IBC Project Work Log

Using Hyperledger Fabric to store and share Human Ageing Genomics data

CSE 528
Introduction to Blockchain and Cryptocurrency
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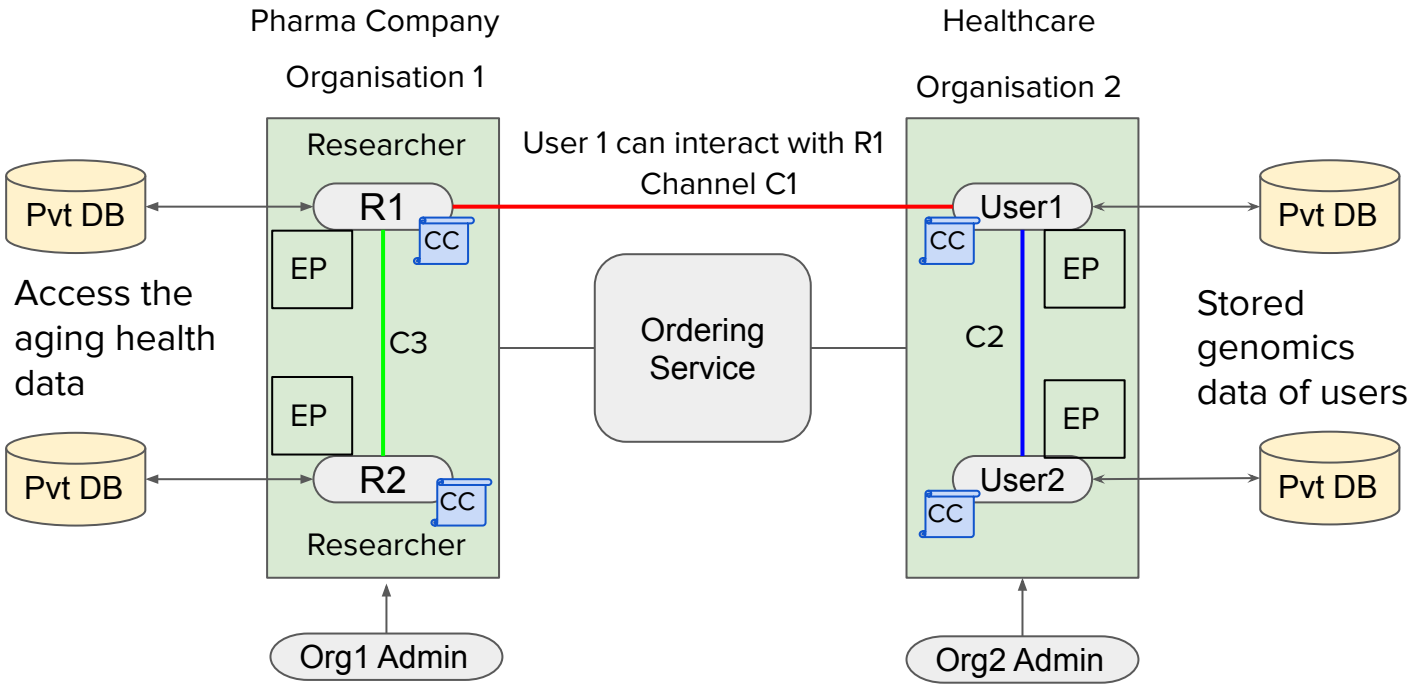
Block diagram



31-03-21

- Installed hyperledger/fabric-couchDB docker container
- Identified docker-compose-couch.yaml to edit couchdb username and pwd.
- Identified sample.py file in fabric-sdk-py/docs
- Core.yaml path - fab-sdk-py/fabric-bin/config
- Modify the content of blockchain state in the ledger section of core.yaml to select couchDB as the statedatabase
- Creation of index to query specific genomic data can be really helpful.

CouchDB

https://hyperledger-fabric.readthedocs.io/en/release-1.4/couchdb_as_state_database.html

https://docs.couchdb.org/en/stable/api/database/find.html

Run this command to install docker container running couchdb

hyperledger/fabric-couchdb

Chaincode asset data

Assets (Ageing genomic data) ---> modelled as **JSON** data.

01-04-21

- Revision of today's IBC class.
- CouchDB python, able to run couchdb-python at http://127.0.0.1:5984/ , followed simple example from 1. Getting started with couchdb-python
- Came across couchdb 2, Install couchdb 3 pekrau/CouchDB2
- Sample application docker https://docs.docker.com/get-started/02_our_app/
- Ran hyperledger fabric-couchdb https://github.com/apache/couchdb-docker

Couchdb Interface

http://127.0.0.1:5984/_all_dbs/

http://127.0.0.1:5984/_utils

02-04-21

- **Command to run:** docker run -p 5984:5984 -d hyperledger/fabric-couchdb
- List all databases: http://localhost:5984/_all_dbs/
- Access couchdb database: http://127.0.0.1:5984/_utils/
- Tutorial: https://www.tutorialkart.com/couchdb-tutorial/
- DockerUser - https://deeptiman.medium.com/couchdb-as-a-state-database-in-hyperledger-fabric-adb5d820c82e
- http://www.dev.fyicenter.com/1001245_CouchDB_Container_Used_in_Hyperledger_Fabric.html
- Storage of genomic data using couchdb database

Creating docker file

1. Create a simple Python Script with called **test.py** inside a directory (say **hello-demo**). Copy the below statement inside the Python script and save it inside the directory. **print("Hello World!")**
2. Inside the same directory, create another file called Docker file. In this file, we will define the sequence of steps needed to create the Docker Image. Take a look at the below *Dockerfile* template.

- FROM python:3
- WORKDIR /usr/src/app
- COPY . .
- CMD ["test.py"]
- ENTRYPOINT ["python3"]

3. **Create docker image,** sudo docker build -t hello-demo **.**
4. **Verify the Image Build** sudo docker images
5. **Running the Docker Container** sudo docker run -it hello-demo test.py

04-04-21

- Made a plan for execution, importance of indexes, stored as an image
- Identified collections_config used during chaincode instantiate is a path to the collections configuration file.
- Started couchdb: **ghanendra@ghanendra:~/fabric-sdk-py/test/fixtures$ docker-compose -f docker-compose-couch.yaml up**

05-04-21

- Defining policy for collections_config

06-04-21 to 09-04-21

- Shim **APIS** are defined inside the chaincode.
- Private data stored in Leveldb or Couchdb.
- Using Get_Transient( ) API cc can retrieve data.
- Checked chaincodes, **GetPrivateData QueryResult()** for CouchDB.

10-04-21

- Peers access the chaincode functions.
- Installed marbles_cc_private chaincode onto channel.
- Transient map is defined in hfc/utils.
- Collection_config_policy defined in hfc/fabric/channel
- Hyperledger Fabric SDK for node.js Tutorial: How to use private data

1. **Access Pvt data from chaincode or CLI.**
2. **Using Couchdb pvt database.**

Week 2 Marbles_cc_private chaincode to be used for creating my own chaincode.

Writing Your First Chaincode — hyperledger-fabricdocs master documentation

13-04-21

Still struggling with the **Transient map** Initialization problem.

- Executed simple **example_cc** chaincode, Invoked and Query.

14-04-21

- Transient map definition is incorrect.
- Importance of arguments during chaincode instantiation.
- Executed example cc, Invoke functions - invoke, delete, query.
- Chaincode function **fcn** is used in chaincode_invoke command.
- Installation of **marbles_cc** on the peers and running cc fcns.

15-04-21

- Writing transient map properly for private data access
- Success in running **marble_cc_private** chaincode
- Use **docType** for defining type of documents that can be shared among orgs.
- Executed all the chaincode function of the marble_cc_private. **:)**
- Addition of Supplementary information to slides- https://bmcmedgenomics.biomedcentral.com/articles/10.1186/s12920-020-00732-x#Sec21
- Plan for creation of a chaincode **genomic_cc**.
- Check with CouchDB as state database, GET_QUERY_RESULT failed: transaction ID: 2d9e911f3ce3ea2a89b22adf7645696404012a70344f75aaaf6365eadcaa9b51: **Execute Query not supported for leveldb**
- Role of Indexes to store and query rich genomic databases.

16-04-21

- Understanding of **shim APIs** at deeper level. (Read more in detail.)
- Creation of chaincode in go.
- https://en.wikipedia.org/wiki/Gene (Defining struct of gene)
- **Genomic_cc.go** chaincode created, requires slight modifications.
- Deleted docker images of chaincode packages - **docker rmi IMAGE ID**

19-04-21

- Running all functions **fcns** of **genomic_cc** chaincode chaincode.
- Addition of organisations and peers to the fabric network.
- Access of CouchDB from chaincode, running private data access functions like GetState, PutState, GetStateByRange,GetQueryResult.
- Develop understanding of the asset transfer Fabric sample demonstrates use of CouchDB queries from chaincode.
- asset Transfer Basic
- Define channels, collections, endorsement policies.
- Define fabric ca and msp.
- How to **access peer's CouchDB state database,** Couchdb Fauxton can be used to create and update indexes.
- Check genomic_cc.go couchdb.

22-04-21

- http://192.168.99.100:5984/_utils/#/database/mydemochannel/_all_docs
- Defining Index to store data.
  "{\"index\":{\"fields\":[\"docType\",\"owner\"]},\"name\":\"indexOwner\",\"ddoc\":\"indexOwnerDoc\",\"type\":\"json\"}" http://hostname:port/myc1_assets/_index
- Backend technology enabler is **docker and docker-compose**.
- Docker-compose basics to understand how multiple containers interact with each other to integrate CouchDB with each peer.
- https://docs.docker.com/compose/gettingstarted/
- Modified docker-compose-2orgs-4peers-tls.yaml file to incorporate Couchdb service as docker container to each peers.

23-04-21

- Blockchain add NFT genomics data news of George Church to Presentation.
- Add couchdb 2 and 3 to organisation org2 peers.
- Creation of indexes and store data using chaincode to Couchdb.
- **args = ['{"selector":{"gene":"ATTCGGATAACGCG"}}'] ,** for fcn = "queryLongetivityMapByGene"

24-04-21

- **Creating chaincode from scratch.**
- Chaincode for Developers — hyperledger-fabric
- Verify index was deployed on the chaincode.
- Query data using indexes.
- Use shim apis to access data, read and write private data.

26-04-21

- Adding encryption on chaincode example - Hyperledger Fabric encryption_cc
- Executed **simpleAsset** chaincode, Putstate, Getstate function.
- Execute GetPrivateData, PutPrivateData,