

BLOCKCHAIN USE CASE FOR POWER INDUSTRY

1. DEFINITION

Hyperledger Fabric is a blockchain framework implementation and one of the Hyperledger projects hosted by The Linux Foundation. Intended as a foundation for developing applications or solutions with a modular architecture, Hyperledger Fabric allows components, such as consensus and membership services, to be plug-and-play. Hyperledger Fabric leverages container technology to host smart contracts called “chaincode” that comprise the application logic of the system.

– Reference: www.hyperledger.org

2. HYPERLEDGER FABRIC FOR POWER DISCOM

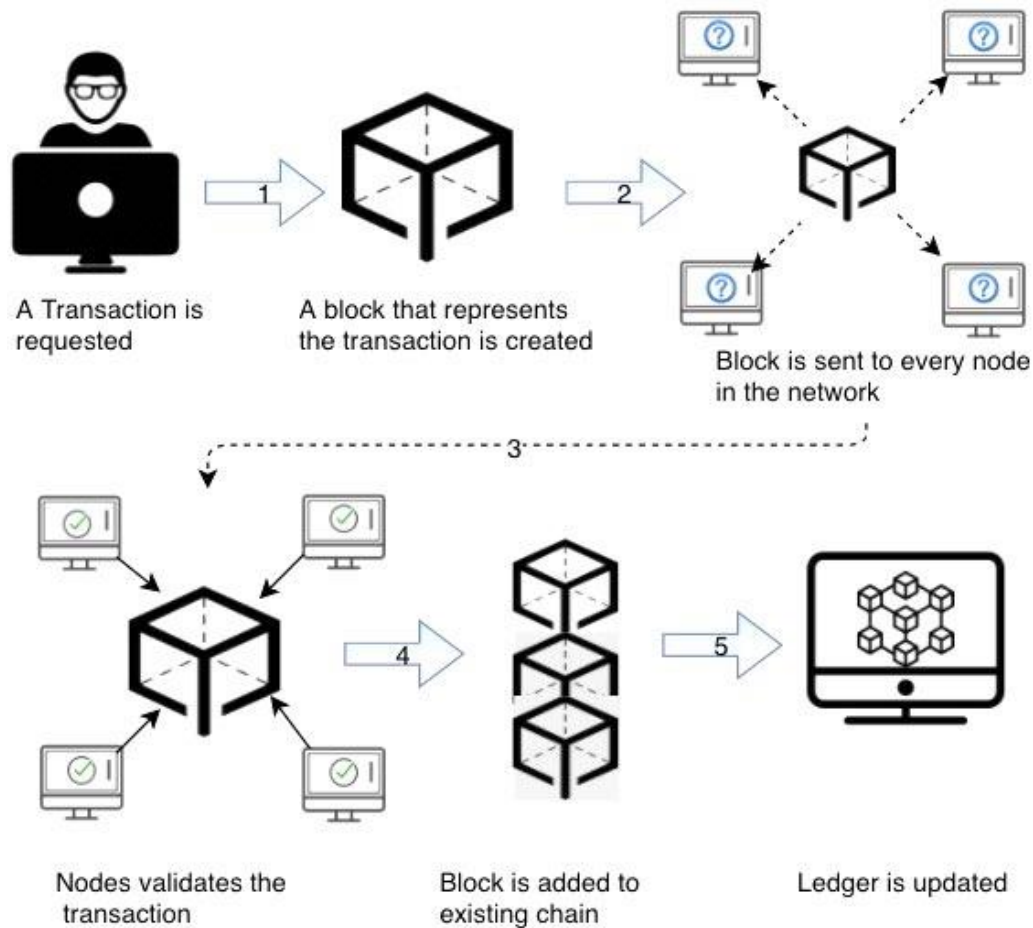
GenX is a pioneer in Blockchain based solution. Apart from doing pilots for a few use cases, GenX has been running a ‘Digital Closed Loop Wallet’ for an Indian Discom Company using Hyperledger Fabric. GenX deployed the Hyperledger Fabric as per Linux Foundation Architectural guidelines and implemented Chaincode. GenX also implemented a transaction system for Wallet charging, collection transaction, pre-paid smart meters voucher generation and recharging.

The Discom has been facing challenges in faster and efficient collection of bills in secured and trusted manner. It wants to allow various individual agents as well as agencies such as CSCs to collect money from consumers on their behalf. The Discom also wants to ensure that there are no revenue leakages as part of this collection network expansion. So, the Discom decided to implement a Blockchain based Digital Closed Loop Wallet where each agent/agency will be given a wallet on the blockchain. They will charge their wallet by putting money in specified banks and collect payments from consumers till they have money in the wallet and consequently re-charge the wallet and continue the process. Similarly, the pre-paid agents will generate electronic vouchers using blockchain till they have money in their wallets; transfer vouchers to their mobile phones and charge pre-paid meters using NFC (Near Field Technology). The collections are also reconciled with the billing systems of the Discom.

GenX decided to implement the solution using Hyperledger fabric. Below are the advantages of blockchain technology:

Specification	Description
Transparency	Transaction histories are becoming more transparent through the use of blockchain using distributed ledger technology.
Security	Enhanced Security: Blockchain has an opportunity to really change how critical information is shared by helping to prevent fraud and unauthorized activity
Efficiency	Increased Efficiency & Speed: By streamlining and automating these processes with blockchain, the transactions can be completed faster and more efficiently.
Traceability	Improved Traceability: This historical transaction data trail can help to verify the authenticity of assets and prevent fraud
Cost	Reduced Cost: Using Blockchain network, we don't need as many third parties or middlemen to make guarantees because it doesn't matter if you can trust your trading partner; we just need to trust data on blockchain network.
Decentralization	Blockchain actually allows individual transactions to have their own proof of validity and the authorization to enforce those constraints

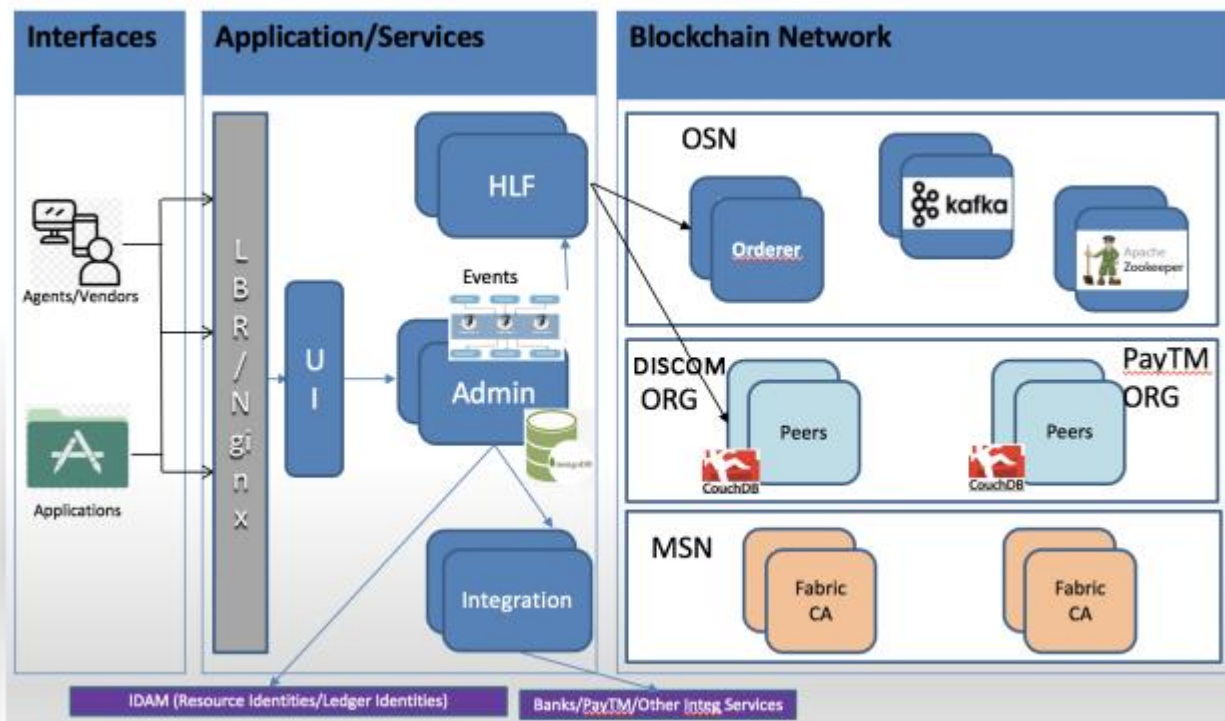
3. HOW THE BLOCKCHAIN TECHNOLOGY WORKS



Building Blocks of Blockchain

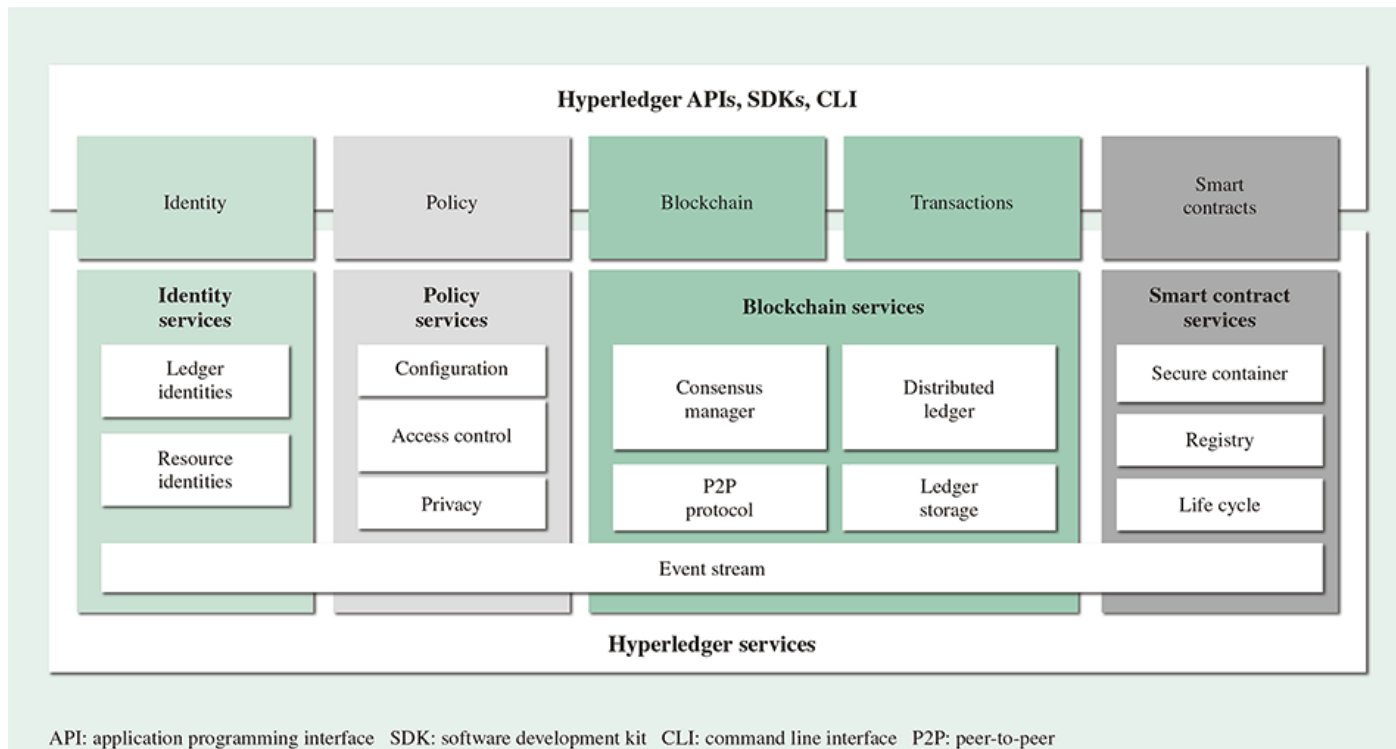
- Distribution of Information to multiple hosts.
- Signed Transactions powered by Public Key Infrastructure.
- Cryptographic hashing
- Democratic Digital Consensus

4. DISCOM: DIGITAL WALLET ARCHITECTURE



5. HYPERLEDGER FABRIC COMPONENTS

DEPLOYED AT THE DISCOM



Blockchain Data Model (Sample)

DISCOM

```
{
  "$class": "org.discom.product.dwallet.Org",
  "organisation": "DISCOM",
  "email": "admin@discom.in",
  "balance": 100,
  "Account": []
}
```

Payment Agents

```
{
  "$class": "org.discom.product.dwallet.PaymentAgent",
  "firstName": "Ram",
  "lastName": "Kumar",
  "email": "ramK@acme.org",
  "balance": 0,
  "Account": []
}
```

Transactions

```
{
  "$class": "org.discom.product.dwallet.CreditAmount",
  "txnId": "t2",
  "walletId": "w3",
  "Amount": 1000,
  "description": "Credit given amount to Digital Wallet",
  "owner":
  "resource:org.discom.product.dwallet.PaymentAgent#pawanG@example.org"
}
```

11

Blockchain Chain-Code Sample

```
// Set stores the asset (both key and value) on the ledger. If the key exists,
// it will override the value with the new one
func set(stub shim.ChaincodeStubInterface, args []string) (string, error) {
    if len(args) != 2 {
        return "", fmt.Errorf("Incorrect arguments. Expecting a key and a value")
    }

    err := stub.PutState(args[0], []byte(args[1]))
    if err != nil {
        return "", fmt.Errorf("Failed to set asset: %s", args[0])
    }
    return args[1], nil
}

// Get returns the value of the specified asset key
func get(stub shim.ChaincodeStubInterface, args []string) (string, error) {
    if len(args) != 1 {
        return "", fmt.Errorf("Incorrect arguments. Expecting a key")
    }

    value, err := stub.GetState(args[0])
    if err != nil {
        return "", fmt.Errorf("Failed to get asset: %s with error: %s", args[0], err)
    }
    if value == nil {
        return "", fmt.Errorf("Asset not found: %s", args[0])
    }
    return string(value), nil
}
```

6. BLOCKCHAIN DEPLOYMENT MODELS

COMPARISON

Category	Self Managed – Any cloud/private data center	Cloud Managed – IBM/Oracle
Infrastructure Operations	Custom Managed	Provider Managed
Expertise	Needed <ul style="list-style-type: none"> Blockchain 	Needed <ul style="list-style-type: none"> Blockchain Provider specific
Time	High	Medium
Cost	Low - Depends on usage	High - Depends on usage
Flexibility	High	Low – Depends on Provider support
Control	High	Low