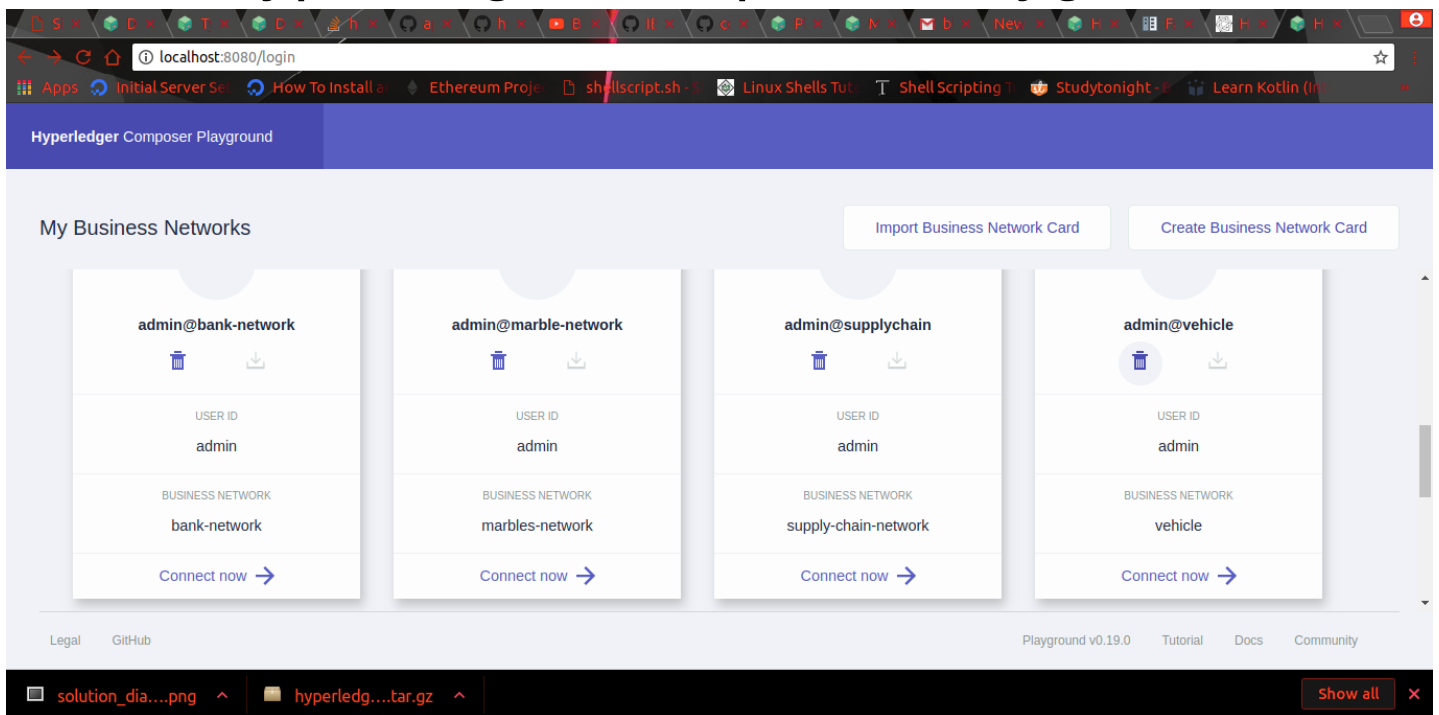


Figure 1.1

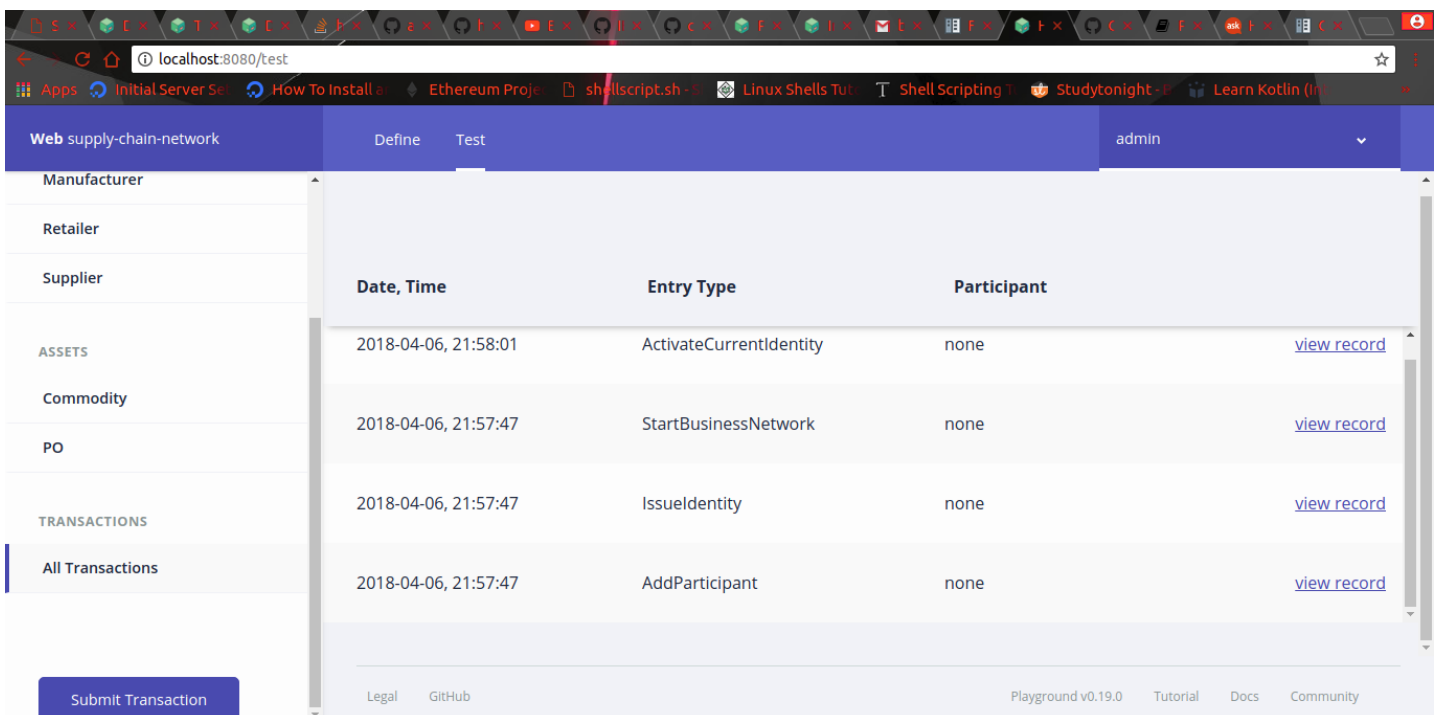


Figure 1.2

5. Process Flow Diagrams

5.1 Hyperledger Composer

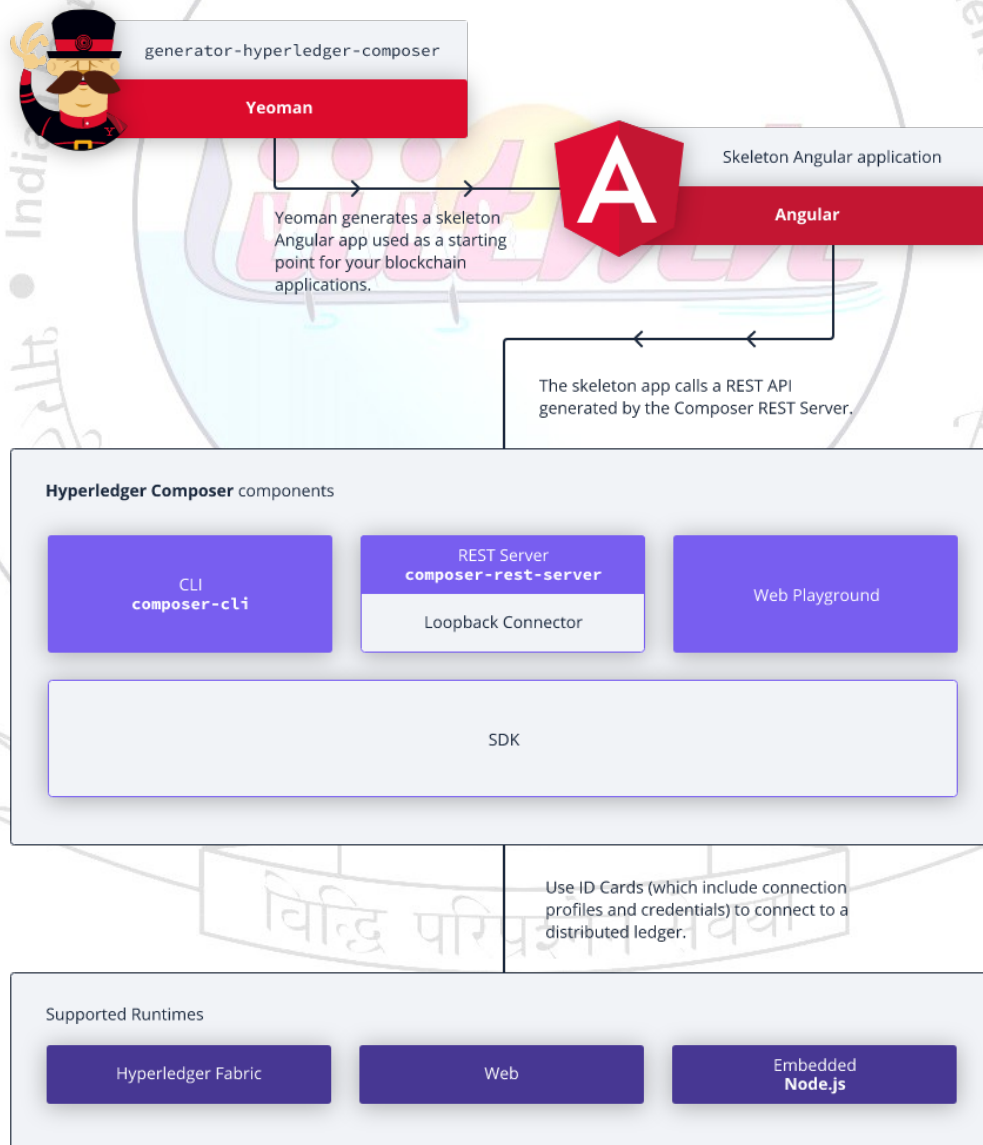
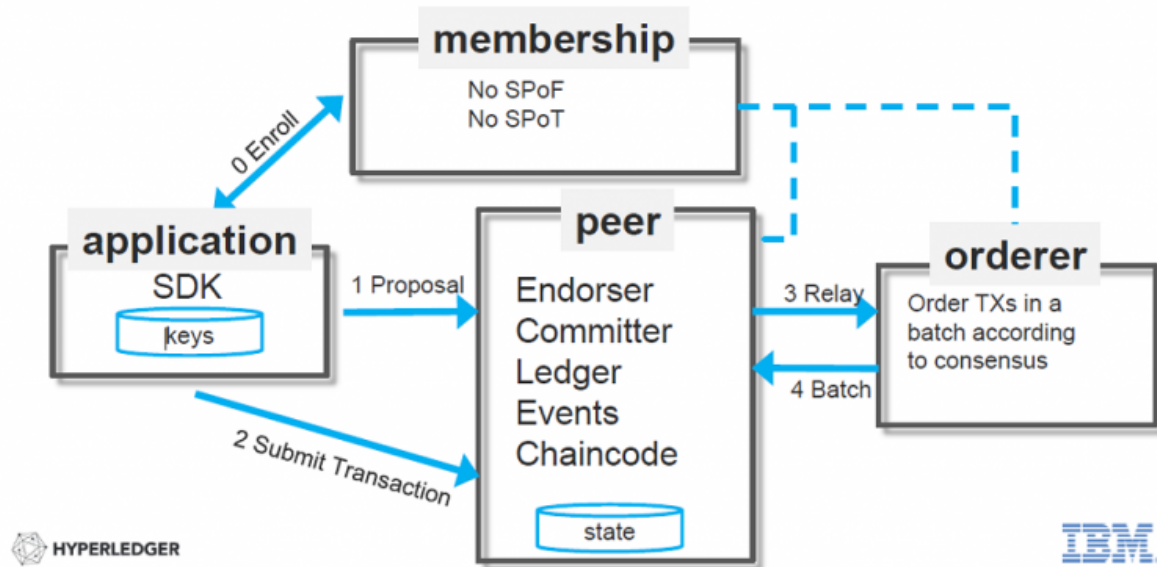


Figure 3.1

5.2 Supply Chain Network(Hyperledger Fabric) Phase1

Fabric v1.0 Architecture



Phase2

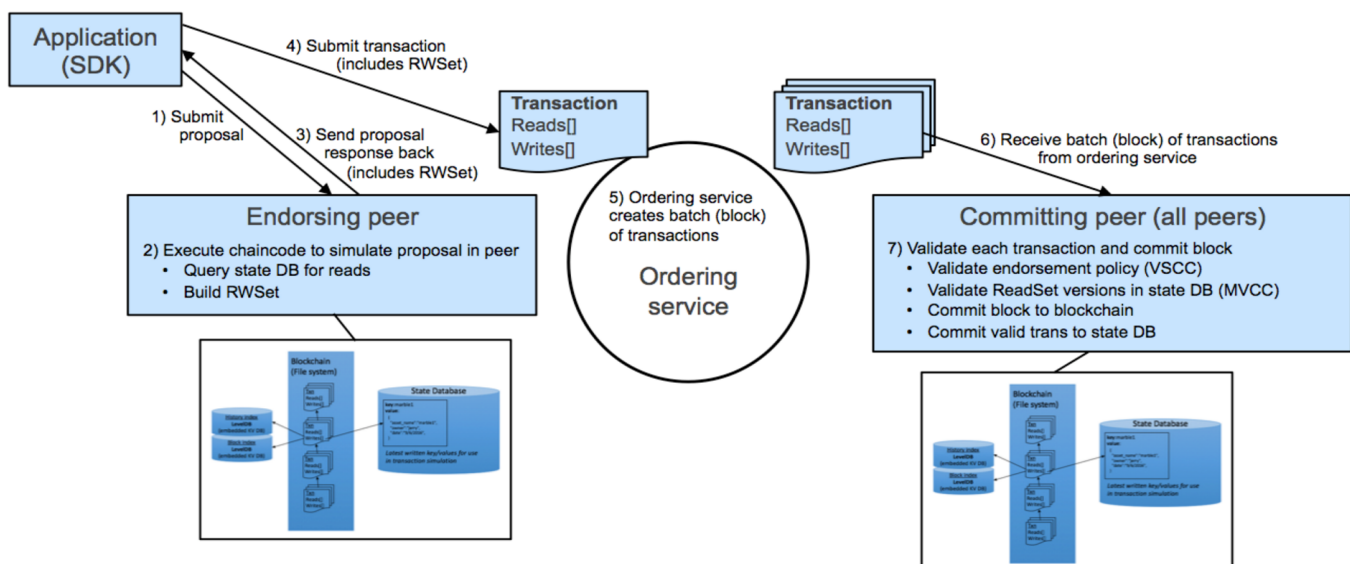


Figure 2.2

5.3 Blockchain Technology Driven Solution

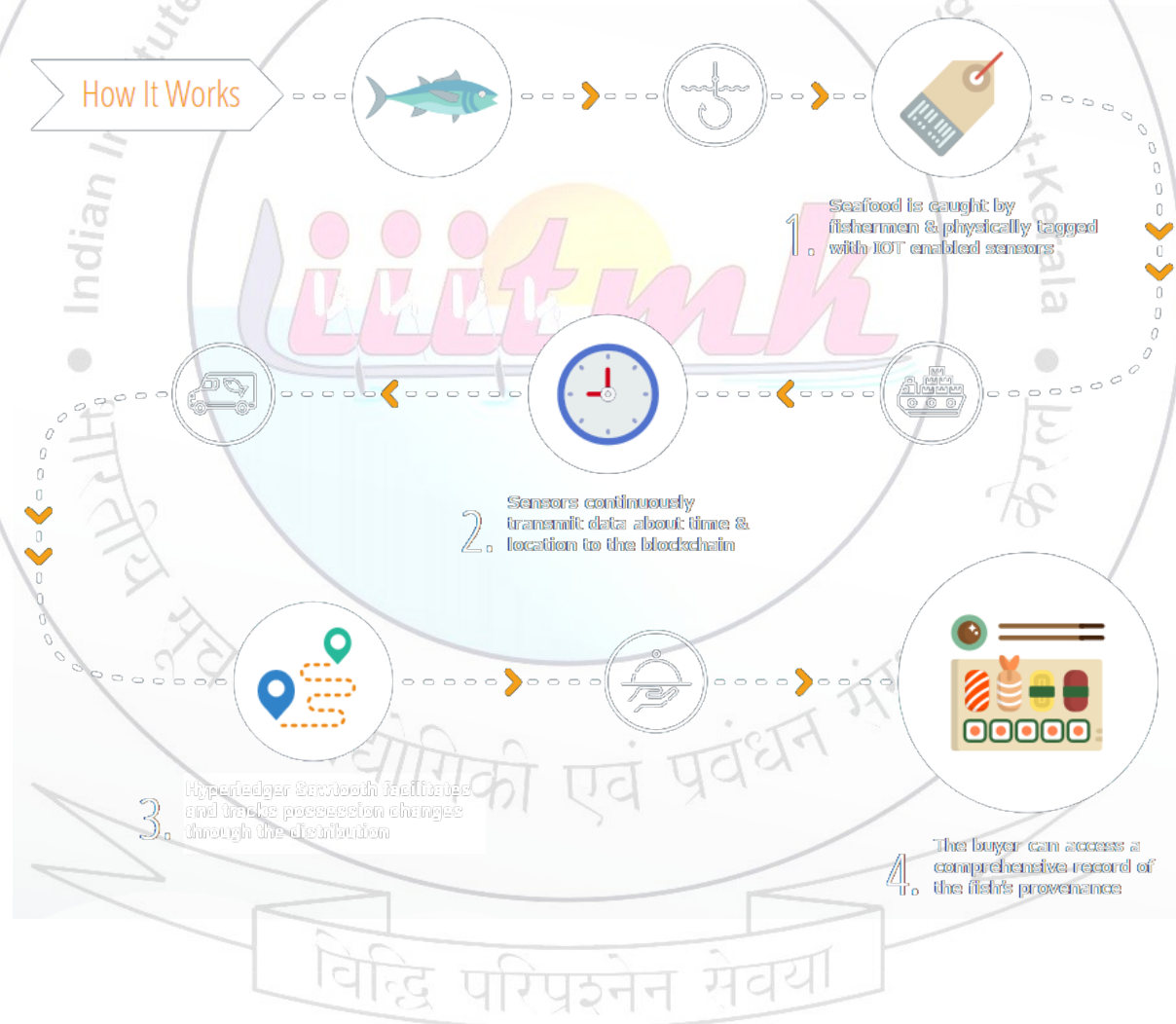
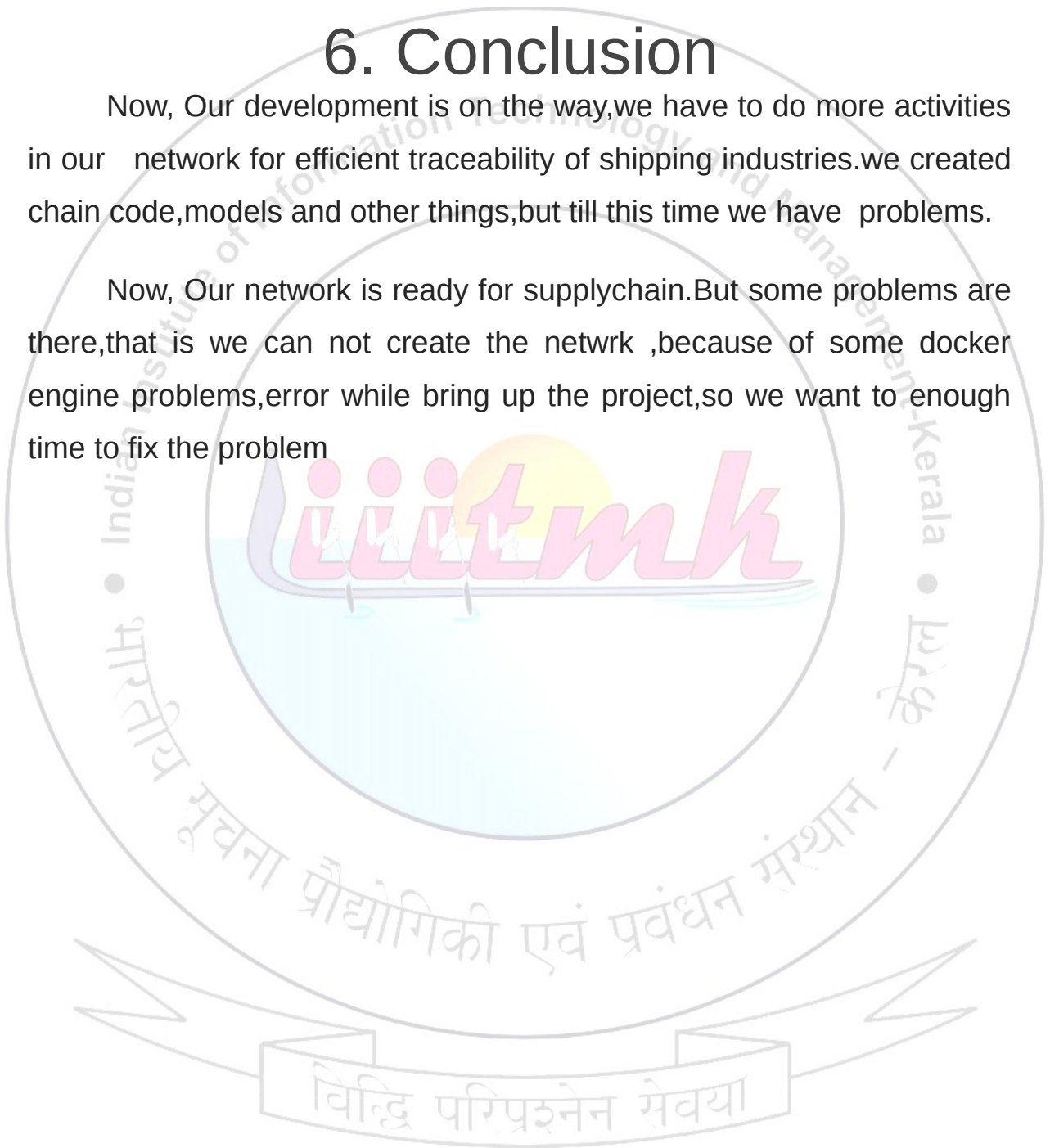


Figure.
2.3

6. Conclusion

Now, Our development is on the way,we have to do more activities in our network for efficient traceability of shipping industries.we created chain code,models and other things,but till this time we have problems.

Now, Our network is ready for supplychain.But some problems are there,that is we can not create the netwrk ,because of some docker engine problems,error while bring up the project,so we want to enough time to fix the problem



7. Reference

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