COMP 5703 IT Capstone Project

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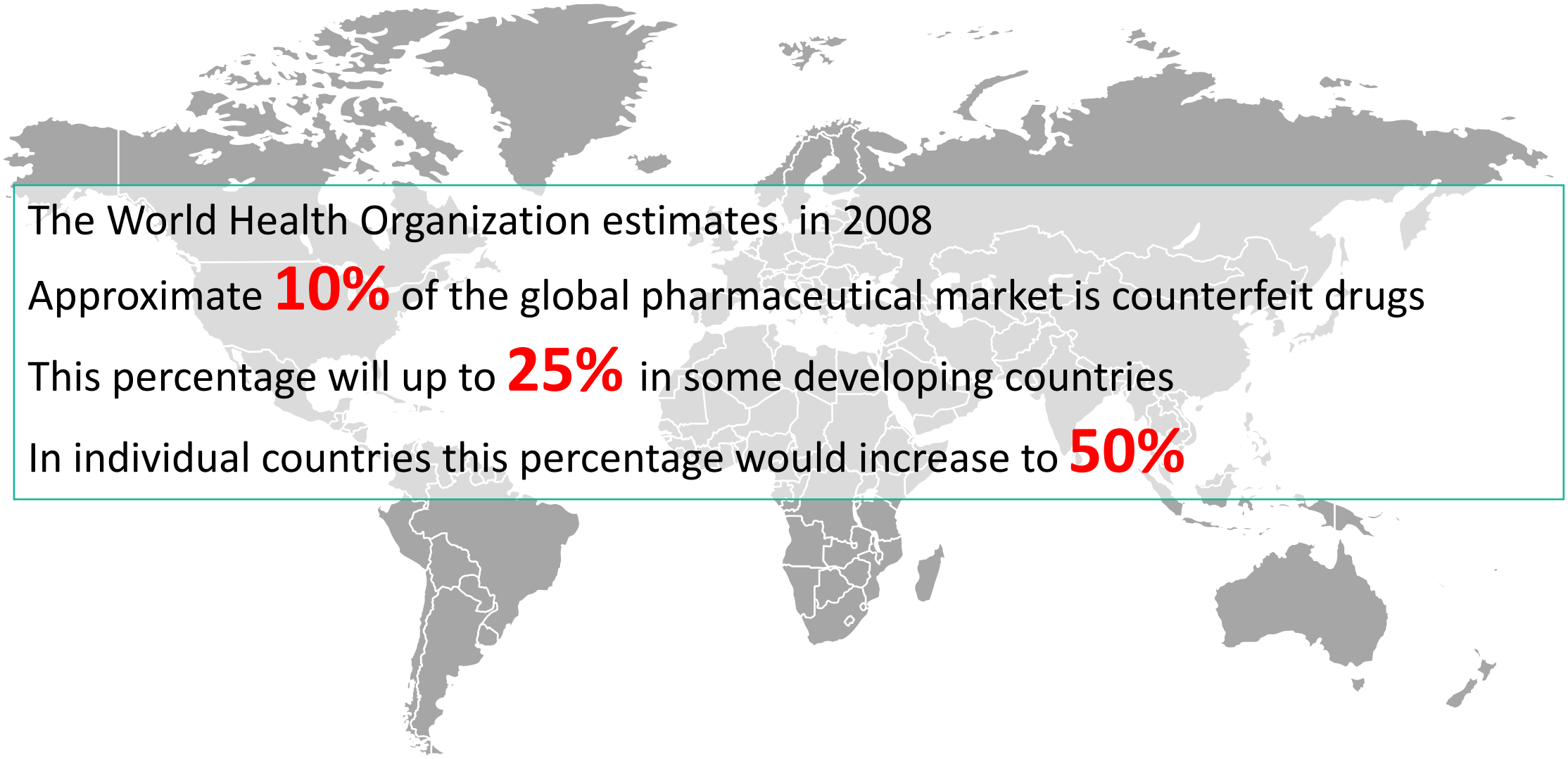
Background



The World Health Organization estimates in 2008

Approximate **10%** of the global pharmaceutical market is counterfeit drugs

This percentage will up to **25%** in some developing countries

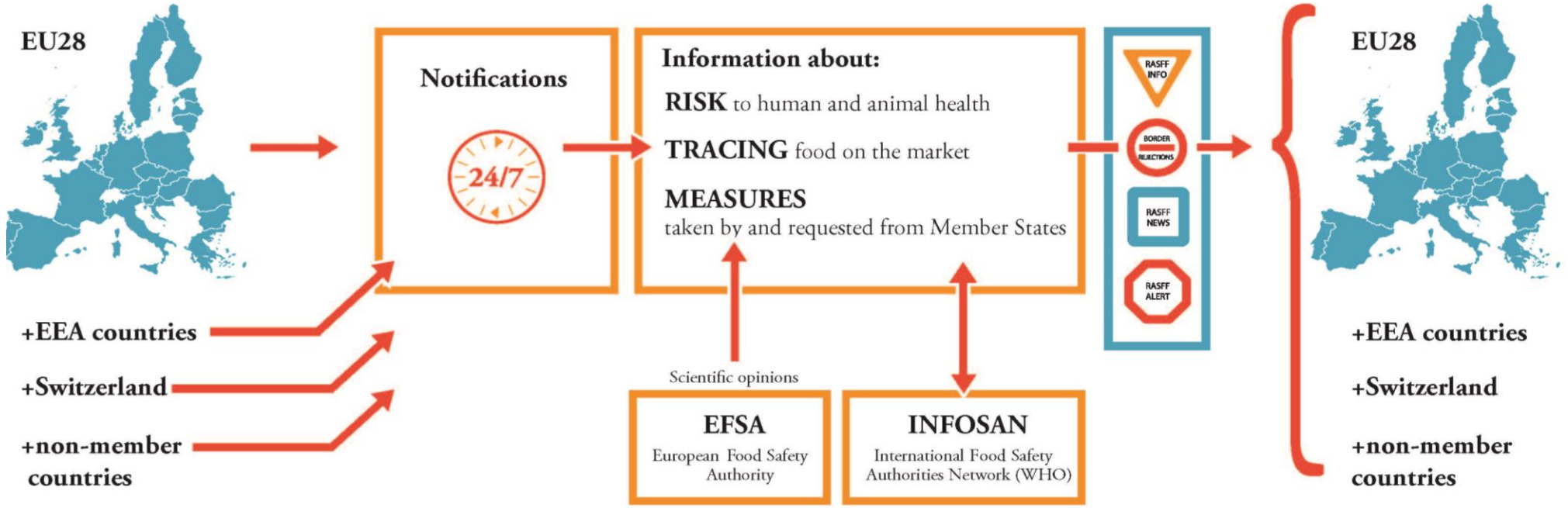
In individual countries this percentage would increase to **50%**

Existing Platforms

Mobile Authentication Service(MAS)

- The National Agency for Food and Drug Administration and Control (NAFDAC)

Existing Platforms



Rapid Alarm and Product Recall System

- Exchange of information between 31 European countries and the European Commission about dangerous non-food products

Objective

Objective

Problems

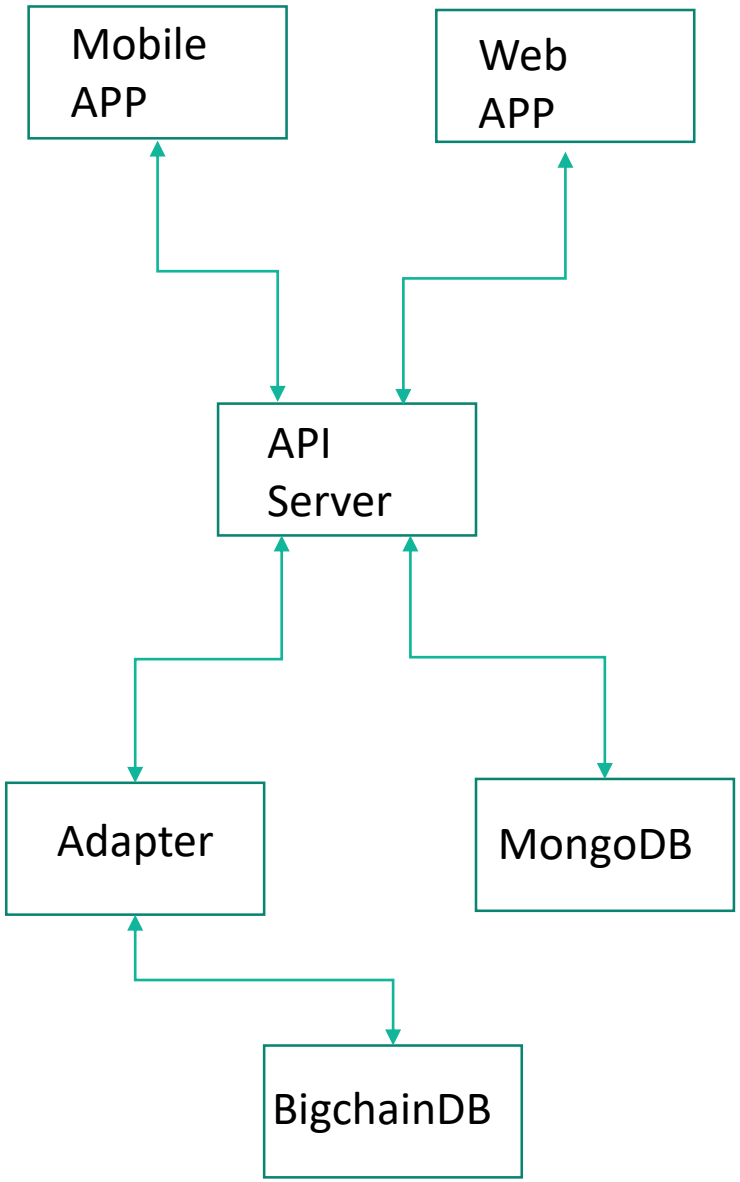
1. Serial Number Reuse
2. Unauthenticated producer (most likely produce fake drug)

Solution

1. Blockchain system: BigchainDB
2. Producer Authentication

Deliverables

1. Api Server
2. Mobile Application
3. Web Application



Methodology & Demonstration

Blockchain & API server

Mobile App

Web App

Methodology – Blockchain

URL of our blockchain system: BigchianDB

http://188.166.250.43:9984/


```
{
  "api": {
    "v1": {
      "assets": "/api/v1/assets/",
      "docs": "https://docs.bigchaindb.com/projects/server/en/v1.1.0/http-client-server-api.html",
      "outputs": "/api/v1/outputs/",
      "statuses": "/api/v1/statuses/",
      "streams": "ws://localhost:9985/api/v1/streams/valid_transactions",
      "transactions": "/api/v1/transactions/"
    }
  },
  "docs": "https://docs.bigchaindb.com/projects/server/en/v1.1.0/",
  "keyring": [],
  "public_key": "CkCoQrxsD4YhNTAV6pDBoWvb24qZDMsDXfsVwDRryWSe",
  "software": "BigchainDB",
  "version": "1.1.0"
}
```

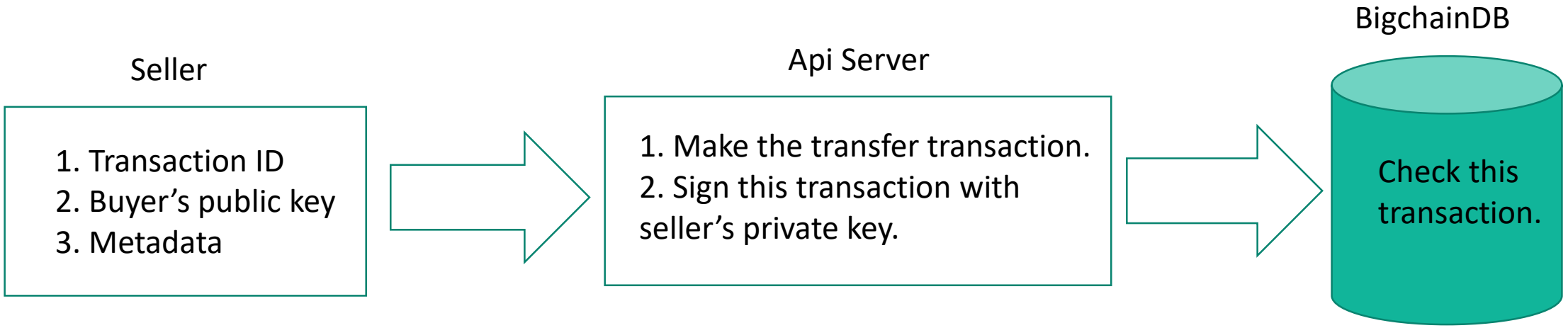

Deployed on ubuntu 14.04

Single stand-alone BigchainDB node

Methodology – Blockchain

Serial Number Reuse Solution

Use transaction ID instead of the serial number.



Possible Situation

1. Real transaction ID
2. Invalid transaction ID
3. Reused transaction ID

Real Transaction ID
Save this transaction and send back the transaction ID.


```
{
    "user_profile": {
        "_id": "59e30e6abd282b06f6199c52",
        "updatedAt": "2017-10-15T07:29:46.419Z",
        "createdAt": "2017-10-15T07:29:46.419Z",
        "email": "alice",
        "password": "1234",
        "private_key": "3xBnQ23nKm6kYTkRmqCYumFqToFsDYnEQo41g9KhE1ZA",
        "public_key": "AQYP5fpZt3ytZ4AtVzxUdxEzpe3TCBQF9LSFuFR7vFL4",
        "__v": 0
    },
    "transaction_id": "143a9b111d9419c95d86dee6463fa02de7f697658557cb49dc2795c4e0b892ff"
}
```


BigchainDB

Check the transaction.

Api Server

Send back the transaction ID.

Seller

Show the new transaction ID.

Buyer

Check the transaction ID and pay for the drug.

Api Server

Check the failure message and response to seller's mobile.

Seller

No transaction ID to show.

Buyer

The drug is fake. Don't pay.

Invalid transaction ID
Reused transaction ID
Do not save this transaction and send back the failure message.

Invalid Transaction ID Failure Message


```
{
    "url": "http://localhost:9984/api/v1/transac
    "status": 404,
    "statusText": "NOT FOUND",
    "headers": {
        "_headers": {
            "server": [
                "gunicorn/19.7.1"
            ],
            "date": [
                "Tue, 17 Oct 2017 06:13:44 GMT"
            ],
            "connection": [
                "close"
            ],
            "content-type": [
                "application/json"
            ],
            "access-control-allow-origin": [
                "*"
            ],
            "content-length": [
                "47"
```


Reused Transaction ID Failure Message


```
{
    "url": "http://localhost:9984/api/v1/transactions",
    "status": 400,
    "statusText": "BAD REQUEST",
    "headers": {
        "_headers": {
            "server": [
                "gunicorn/19.7.1"
            ],
            "date": [
                "Tue, 17 Oct 2017 06:13:12 GMT"
            ],
            "connection": [
                "close"
            ],
            "content-type": [
                "application/json"
            ],
            "access-control-allow-origin": [
                "*"
            ],
            "content-length": [
                "163"
```

Methodology – Api Server

URL of our Api Server

http://188.166.250.43:3000/

API_SERVER

COMP5703_BLOCKCHAIN_IOT_GROUP_3

Method	URL	Function
get	/	Show homepage.
get	/user	Show user profile.
post	/user/signup	Sign up with email and password.
post	/user/login	Login with email and password.
post	/blockchain/create_new_asset	Create new asset.
post	/blockchain/transfer_asset	Transfer the asset from the seller to the buyer.
post	/blockchain/transaction_check	Check if the user is the owner of the transaction.

Deployed on ubuntu 14.04

Inner Tech

1. mongoose
2. dotenv
3. passport
4. JWT
5. bigchaindb-driver

Methodology – Api Server

Problems

1. Serial Number Reuse
2. Unauthenticated producer (most likely produce fake drug)

Solution

1. Blockchain system: BigchainDB
2. Producer Authentication


```
{
    "msg": "You are not allowed to create new asset."
}
```


Only the authenticated producer can add drug into the system and get the valid transaction ID.


```
{
    "user_profile": {
        "_id": "59eac3f7ae4c8a695818d257",
        "updatedAt": "2017-10-21T03:54:39.627Z",
        "createdAt": "2017-10-21T03:50:15.233Z",
        "email": "alice",
        "password": "1234",
        "private_key": "EqzgZom8BvQXEQs3yXuBGZJPMKzxUdcHRU5g3husHdpr",
        "public_key": "Af5EmfRdvTqExVdPo3QfdVNFLUAsMH13twuWxxixLifY",
        "producer": "yes",
        "__v": 0
    },
    "asset": {
        "drug": {
            "serial_number": "sydney_201710221449",
            "manufacturer": "Jiang"
        }
    },
    "transaction_id": "8b5de85c14ebc75ac19fbcd542b1a82ee80259ecf1115b7e667c285c08252383"
}
```

Methodology – Mobile App

- React-native

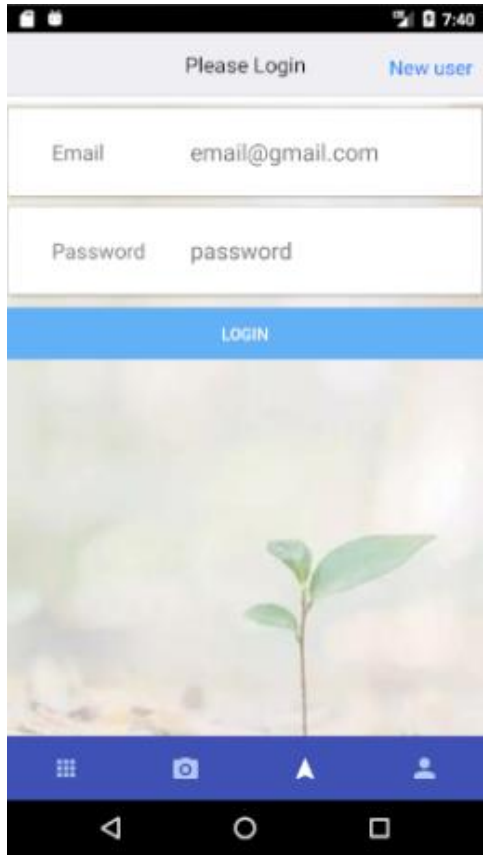
  Community-driven, Code reuse and cost saving, Live reload
- redux-thunk

  applyMiddleWare: enabling asynchronous function
- React-native-router-flux

  Scene: navigation between different pages
- axios

  Post, get
- nativebase

Demonstration – Mobile App

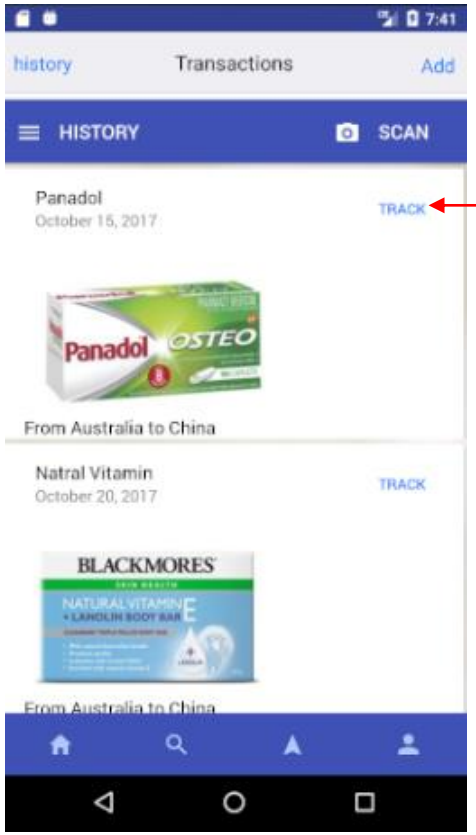


Not existing user

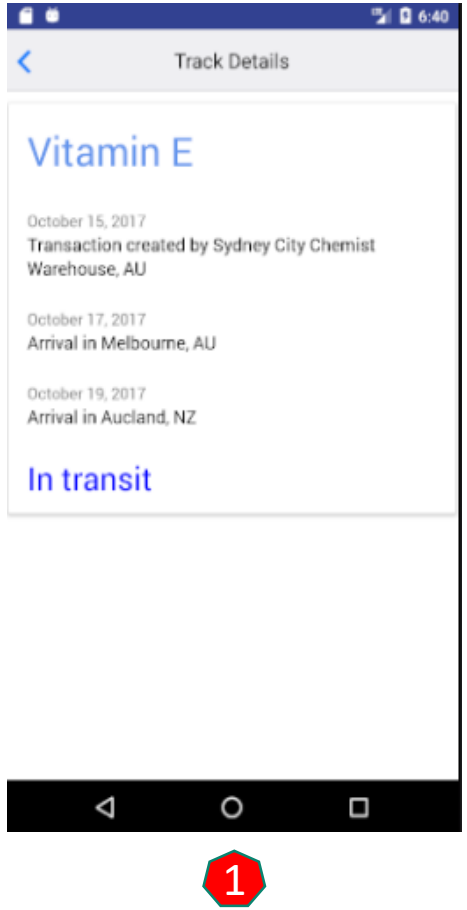
Click new user

After you create a new account successfully, the app will navigate back to login page again

Existing user

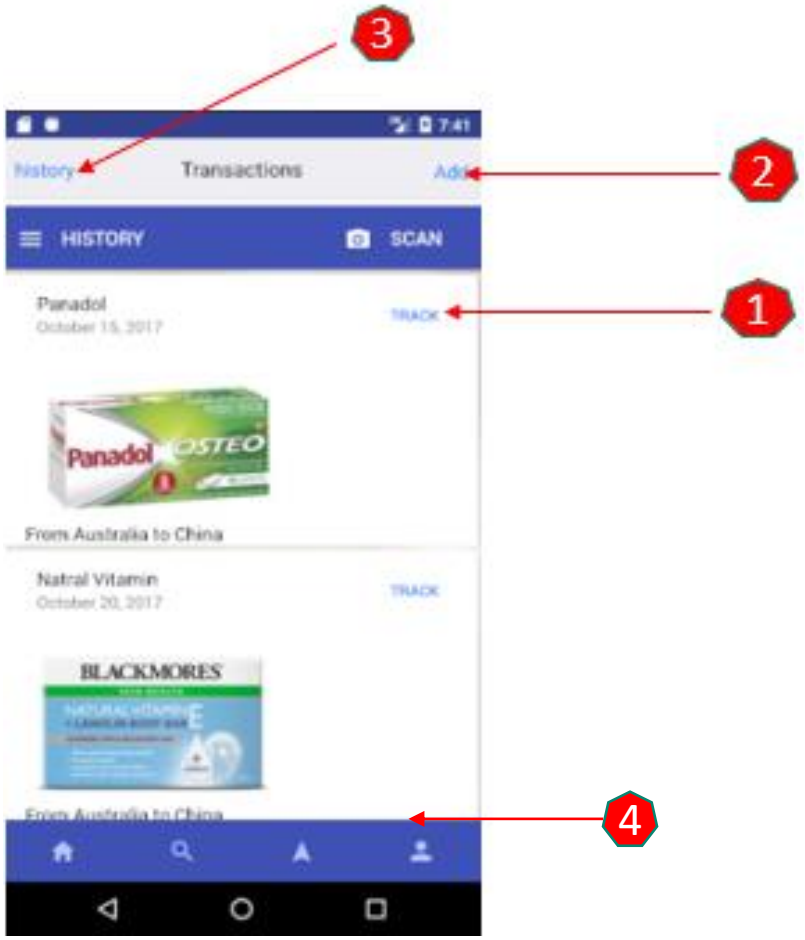


1



1

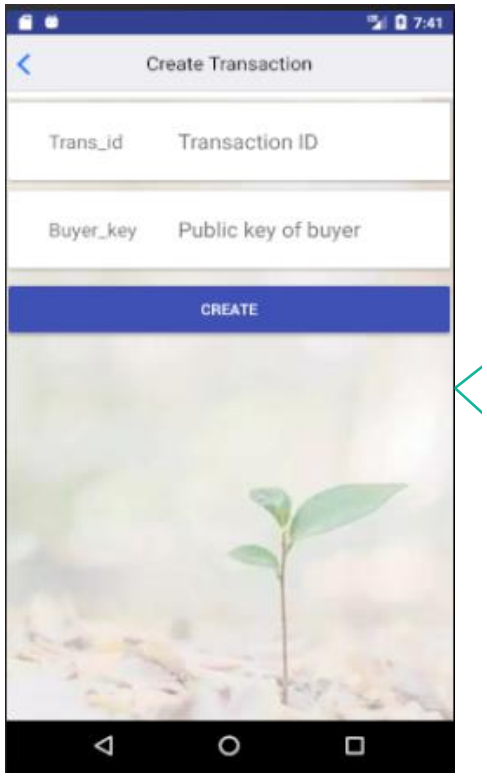
Demonstration – Mobile App



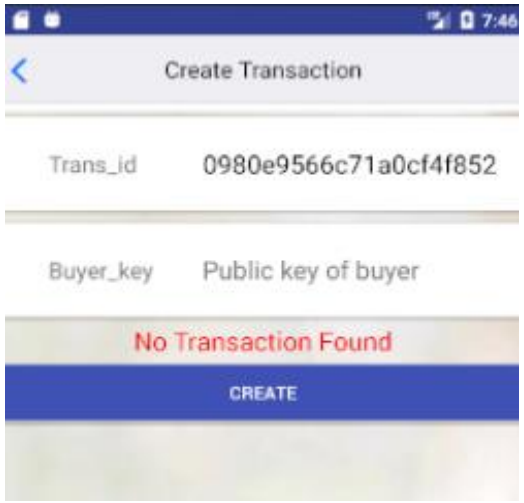
3

4

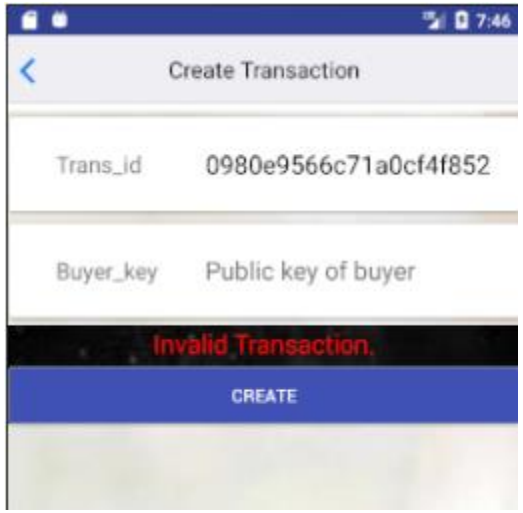
Demonstration – Mobile App



Fail transaction

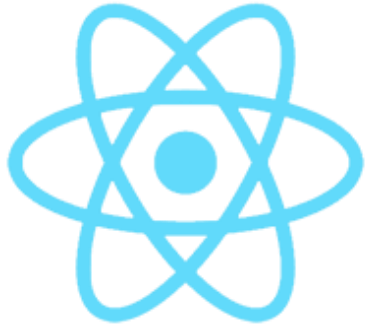


No transaction found



Suspicious transaction

Methodology — Web App

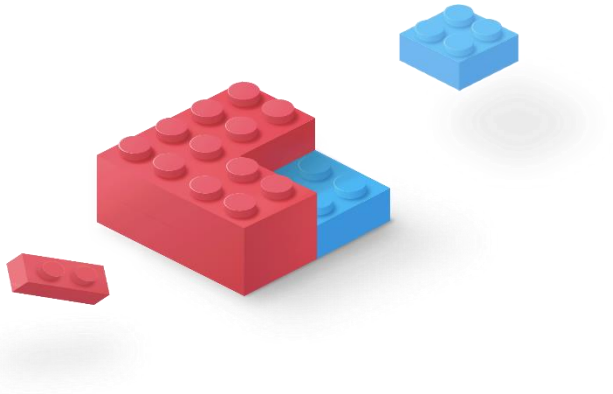


React

Reusable components

Redux

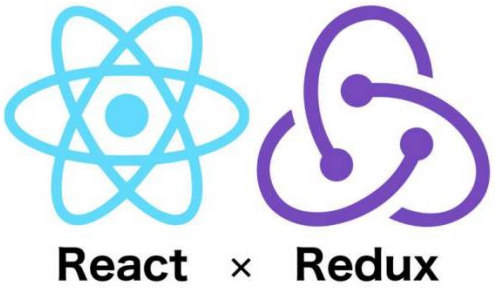
Manage and operate the states



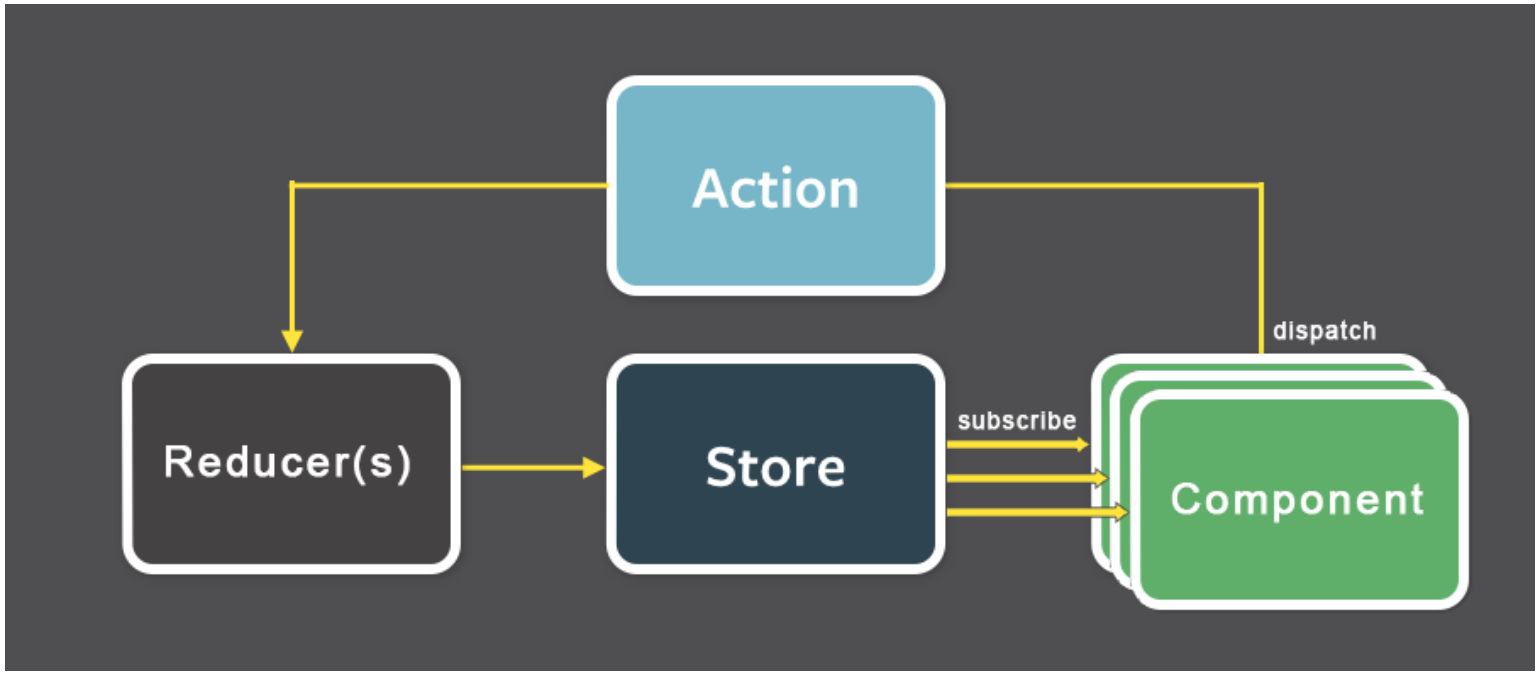
Ant Design

The UI designer

Methodology — Web App



Advantages



localhost:8080

Hilda

localhost:8080

Medicine Tracking System

Bring you a healthy life

LogIn / Register

THREE LAYERS OF PROTECTION

CRYTOGRAPHIC CERTAINTY

Rely on the mathematical assurance that cryptography protects the identity of your products from being copied or faked

LOGISTICS TRACKING

Delve into a fully auditable record of your shipment's logistics movements with confidence that any anomalies can be detected

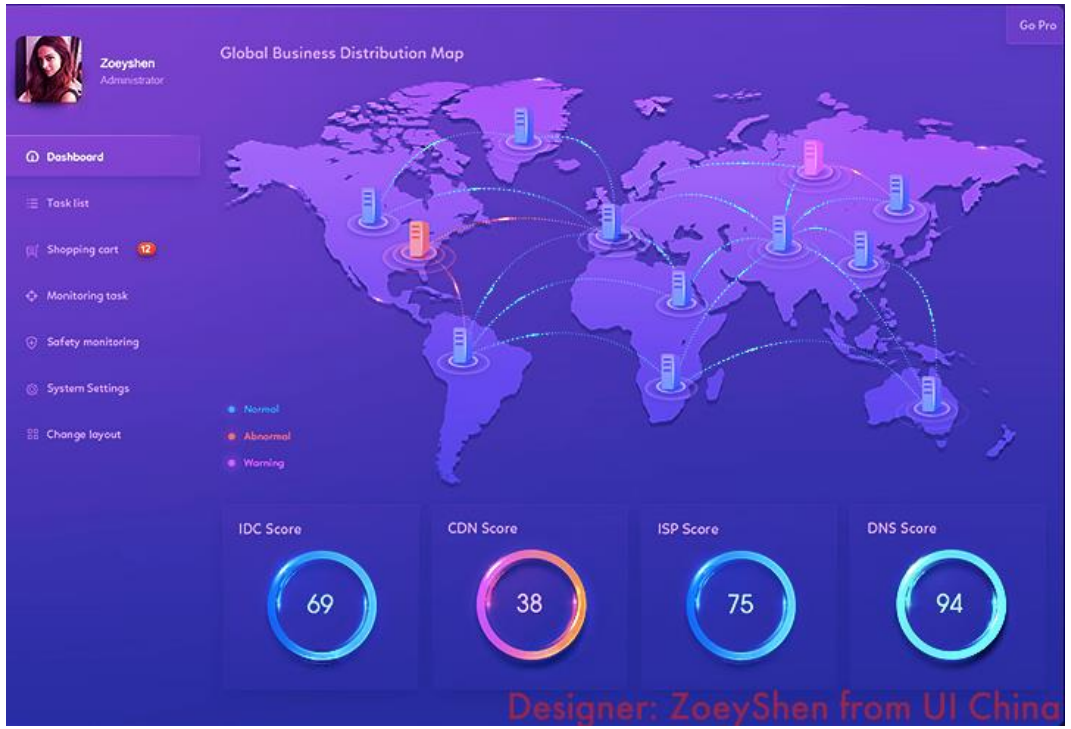
BLOCKCHAIN TECHNOLOGY

Be certain that this innovative new technology defeats the business model of counterfeiters as it prevents the sale of copies

Discussion & Evaluation

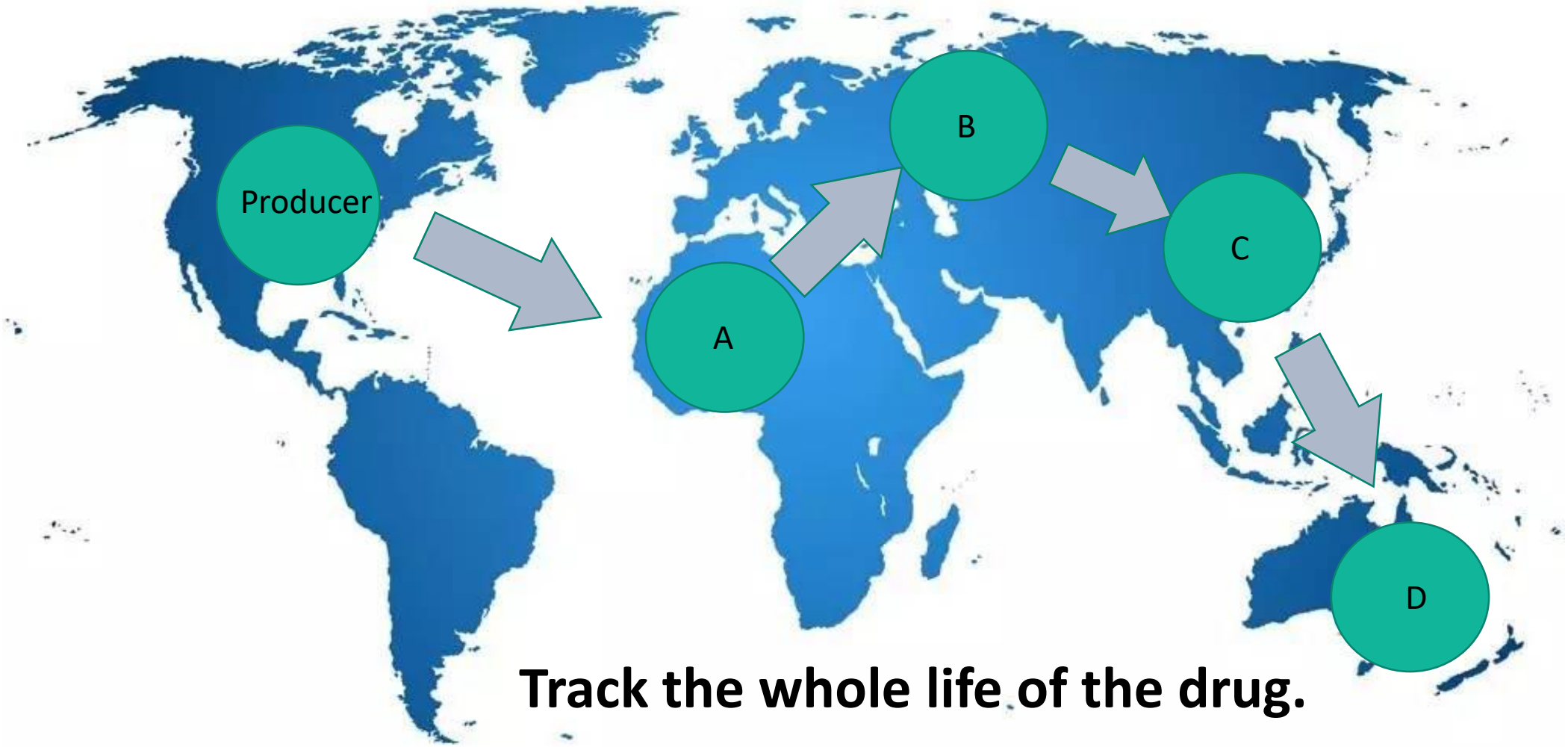
Web App Blockchain & API server Mobile App

Evaluation & Discussion — Web Application



- Show the Private and Public key as QR code
- Optimize the display way of logistics information
- Reduce page jumps and optimize UI design
- … …

Evaluation & Discussion – Api Server



Track the whole life of the drug.

Evaluation & Discussion - Mobile App

- Scan Function is still a challenge

a. scan the barcode attached on the product to get the transaction id of the product

b. the public key of the buyer should be stored in the phone as QR code. In transaction, the seller can scan the QR code to access the buyer's public key in order to complete transaction

- UI design needs to be optimized

header, button, layout

- Real-time track

Google api

Summary & Reflection

Summary

A consistent pharmaceutical track system enabled by bigChainDB.

- **Api:** account creation, user login, product creation, product transaction
- **Web Application:** user creation and login, transaction history, product creation, product ownership check up
- **Mobile App:** user login and creation, track product in transit, check transition history, product transaction,

The system can guarantee the uniqueness of the product and the genuine characteristics of the pharmaceutical.

Reflection

- Experienced many new technologies such as blockchain database, React-Redux framework, React-native
- The structure and concept of react native are a little difficult to understand
- High reusability of react native code in different platforms
- Blockchain system is efficient to guarantee the uniqueness of transaction


Thank
you