

2020

Pharma Supply Chain Network Hyperledger Solution to Tackle Drug Counterfeiting



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1. Introduction

Drug counterfeiting is a major problem faced by pharmacy supply chain eco-systems worldwide and has potential negative consequences alike for all stakeholders. This Capstone project is intended to build a Blockchain solution using Hyperledger Fabric to tackle the drug sham challenge through tamper-evident architecture provided by Blockchain technology. Current document explains the overall network architecture, various stakeholders modeled, process of starting the network, installing and instantiating chaincode and testing out various transactions.

1.1. Network Stakeholders:

There are five stakeholder organizations in the supply chain network -

- Manufacturer
- Distributor
- Retailer
- Consumer
- Transporter

Each of these orgs contributes two peers to the Hyperledger fabric network that is setup.

Interaction workflow between these orgs is depicted below -



2. Network Topology

- Name of the network is **pharma-network**
- There is one orderer on the network, 2 peers for each of the 5 orgs for a total of 10 peers, 5 certification authorities one per org and a CLI node - amounting to **17 docker containers** that are started as part of network setup.
- Each organization has only “Admin” user
- TLS is disabled on the network

2.1. Orderer Properties

- **Orderer Type** : Solo
- **Orderer Name** : orderer.pharma-network.com

2.2. Organization Peers and CAs

Each of the stakeholder organization has -

- One Certificate Authority
- Two Peers

The properties of each peer are demonstrated in below table -

Organization	CA Name	Peer Name	Anchor Peer	Chaincode Installed	Endorser On Network	Endorser For Client App
Manufacturer	ca.manufacturer.pharma-network.com	peer0.manufacturer.pharma-network.com	✓	✓	✓	✓
		peer1.manufacturer.pharma-network.com	✗	✓	✓	✗
Distributor	ca.distributor.pharma-network.com	peer0.distributor.pharma-network.com	✓	✓	✓	✓
		peer1.distributor.pharma-network.com	✗	✓	✓	✗
Retailer	ca.retailer.pharma-network.com	peer0.retailer.pharma-network.com	✓	✓	✓	✓
		peer1.retailer.pharma-network.com	✗	✓	✓	✗
Consumer	ca.consumer.pharma-network.com	peer0.consumer.pharma-network.com	✓	✓	✓	✓
		peer1.consumer.pharma-network.com	✗	✓	✓	✗
Transporter	ca.transporter.pharma-network.com	peer0.transporter.pharma-network.com	✓	✓	✓	✓
		peer1.transporter.pharma-network.com	✗	✓	✓	✗

3. Project Structure

- The project is built from scratch using **Visual Studio Code** as the editor.
- Open the project files using VS Code and not other editors like “Atom” to avoid formatting/ indentation issues.
- Entire **pharma-net** project is organized into below listed main folders -
 - ❖ network
 - ❖ chaincode
 - ❖ application
 - ❖ test
- There is an additional “chaincode-advanced” folder which is empty and only used during docker volume mappings
- These folders are further organized into hierarchical sub-folders that follow software industry standard best practices like modularity, cohesion, separation of concerns, single responsibility principle and DRY (Don’t Repeat Yourself).

The project folders are explained in further sections.

3.1. network

network folder contains all the artifacts related to Docker network setup. The structure and files available in this folder are outlined below.

Folder/ File Name	Purpose
Bin	Contains all the fabric binaries required during network setup phase
channel-artifacts	Channel artifacts such as orderer genesis file, channel creation and anchor peer updates are stored in this folder during network setup
docker-base	Contains base Docker compose YAML files for orderer and peer configurations
Scripts	Has network automation script modules used during network setup
configtx.yaml	Configuration file to generate channel artifacts
crypto-config.yaml	Configuration file to generate crypto materials
docker-compose.yml	Main Docker compose YAML file for the pharma network
fabricNetwork.sh	Network automation shell script

3.2. chaincode

chaincode folder contains the smart contracts with core business logic of pharma network. pharmanet chaincode is comprised of below listed three smart contracts-

➤ **registrationcontract:**

Business logic for-

- ❖ Instantiating chaincode on the network
- ❖ Register new company
- ❖ Add new drug

➤ **transferdrugcontract:**

Business logic for-

- ❖ Create purchase order
- ❖ Create shipment
- ❖ Update shipment
- ❖ Retail drug

➤ **viewlifecyclecontract:**

Business logic for-

- ❖ View drug history
- ❖ View drug current state

Structure of chaincode folder is explained below.

Folder/ File Name	Purpose
Contracts	Contains the three contracts that are part of pharmanet chaincode
Enums	Enum objects used across all smart contracts
Utils	Helper files with common functions for ledger operations
index.js	Main entry file for the NodeJS smart contract
package.json	JSON configuration file listing all the dependencies and scripts
package-lock.json	Auto generated file from "npm install" command

3.3. application

Contains code for the Node.JS application to

- Submit transactions on the network by invoking respective smart contracts functions
- Create node server and expose API end points for accessing from Postman

Structure of this folder is explained below

Folder/ File Name	Purpose	Sub Folder	Sub Folder Purpose
ccps	Common Connection Profiles for each organization on the network		
enums	Enum objects used throughout the application		
helpers	Helper files for establishing gateway connections to network and file system functions		
identity	Folder where auto-generated wallets for each organization are stored		
modules	Node.JS modules for submitting transactions on fabric network	common	Common modules to auto generate org wallets
		registration	Modules to submit transactions to registration smart contract
		transferdrug	Modules to submit transactions to transfer drug smart contract
		viewlifecycle	Modules to submit transactions to view lifecycle smart contract
routes	HTTP request handlers for each of the Node.JS modules		
index.js	Main entry point for the Node.js application		
package.json	JSON configuration file listing all the dependencies		

3.4. test

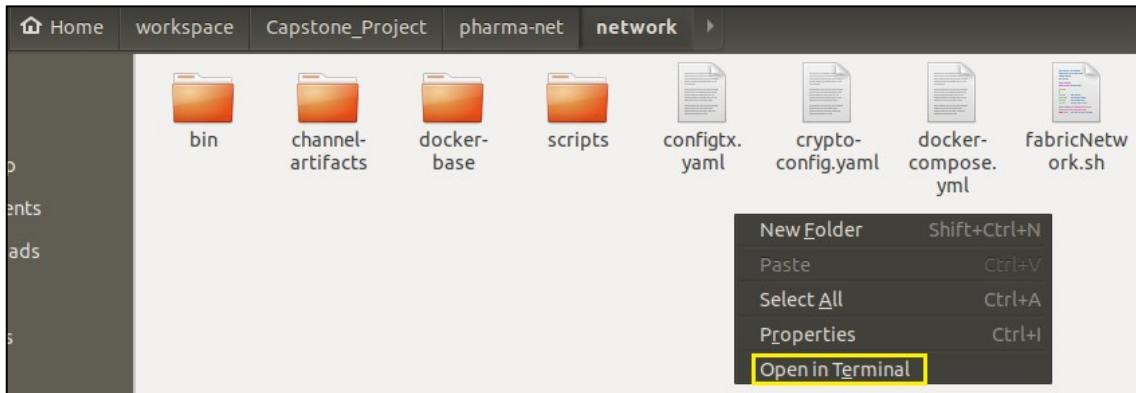
Contains postman collection files for initiating test HTTP requests through postman -

- **History.postman_collection.json:** Collection file for History Track Down test cases
- **Initiation.postman_collection.json:** Collection file for Initiation test cases
- **Supply Chain.postman_collection.json:** Collection file for Supply Chain test cases

4. Pre setup steps

This section details the steps to be performed before starting network setup

- **Step 1:** Download zip folder from Google Drive link available in assignment submission page.
- **Step 2:** Unzip the folder to a suitable location on Ubuntu machine.
- **Step 3:** Navigate to “pharma-net > network” path inside unzipped folder
- **Step 4:** Right click anywhere inside network folder and select “Open in Terminal” as shown below



This will open Terminal pointing to network folder as shown below

```
File Edit View Search Terminal Help
upgrad@upgrad-VirtualBox:~/workspace/Capstone_Project/pharma-net/network$
```

- **Step 5:** Execute below command and ensure that no Docker containers are running.

```
docker ps -a
```

The output of above command should look similar to shown in below screenshot:

CONTAINER ID	IMAGE	COMMAND	CREATED	STATUS	PORTS	NAMES
upgrad@upgrad-VirtualBox:~/workspace/Capstone_Project/pharma-net/network\$						

In case any containers are running, use below command to force kill them and re-run "docker ps -a" command to ensure all containers have been removed

```
docker rm -f $(docker ps -aq)
```

- **Step 6:** Run below command in the terminal to ensure no stale docker images are available

```
docker images
```

The output of this command should look like below:

REPOSITORY	TAG	IMAGE ID	CREATED	SIZE
hyperledger/fabric-tools	1.4.3	18ed4db0cd57	8 months ago	1.55GB
hyperledger/fabric-tools	latest	18ed4db0cd57	8 months ago	1.55GB
hyperledger/fabric-ca	1.4.3	c18a0d3cc958	8 months ago	253MB
hyperledger/fabric-ca	latest	c18a0d3cc958	8 months ago	253MB
hyperledger/fabric-ccenv	1.4.3	3d31661a812a	8 months ago	1.45GB
hyperledger/fabric-ccenv	latest	3d31661a812a	8 months ago	1.45GB
hyperledger/fabric-orderer	1.4.3	b666a6ebbe09	8 months ago	173MB
hyperledger/fabric-orderer	latest	b666a6ebbe09	8 months ago	173MB
hyperledger/fabric-peer	1.4.3	fa87cca0ef	8 months ago	179MB
hyperledger/fabric-peer	latest	fa87cca0ef	8 months ago	179MB
hyperledger/fabric-javaenv	1.4.3	5ba5ba09db8f	9 months ago	1.76GB
hyperledger/fabric-javaenv	latest	5ba5ba09db8f	9 months ago	1.76GB
hyperledger/fabric-zookeeper	0.4.15	20c6045930c8	13 months ago	1.43GB
hyperledger/fabric-zookeeper	latest	20c6045930c8	13 months ago	1.43GB
hyperledger/fabric-kafka	0.4.15	b4ab82bbaf2f	13 months ago	1.44GB
hyperledger/fabric-kafka	latest	b4ab82bbaf2f	13 months ago	1.44GB
hyperledger/fabric-couchdb	0.4.15	8de128a55539	13 months ago	1.5GB
hyperledger/fabric-couchdb	latest	8de128a55539	13 months ago	1.5GB
hyperledger/fabric-baseimage	amd64-0.4.15	c4c532c23a50	13 months ago	1.39GB
hyperledger/fabric-baseos	amd64-0.4.15	9d6ec11c60ff	13 months ago	145MB

upgrad@upgrad-VirtualBox:~/workspace/Capstone_Project/pharma-net/network\$

In case the command shows any image with repository like "**dev-peer*.*.pharma-network.com-***", use below command to remove these images (Substitute **[ImageID]** with "Image ID" available from above command for dev images) - see below screenshots for reference. This step is required to ensure no stale code is left over from any previous runs before starting network setup.

```

docker rmi ImageID
upgrad@upgrad-VirtualBox:~/workspace/Capstone_Project/pharma-net/network$ docker images
REPOSITORY          IMAGE ID        CREATED         SIZE
dev-peer1.consumer.pharma-network.com-pharmanet-1.1-a210503486c55954aba482afe1fbf9481c82a325f4608b2667067df3407c4186   latest
0c842a5ccde2      17 hours ago    1.46GB
dev-peer0.retailer.pharma-network.com-pharmanet-1.1-05226a74d169555b961a3a5137c0734c2ea1493c7cdab8ffae52ae5506a6e893   latest
4d7bb7447e3b      20 hours ago    1.46GB
dev-peer0.distributor.pharma-network.com-pharmanet-1.1-d6cbc72fbbcd3a5d7c6823a4adb814cf4b83f53b14935ac5e1b30ffc19e6b12   latest
33301832ded1      24 hours ago    1.46GB
dev-peer0.transporter.pharma-network.com-pharmanet-1.1-6fbb3cff19badbd63e61939b5749a095b0c24b7d447f7cd37c9dbb7b0a21515d   latest
aa4b6000ee5e      25 hours ago    1.46GB
dev-peer0.manufacturer.pharma-network.com-pharmanet-1.1-e495267999d574714379b7cdccb79910870aad9e77dfbd65a90bdbbe33890ca9   latest
b6fd04e78594      25 hours ago    1.46GB
dev-peer0.manufacturer.pharma-network.com-pharmanet-1.1-941d9f41fb3927bb09dd9345376e89e8c838651f9ca9196ab5ff6d70be099b48   latest
4de3795c2e07      26 hours ago    1.46GB
hyperledger/fabric-tools          1.4.3
18ed4db0cd57      8 months ago   1.55GB
hyperledger/fabric-tools          latest
18ed4db0cd57      8 months ago   1.55GB
hyperledger/fabric-ca             1.4.3
c18a0d3cc958      8 months ago   253MB
hyperledger/fabric-ca             latest
c18a0d3cc958      8 months ago   253MB
hyperledger/fabric-ccenv          1.4.3
3d31661a812a      8 months ago   1.45GB
hyperledger/fabric-ccenv          latest
3d31661a812a      8 months ago   1.45GB
hyperledger/fabric-orderer       1.4.3
b66aa6ebbe09      8 months ago   173MB
hyperledger/fabric-orderer       latest
upgrad@upgrad-VirtualBox:~/workspace/Capstone_Project/pharma-net/network$ docker rmi 4d7bb7447e3b
Untagged: dev-peer0.retailer.pharma-network.com-pharmanet-1.1-05226a74d169555b961a3a5137c0734c2ea1493c7cdab8ffae52ae5506a6e893:latest
Deleted: sha256:4d7bb7447e3b2ff7e1c662845c8905dbb145adcf5f387f134260ef6de8304163
Deleted: sha256:323cb4bb5b8971848e3b3b899149c1faa600377b10b8b351b58a5dfa9e1966
Deleted: sha256:19f5a9f09c3c9cafed993f14a95d631dd97cf7a3908864516889fac95e23ff3c
Deleted: sha256:986b483d7605fa0f1d7751749d5df7707e061a687ac84945f92ad01de6665
upgrad@upgrad-VirtualBox:~/workspace/Capstone_Project/pharma-net/network$ docker rmi 33301832ded1
Untagged: dev-peer0.distributor.pharma-network.com-pharmanet-1.1-d6cbc72fbbcd3a5d7c6823a4adb814cf4b83f53b14935ac5e1b30ffc19e6b12:latest
Deleted: sha256:33301832ded1cb0ba6fcbb32b9bd000f5dde402bcf0dba04ff5d06ac588c7123
Deleted: sha256:m2f213aaaf17e2bbff1b58921dc13682dae4ca443a22a1badcef1336632e3f8
Deleted: sha256:c828059dbae706808f67f37d19210a24d54090e430338422059c7fe172c5425
Deleted: sha256:08a022af4f559ef7281ab83325746026582187979f6cb447f08af1f27ce50b0
upgrad@upgrad-VirtualBox:~/workspace/Capstone_Project/pharma-net/network$ docker rmi aa4b6000ee5e
Untagged: dev-peer0.transporter.pharma-network.com-pharmanet-1.1-6fbb3cff19badbd63e61939b5749a095b0c24b7d447f7cd37c9dbb7b0a21515d:latest
Deleted: sha256:aa4b6000ee5e3692f386f149483a45fe4c7cc1f627d6521b23fa34064466029a
Deleted: sha256:f4da4954c7969a862b32800e32995bb3bd8da6a11ce867d0f0ae19
Deleted: sha256:83cab00938929c67090f299e5bd85d1bi188158235c0dc4d7c8esd314e5d3583
Deleted: sha256:d64da30644366c42bb5e42f9649daaceab28e12c95bbc1e80b9752d0a58e0
upgrad@upgrad-VirtualBox:~/workspace/Capstone_Project/pharma-net/network$ docker rmi b6fd04e78594
Untagged: dev-peer1.manufacturer.pharma-network.com-pharmanet-1.1-e495267999d574714379b7cdccb79910870aad9e77dfbd65a90bdbbe33890ca9:latest
Deleted: sha256:b6fd04e78594efab4a6d7a2ca2bfdf95824513b139d62f2face49985ad9d702
Deleted: sha256:1202a5b47bea5a1d96a17c1b1ecffed109e3f3bde4a10d63b0538143a33bce68
Deleted: sha256:ac6527e3c511b62ea1ba89d26775a521b726a4b1eb1e480216283a6605ec95c3
Deleted: sha256:c15205fa01c04b9e085669319513c76c6aa45b6436b92dae449453fd3273490d
upgrad@upgrad-VirtualBox:~/workspace/Capstone_Project/pharma-net/network$ docker rmi 4de3795c2e07
Untagged: dev-peer0.manufacturer.pharma-network.com-pharmanet-1.1-941d9f41fb3927bb09dbd345376e89e8c838651f9ca9196ab5ff6d70be099b48:latest
Deleted: sha256:4de3795c2e0739ee6b92aca4fdff4e1574b78c4b62ee7e128f4afc74f464577e
Deleted: sha256:73f23d85946395cff0ae08c3fb741cff22556158f7b820f6af36d2f4671a62f
Deleted: sha256:4fa2d6b48c7d141387c772c12366200ce01e93c1daaac69369aae6594cbd0270
Deleted: sha256:f0ad2f35a0924de697e053e9fe0aabb0705674a5c0ce95e8489d0241ee49
upgrad@upgrad-VirtualBox:~/workspace/Capstone_Project/pharma-net/network$ 

```

- **Step 7:** Run below commands one by one in terminal to give necessary permissions on fabric binaries required during network setup

```

cd bin
chmod 777 configtxlator
chmod 777 configtxgen
chmod 777 cryptogen
cd ..

```

Terminal screen will look like below once these commands are executed

```

upgrad@upgrad-VirtualBox:~/workspace/Capstone_Project/pharma-net/network$ cd bin
upgrad@upgrad-VirtualBox:~/workspace/Capstone_Project/pharma-net/network/bin$ chmod 777 configtxlator
upgrad@upgrad-VirtualBox:~/workspace/Capstone_Project/pharma-net/network/bin$ chmod 777 configtxgen
upgrad@upgrad-VirtualBox:~/workspace/Capstone_Project/pharma-net/network/bin$ chmod 777 cryptogen
upgrad@upgrad-VirtualBox:~/workspace/Capstone_Project/pharma-net/network/bin$ cd ..
upgrad@upgrad-VirtualBox:~/workspace/Capstone_Project/pharma-net/network$ 

```

- **Step 8:** Run below commands in terminal one by one to give necessary permissions on all files inside project folder

```

cd ../..
chmod 777 -R pharma-net
cd pharma-net/network

```

Terminal screen will look like below once commands are executed

```

upgrad@upgrad-VirtualBox:~/workspace/Capstone_Project/pharma-net/network$ cd ../..
upgrad@upgrad-VirtualBox:~/workspace/Capstone_Project$ chmod 777 -R pharma-net
upgrad@upgrad-VirtualBox:~/workspace/Capstone_Project$ cd pharma-net/network
upgrad@upgrad-VirtualBox:~/workspace/Capstone_Project/pharma-net/network$ 

```

- With this all pre-setup steps are completed and network setup can be started

5. Bootstrap pharma-network

- Starting pharma-network is a one step process by executing a single command which triggers the network automation script. The command performs following steps to bootstrap pharma-network:
 - ❖ Generates crypto-materials for all the 5 organizations
 - ❖ Generates channel artifacts for -
 - Orderer genesis block
 - Channel creation
 - Anchor peer updates for each org
 - ❖ Starts Docker containers for -
 - Orderer
 - 10 peers, 2 per org
 - 5 CAs, 1 per org
 - cli
 - ❖ Creates channel “**pharmacchannel**”
 - ❖ Joins all 10 peers of 5 orgs to pharmacchannel
 - ❖ Updates peer0 as Anchor peer for each org

- Run the following command to bootstrap pharma network inside terminal window

```
./fabricNetwork.sh up
```

- Command will ask confirmation as shown below. Simply press Enter to allow command to proceed.

```

upgrad@upgrad-VirtualBox:~/workspace/Capstone_Project/pharma-net/network$ ./fabricNetwork.sh up
Starting for channel 'pharmacchannel' with CLI timeout of '15' seconds and CLI delay of '5' seconds and chaincode version '1.1'
Continue? [Y/n] 

```

- Wait for command to complete network setup. Screenshots of terminal at different stages of command execution are shown below.

```

upgrad@upgrad-VirtualBox:~/workspace/Capstone_Project/pharma-net/network$ ./fabricNetwork.sh up
Starting for channel 'pharmacchannel' with CLI timeout of '15' seconds and CLI delay of '5' seconds and chaincode version '1.1'
Continue? [Y/n]
proceeding ...
LOCAL_VERSION=1.4.3
DOCKER_IMAGE_VERSION=1.4.3
/home/upgrad/workspace/Capstone_Project/pharma-net/network/bin/cryptogen

#####
##### Generate certificates using cryptogen tool #####
#####
+ cryptogen generate --config=./crypto-config.yaml
manufacturer.pharma-network.com
distributor.pharma-network.com
retailer.pharma-network.com
consumer.pharma-network.com
transporter.pharma-network.com
+ res=0
+ set +x

/home/upgrad/workspace/Capstone_Project/pharma-net/network/bin/configtxgen
#####
##### Generating Orderer Genesis block #####
#####
+ configtxgen -profile OrdererGenesis -channelID pharma-sys-channel -outputBlock ./channel-artifacts/genesis.block
2020-05-05 19:52:13.988 IST [common.tools.configtxgen] main -> INFO 001 Loading configuration
2020-05-05 19:52:14.244 IST [common.tools.configtxgen.localconfig] completeInitialization -> INFO 002 orderer type: solo
2020-05-05 19:52:14.245 IST [common.tools.configtxgen.localconfig] Load -> INFO 003 Loaded configuration: /home/upgrad/workspace/Capstone_Proj
ect/pharma-net/network/configtx.yaml

```

```
+ res=0
+ set +x

Creating network "network_pharmacy" with the default driver
Creating volume "network_orderer.pharma-network.com" with default driver
Creating volume "network_peer0.manufacturer.pharma-network.com" with default driver
Creating volume "network_peer1.manufacturer.pharma-network.com" with default driver
Creating volume "network_peer0.distributor.pharma-network.com" with default driver
Creating volume "network_peer1.distributor.pharma-network.com" with default driver
Creating volume "network_peer0.retailer.pharma-network.com" with default driver
Creating volume "network_peer1.retailer.pharma-network.com" with default driver
Creating volume "network_peer0.consumer.pharma-network.com" with default driver
Creating volume "network_peer1.consumer.pharma-network.com" with default driver
Creating volume "network_peer0.transporter.pharma-network.com" with default driver
Creating volume "network_peer1.transporter.pharma-network.com" with default driver
Creating ca.retailer.pharma-network.com ...
Creating peer0.manufacturer.pharma-network.com ...
Creating peer1.consumer.pharma-network.com ...
Creating ca.transporter.pharma-network.com ...
Creating ca.consumer.pharma-network.com ...
Creating ca.distributor.pharma-network.com ...
Creating peer1.distributor.pharma-network.com ...
Creating orderer.pharma-network.com ...
Creating peer0.retailer.pharma-network.com ...
Creating ca.manufacturer.pharma-network.com ...
Creating peer1.transporter.pharma-network.com ...
Creating peer1.manufacturer.pharma-network.com ...
Creating peer0.consumer.pharma-network.com ...
Creating peer0.transporter.pharma-network.com ...
Creating peer0.distributor.pharma-network.com ...
Creating peer1.retailer.pharma-network.com ...

+ res=0
+ set +x

Creating network "network_pharmacy" with the default driver
Creating volume "network_orderer.pharma-network.com" with default driver
Creating volume "network_peer0.manufacturer.pharma-network.com" with default driver
Creating volume "network_peer1.manufacturer.pharma-network.com" with default driver
Creating volume "network_peer0.distributor.pharma-network.com" with default driver
Creating volume "network_peer1.distributor.pharma-network.com" with default driver
Creating volume "network_peer0.retailer.pharma-network.com" with default driver
Creating volume "network_peer1.retailer.pharma-network.com" with default driver
Creating volume "network_peer0.consumer.pharma-network.com" with default driver
Creating volume "network_peer1.consumer.pharma-network.com" with default driver
Creating volume "network_peer0.transporter.pharma-network.com" with default driver
Creating volume "network_peer1.transporter.pharma-network.com" with default driver
Creating ca.retailer.pharma-network.com ...
Creating peer0.manufacturer.pharma-network.com ...
Creating peer1.consumer.pharma-network.com ... done
Creating ca.transporter.pharma-network.com ... done
Creating ca.consumer.pharma-network.com ...
Creating ca.distributor.pharma-network.com ... done
Creating peer1.distributor.pharma-network.com ... done
Creating orderer.pharma-network.com ...
Creating peer0.retailer.pharma-network.com ...
Creating ca.manufacturer.pharma-network.com ... done
Creating peer1.transporter.pharma-network.com ... done
Creating peer0.consumer.pharma-network.com ...
Creating peer0.transporter.pharma-network.com ... done
Creating peer0.distributor.pharma-network.com ...
Creating peer1.retailer.pharma-network.com ...

=====
|   ____|  |    | / \  |  | \  |  |  |
|  \__\|  |    | / _ \|  | \  |  |  |
|  _ ) |  |    | / _ \ |  | <  |  |  |
|  ___/|  |    | /_ \ \ |  | \ |  |  |

Setting Up Hyperledger Fabric Network

Channel name : pharmachannel
+ peer channel create -o orderer.pharma-network.com:7050 -c pharmachannel -f ./channel-artifacts/channel.tx
Creating channel...
+ res=0
+ set +x
2020-05-05 14:40:30.798 UTC [channelCmd] InitCmdFactory -> INFO 001 Endorser and orderer connections initialized
2020-05-05 14:40:31.456 UTC [cli.common] readBlock -> INFO 002 Received block: 0
===== Channel 'pharmachannel' created =====

Having all peers join the channel...
+ peer channel join -b pharmachannel.block
+ res=0
+ set +x
2020-05-05 14:40:32.645 UTC [channelCmd] InitCmdFactory -> INFO 001 Endorser and orderer connections initialized
2020-05-05 14:40:32.971 UTC [channelCmd] executeJoin -> INFO 002 Successfully submitted proposal to join channel
===== peer0.manufacturer.pharma-network.com joined channel 'pharmachannel' =====

+ peer channel join -b pharmachannel.block
+ res=0
+ set +x
2020-05-05 14:40:38.865 UTC [channelCmd] InitCmdFactory -> INFO 001 Endorser and orderer connections initialized
2020-05-05 14:40:39.154 UTC [channelCmd] executeJoin -> INFO 002 Successfully submitted proposal to join channel
===== peer1.manufacturer.pharma-network.com joined channel 'pharmachannel' =====
```

```

Updating anchor peers for manufacturer...
+ peer channel update -o orderer.pharma-network.com:7050 -c pharmachannel -f ./channel-artifacts/manufacturerMSPanchors.tx
+ res=0
+ set +x
2020-05-05 14:41:35.499 UTC [channelCmd] InitCmdFactory -> INFO 001 Endorser and orderer connections initialized
2020-05-05 14:41:35.694 UTC [channelCmd] update -> INFO 002 Successfully submitted channel update
===== Anchor peers updated for org 'manufacturerMSP' on channel 'pharmachannel' =====

Updating anchor peers for distributor...
+ peer channel update -o orderer.pharma-network.com:7050 -c pharmachannel -f ./channel-artifacts/distributorMSPanchors.tx
+ res=0
+ set +x
2020-05-05 14:41:41.863 UTC [channelCmd] InitCmdFactory -> INFO 001 Endorser and orderer connections initialized
2020-05-05 14:41:42.194 UTC [channelCmd] update -> INFO 002 Successfully submitted channel update
===== Anchor peers updated for org 'distributorMSP' on channel 'pharmachannel' =====

Updating anchor peers for retailer...
+ peer channel update -o orderer.pharma-network.com:7050 -c pharmachannel -f ./channel-artifacts/retailerMSPanchors.tx
+ res=0
+ set +x
2020-05-05 14:41:48.243 UTC [channelCmd] InitCmdFactory -> INFO 001 Endorser and orderer connections initialized
2020-05-05 14:41:48.694 UTC [channelCmd] update -> INFO 002 Successfully submitted channel update
===== Anchor peers updated for org 'retailerMSP' on channel 'pharmachannel' =====

Updating anchor peers for consumer...
+ peer channel update -o orderer.pharma-network.com:7050 -c pharmachannel -f ./channel-artifacts/consumerMSPanchors.tx
+ res=0
+ set +x
2020-05-05 14:41:56.641 UTC [channelCmd] InitCmdFactory -> INFO 001 Endorser and orderer connections initialized
2020-05-05 14:41:57.116 UTC [channelCmd] update -> INFO 002 Successfully submitted channel update
===== Anchor peers updated for org 'consumerMSP' on channel 'pharmachannel' =====

```

- Successful completion will look like shown below.

```

+ set +x
2020-05-05 14:41:48.243 UTC [channelCmd] InitCmdFactory -> INFO 001 Endorser and orderer connections initialized
2020-05-05 14:41:48.694 UTC [channelCmd] update -> INFO 002 Successfully submitted channel update
===== Anchor peers updated for org 'retailerMSP' on channel 'pharmachannel' =====

Updating anchor peers for consumer...
+ peer channel update -o orderer.pharma-network.com:7050 -c pharmachannel -f ./channel-artifacts/consumerMSPanchors.tx
+ res=0
+ set +x
2020-05-05 14:41:56.641 UTC [channelCmd] InitCmdFactory -> INFO 001 Endorser and orderer connections initialized
2020-05-05 14:41:57.116 UTC [channelCmd] update -> INFO 002 Successfully submitted channel update
===== Anchor peers updated for org 'consumerMSP' on channel 'pharmachannel' =====

Updating anchor peers for transporter...
+ peer channel update -o orderer.pharma-network.com:7050 -c pharmachannel -f ./channel-artifacts/transporterMSPanchors.tx
+ res=0
+ set +x
2020-05-05 14:42:07.191 UTC [channelCmd] InitCmdFactory -> INFO 001 Endorser and orderer connections initialized
2020-05-05 14:42:08.020 UTC [channelCmd] update -> INFO 002 Successfully submitted channel update
===== Anchor peers updated for org 'transporterMSP' on channel 'pharmachannel' =====

===== All GOOD, Hyperledger Fabric Pharma Network Is Now Up and Running! =====

```



upgrad@upgrad-VirtualBox:~/workspace/Capstone_Project/pharma-net/network\$ █

- Run below command and ensure that status of all docker containers is showing "Up xx seconds" or "Up xx minutes" to confirm that network setup was successful

```
docker ps -a
```

CONTAINER ID	IMAGE	NAMES	COMMAND	CREATED	STATUS	PORTS
973ac7361efa	hyperledger/fabric-tools:latest	cli	"/bin/bash"	3 minutes ago	Up 3 minutes	
362520c49b9d	hyperledger/fabric-peer:latest	"peer node start"		5 minutes ago	Up 3 minutes	0.0.0.0:12051->12051/
tcp, 0.0.0.0:12053->12053/tcp	peer1.retailer.pharma-network.com					
9bd47c14226d	hyperledger/fabric-peer:latest	"peer node start"		5 minutes ago	Up 3 minutes	0.0.0.0:15051->15051/
tcp, 0.0.0.0:15053->15053/tcp	peer0.transporter.pharma-network.com					
a5ff5d8878a1	hyperledger/fabric-peer:latest	"peer node start"		5 minutes ago	Up 3 minutes	0.0.0.0:8051->8051/tcp
p, 0.0.0.0:8053->8053/tcp	peer1.manufacturer.pharma-network.com					
1f9522ac3ab3	hyperledger/fabric-peer:latest	"peer node start"		5 minutes ago	Up 3 minutes	0.0.0.0:16051->16051/
tcp, 0.0.0.0:16053->16053/tcp	peer1.transporter.pharma-network.com					
028221f0fcf31	hyperledger/fabric-peer:latest	"peer node start"		5 minutes ago	Up 3 minutes	0.0.0.0:9051->9051/tcp
p, 0.0.0.0:9053->9053/tcp	peer0.distributor.pharma-network.com					
5bb1c24c6048	hyperledger/fabric-peer:latest	"peer node start"		5 minutes ago	Up 3 minutes	0.0.0.0:13051->13051/
tcp, 0.0.0.0:13053->13053/tcp	peer0.consumer.pharma-network.com					
d302ccfe8c7	hyperledger/fabric-ca:latest	"sh -c 'fabric-ca-se..."		5 minutes ago	Up 4 minutes	0.0.0.0:7054->7054/tcp
p	ca.manufacturer.pharma-network.com					
ab34d71ea869	hyperledger/fabric-orderer:latest	"orderer"		6 minutes ago	Up 3 minutes	0.0.0.0:7050->7050/tcp
p	orderer.pharma-network.com					
82473cad1711	hyperledger/fabric-peer:latest	"peer node start"		6 minutes ago	Up 3 minutes	0.0.0.0:10051->10051/
tcp, 0.0.0.0:10053->10053/tcp	peer1.distributor.pharma-network.com					
e922cd992f39	hyperledger/fabric-peer:latest	"peer node start"		6 minutes ago	Up 4 minutes	0.0.0.0:7051->7051/tcp
p, 0.0.0.0:7053->7053/tcp	peer0.manufacturer.pharma-network.com					
61dbe736af80	hyperledger/fabric-ca:latest	"sh -c 'fabric-ca-se..."		6 minutes ago	Up 4 minutes	0.0.0.0:8054->7054/tcp
p	ca.distributor.pharma-network.com					
cd2b1f080e04	hyperledger/fabric-peer:latest	"peer node start"		6 minutes ago	Up 4 minutes	0.0.0.0:11051->11051/
tcp, 0.0.0.0:11053->11053/tcp	peer0.retailer.pharma-network.com					
376dea220400	hyperledger/fabric-ca:latest	"sh -c 'fabric-ca-se..."		6 minutes ago	Up 4 minutes	0.0.0.0:10054->7054/tcp
cp	ca.consumer.pharma-network.com					
fd9c4f4e0c22	hyperledger/fabric-peer:latest	"peer node start"		6 minutes ago	Up 3 minutes	0.0.0.0:14051->14051/

- In case of any time-out error while running network setup command, first ensure that all docker containers are up using above command and then rerun “./fabricNetwork.sh up” to complete network setup.

Note that pharma-network is started in Production mode though chaincode container is created as part of network setup.

6. Install and Instantiate Chaincode

6.1. Install and Instantiate pharmanet Chaincode

- Chaincode “pharmanet” can be installed and instantiated by running a single command using network automation script.
- This command performs following actions:
 - ❖ Installs chaincode one both peers of every organization
 - ❖ Instantiates chaincode on “pharmachannel” through peer0 of “Manufacturer” org
- Run following command on same terminal window opened above step to install and instantiate chaincode

```
./fabricNetwork.sh install -v 1.1
```
- Command will ask confirmation as shown below. Simply press Enter to allow command to proceed.

```
upgrad@upgrad-VirtualBox:~/workspace/Capstone_Project/pharma-net/network$ ./fabricNetwork.sh install -v 1.1
Installing chaincode for channel 'pharnachannel' with CLI timeout of '15' seconds and CLI delay of '5' seconds and chaincode version '1.1'
Continue? [Y/n] ■
```
- Wait for command to complete chaincode installation and instantiation. Screenshots of terminal at different stages of command execution are shown below.

```

upgrad@upgrad-VirtualBox:~/workspace/Capstone_Project/pharma-net/network$ ./fabricNetwork.sh install -v 1.1
Installing chaincode for channel 'pharmacchannel' with CLI timeout of '15' seconds and CLI delay of '5' seconds and chaincode version '1.1'
Continue? [Y/n]
proceeding ...
LOCAL_VERSION=1.4.3
DOCKER_IMAGE_VERSION=1.4.3

Deploying Chaincode PHARMANET On Pharma Network

Channel name : pharmacchannel
Installing chaincode on all peers...
+ peer chaincode install -n pharanet -v 1.1 -l node -p /opt/gopath/src/github.com/hyperledger/fabric/peer/chaincode/
Installing chaincode on peer0.manufacturer.pharma-network.com ...
+ res=0
+ set +x
2020-05-05 14:52:56.581 UTC [chaincodeCmd] checkChaincodeCmdParams -> INFO 001 Using default escc
2020-05-05 14:52:56.581 UTC [chaincodeCmd] checkChaincodeCmdParams -> INFO 002 Using default vscc
2020-05-05 14:52:56.742 UTC [chaincodeCmd] install -> INFO 003 Installed remotely response:<status:200 payload:"OK" >
===== Chaincode is installed on peer0.manufacturer =====

Installing chaincode on peer1.manufacturer.pharma-network.com ...
+ peer chaincode install -n pharanet -v 1.1 -l node -p /opt/gopath/src/github.com/hyperledger/fabric/peer/chaincode/
+ res=0
+ set +x
2020-05-05 14:53:10.337 UTC [chaincodeCmd] checkChaincodeCmdParams -> INFO 001 Using default escc
2020-05-05 14:53:10.337 UTC [chaincodeCmd] checkChaincodeCmdParams -> INFO 002 Using default vscc
2020-05-05 14:53:10.460 UTC [chaincodeCmd] install -> INFO 003 Installed remotely response:<status:200 payload:"OK" >
===== Chaincode is installed on peer0.distributor =====

Installing chaincode on peer1.distributor.pharma-network.com ...
+ peer chaincode install -n pharanet -v 1.1 -l node -p /opt/gopath/src/github.com/hyperledger/fabric/peer/chaincode/
+ res=0
+ set +x
2020-05-05 14:53:19.021 UTC [chaincodeCmd] checkChaincodeCmdParams -> INFO 001 Using default escc
2020-05-05 14:53:19.021 UTC [chaincodeCmd] checkChaincodeCmdParams -> INFO 002 Using default vscc
2020-05-05 14:53:19.231 UTC [chaincodeCmd] install -> INFO 003 Installed remotely response:<status:200 payload:"OK" >
===== Chaincode is installed on peer1.distributor =====

Installing chaincode on peer0.retailer.pharma-network.com ...
+ peer chaincode install -n pharanet -v 1.1 -l node -p /opt/gopath/src/github.com/hyperledger/fabric/peer/chaincode/
+ res=0
+ set +x
2020-05-05 14:53:26.895 UTC [chaincodeCmd] checkChaincodeCmdParams -> INFO 001 Using default escc
2020-05-05 14:53:26.895 UTC [chaincodeCmd] checkChaincodeCmdParams -> INFO 002 Using default vscc
2020-05-05 14:53:27.177 UTC [chaincodeCmd] install -> INFO 003 Installed remotely response:<status:200 payload:"OK" >
===== Chaincode is installed on peer0.retailer =====

Installing chaincode on peer1.retailer.pharma-network.com ...
+ peer chaincode install -n pharanet -v 1.1 -l node -p /opt/gopath/src/github.com/hyperledger/fabric/peer/chaincode/
+ res=0
+ set +x
2020-05-05 14:53:38.235 UTC [chaincodeCmd] checkChaincodeCmdParams -> INFO 001 Using default escc
2020-05-05 14:53:38.241 UTC [chaincodeCmd] checkChaincodeCmdParams -> INFO 002 Using default vscc
2020-05-05 14:53:38.644 UTC [chaincodeCmd] install -> INFO 003 Installed remotely response:<status:200 payload:"OK" >
===== Chaincode is installed on peer1.retailer =====

Installing chaincode on peer1.consumer.pharma-network.com ...
+ peer chaincode install -n pharanet -v 1.1 -l node -p /opt/gopath/src/github.com/hyperledger/fabric/peer/chaincode/
+ res=0
+ set +x
2020-05-05 14:53:55.362 UTC [chaincodeCmd] checkChaincodeCmdParams -> INFO 001 Using default escc
2020-05-05 14:53:55.362 UTC [chaincodeCmd] checkChaincodeCmdParams -> INFO 002 Using default vscc
2020-05-05 14:53:55.677 UTC [chaincodeCmd] install -> INFO 003 Installed remotely response:<status:200 payload:"OK" >
===== Chaincode is installed on peer1.consumer =====

Installing chaincode on peer0.transporter.pharma-network.com ...
+ peer chaincode install -n pharanet -v 1.1 -l node -p /opt/gopath/src/github.com/hyperledger/fabric/peer/chaincode/
+ res=0
+ set +x
2020-05-05 14:54:02.928 UTC [chaincodeCmd] checkChaincodeCmdParams -> INFO 001 Using default escc
2020-05-05 14:54:02.928 UTC [chaincodeCmd] checkChaincodeCmdParams -> INFO 002 Using default vscc
2020-05-05 14:54:03.073 UTC [chaincodeCmd] install -> INFO 003 Installed remotely response:<status:200 payload:"OK" >
===== Chaincode is installed on peer0.transporter =====

Installing chaincode on peer1.transporter.pharma-network.com ...
+ peer chaincode install -n pharanet -v 1.1 -l node -p /opt/gopath/src/github.com/hyperledger/fabric/peer/chaincode/
+ res=0
+ set +x
2020-05-05 14:54:10.582 UTC [chaincodeCmd] checkChaincodeCmdParams -> INFO 001 Using default escc
2020-05-05 14:54:10.586 UTC [chaincodeCmd] checkChaincodeCmdParams -> INFO 002 Using default vscc
2020-05-05 14:54:10.813 UTC [chaincodeCmd] install -> INFO 003 Installed remotely response:<status:200 payload:"OK" >
===== Chaincode is installed on peer1.transporter =====

Instantiating chaincode on channel using peer0.manufacturer.pharma-network.com...
+ peer chaincode instantiate -o orderer.pharma-network.com:7050 -C pharmacchannel -n pharanet -l node -v 1.1 -c '{"Args":["org.pharma-network.pharanet.registrationcontract:instantiate"]}' -P 'OR([''manufacturerMSP.member'',''distributorMSP.member'',''retailerMSP.member'',''consumerMSP.member'',''transporterMSP.member''])'

```

- Successful completion will look like shown below.

```
===== Chaincode is installed on peer0.transporter =====
Installing chaincode on peer0.transporter.pharma-network.com ...
+ peer chaincode install -n pharmanet -v 1.1 -l node -p /opt/gopath/src/github.com/hyperledger/fabric/peer/chaincode/
+ res=0
+ set +x
2020-05-06 14:15:47.550 UTC [chaincodeCmd] checkChaincodeCmdParams -> INFO 001 Using default escc
2020-05-06 14:15:47.550 UTC [chaincodeCmd] checkChaincodeCmdParams -> INFO 002 Using default vscc
2020-05-06 14:15:47.722 UTC [chaincodeCmd] install -> INFO 003 Installed remotely response:<status:200 payload:"OK" >
===== Chaincode is installed on peer0.transporter =====

Instantiating chaincode on channel using peer0.manufacturer.pharma-network.com...
+ peer chaincode instantiate -o orderer.pharma-network.com:7050 -C pharmachannel -n pharmanet -l node -v 1.1 -c '{"Args":["org.pharma-network.pharmanet.registrationcontract":"instantiate"]}' -P 'OR (''"manufacturerMSP.member"'',''"distributorMSP.member"'',''"retailerMSP.member"'',''"consumerMSP.member"'',''"transporterMSP.member"''')
+ res=0
+ set +x
2020-05-06 14:15:53.847 UTC [chaincodeCmd] checkChaincodeCmdParams -> INFO 001 Using default escc
2020-05-06 14:15:53.847 UTC [chaincodeCmd] checkChaincodeCmdParams -> INFO 002 Using default vscc
===== Chaincode is instantiated on peer0.manufacturer on channel 'pharmachannel' =====

===== All GOOD, Chaincode PHARANET Is Now Installed & Instantiated On Pharma Network =====

[ ] [ ] [ ] [ ] [ ]
[ ] [ ] [ ] [ ] [ ]
[ ] [ ] [ ] [ ] [ ]
upgrad@upgrad-VirtualBox:~/workspace/Capstone_Project/pharma-network/network$
```

Note that depending on machine configuration and internet speed, chaincode instantiation can take between 5 to 10 minutes to complete since peer0 of manufacturer org builds a new chaincode container where all dependencies of code are first installed through “npm install” before chaincode gets instantiated.

6.2. Verify chaincode instantiation

- To re-confirm that chaincode was properly instantiated, open a new tab in terminal to view logs of peer. In this new tab, type in following command:
- ```
docker logs -f peer0.manufacturer.pharma-network.com
```
- After pressing Enter, the output should be similar to shown below to confirm that chaincode instantiation was successful

```
.peer_address=172.18.0.17:58152 error="rpc error: code = Canceled desc = context canceled" grpc.code=Canceled grpc.call_duration=1.022957102s
2020-05-06 14:14:02.048 UTC [comm.grpc.server] 1 -> INFO 153 unary call completed grpc.service=gossip.Gossip grpc.method=Ping grpc.request_dealine=2020-05-06T14:14:04.048Z grpc.peer_address=172.18.0.4:40340 grpc.code=OK grpc.call_duration=163.549s
2020-05-06 14:14:04.214 UTC [gossip.channel] reportMembershipChanges -> INFO 154 Membership view has changed. peers went online: [[peer0.distributor.pharma-network.com:9051] [peer1.consumer.pharma-network.com:140051]] , current view: [[peer0.distributor.pharma-network.com:9051] [peer0.retailer.pharma-network.com:11051] [peer1.transporter.pharma-network.com:16051] [peer1.manufacturer.pharma-network.com:8051] [peer0.transporter.pharma-network.com:15051] [peer1.consumer.pharma-network.com:140051] [peer1.distributor.pharma-network.com:10051] [peer0.consumer.pharma-network.com:13051]]
2020-05-06 14:14:09.321 UTC [gossip.channel] reportMembershipChanges -> INFO 155 Membership view has changed. peers went online: [[peer1.retailer.pharma-network.com:120051]] , current view: [[peer1.manufacturer.pharma-network.com:8051] [peer0.transporter.pharma-network.com:16051] [peer1.consumer.pharma-network.com:140051] [peer1.distributor.pharma-network.com:10051] [peer0.consumer.pharma-network.com:13051] [peer0.retailer.pharma-network.com:11051] [peer0.distributor.pharma-network.com:9051] [peer0.transporter.pharma-network.com:16051]]
2020-05-06 14:14:09.927 UTC [endorser] callChaincode -> INFO 156 [[849fa2ca]] Entry chaincode: name:"lscc"
2020-05-06 14:14:09.992 UTC [lscc] executeInstall -> INFO 157 Installed Chaincode [pharmanet] Version [1.1] to peer
2020-05-06 14:14:10.093 UTC [endorser] callChaincode -> INFO 158 [[849fa2ca]] Exit chaincode: name:"lscc" (20ms)
2020-05-06 14:14:10.994 UTC [comm.grpc.server] 1 -> INFO 159 unary call completed grpc.service=protos.Endorser grpc.method=ProcessProposal grpc.peer_address=172.18.0.19:49582 grpc.code=OK grpc.call_duration=24.15749ms
2020-05-06 14:15:53.925 UTC [endorser] callChaincode -> INFO 160 [[pharmachannel]] Entry chaincode: name:"lscc"
2020-05-06 14:22:14.926 UTC [endorser] callChaincode -> INFO 158 [[pharmachannel]] Exit chaincode: name:"lscc" (380983ms)
2020-05-06 14:22:14.929 UTC [comm.grpc.server] 1 -> INFO 15c unary call completed grpc.service=protos.Endorser grpc.method=ProcessProposal grpc.peer_address=172.18.0.19:49622 grpc.code=OK grpc.call_duration=6m21.008047035s
2020-05-06 14:22:17.058 UTC [gossip.privdata] StoreBlock -> INFO 15d [pharmachannel] Received block [6] from buffer
2020-05-06 14:22:17.309 UTC [committer.txvalidator] Validate -> INFO 15e [pharmachannel] Validated block [6] in 213ms
2020-05-06 14:22:17.310 UTC [cceventmgmt] HandleStateUpdates -> INFO 15f Channel [pharmachannel]: Handling deploy or update of chaincode [pharmanet]
2020-05-06 14:22:17.691 UTC [kvledger] CommitWithPvtData -> INFO 160 [pharmachannel] Committed block [6] with 1 transaction(s) in 381ms (state_validation=344ms block_and_pvtdata_commit=31ms state_commit=2ms) commitHash=[1b8345e718e2c13die5440ac883a19415a0b19cbc0fc1166244554274f0eccf]
```

- Press Ctrl + C on terminal after verifying peer logs to exit from logs and then close the terminal tab.

## 7. Start Node Application

### 7.1. Install Dependencies

Before starting node application, dependencies need to be installed by following below steps

- Open a new terminal tab and run following command to verify if npm is installed on VM

```
npm -v
```

If npm is installed, this command will display the version like shown below

```
upgrad@upgrad-VirtualBox:~/workspace/Capstone_Project/pharma-net/network$ npm -v
3.5.2
upgrad@upgrad-VirtualBox:~/workspace/Capstone_Project/pharma-net/network$
```

- If above command does not show npm version, run below commands one by one on terminal to install npm

```
sudo dpkg --configure -a
sudo apt install npm
```

It will ask a question. Press 'Y'. This will install npm on virtual machine.

**Note:** These commands need to be run only once to install npm on virtual machine.

- After ensuring npm is installed on VM, run below commands one by one on terminal to install navigate to application folder and install all the dependencies

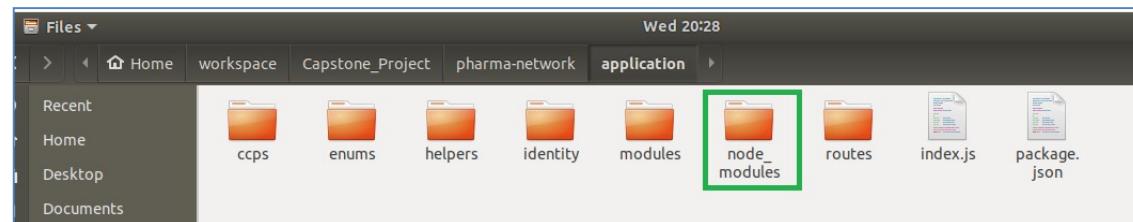
```
cd ../application
npm install
```

Screen will look like below after above npm install completes (it can take few minutes to complete execution)

```
 +- cliui@2.1.0
 | +- center-align@0.1.3
 | | +- align-text@0.1.4
 | | +- kind-of@3.2.2
 | | | +- ts-buffer@1.1.6
 | | | +- longest@1.0.1
 | | | +- repeat-string@1.6.1
 | | | +- lazy-cache@1.0.4
 | | +- right-align@0.1.3
 | | +- wordwrap@0.0.2
 | | +- window-size@0.1.0
 +- pug-lexer@4.1.0
 +- character-parser@2.2.0
 | +- is-regex@0.5
 | +- has@1.0.3
 | | +- function-bind@1.1.1
 | +- ts-expression@3.0.0
 | +- acorn@4.0.13
 +- pug-linker@3.0.6
 +- pug-load@2.0.12
 +- pug-parser@5.0.1
 | +- token-stream@0.0.1
 +- pug-runtime@2.0.5
 +- pug-strip-comments@1.0.4

npm WARN acorn-jsx@5.2.0 requires a peer of acorn@^6.0.0 || ^7.0.0 but none was installed.
npm WARN pharma_network@1.0.0 No repository field.
npm WARN pharma_network@1.0.0 No license field.
upgrad@upgrad-VirtualBox:~/workspace/Capstone_Project/pharma-network/application$
```

- To confirm npm install was successful, open “application” folder on file explorer and observe that a new “node\_modules” folder is created

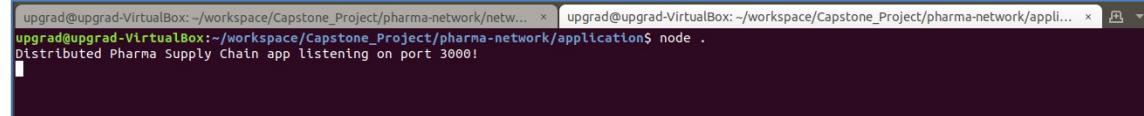


## 7.2. Start Node Application

- Run below command inside application folder on terminal to start the node application

```
node .
```

- Successful execution of the command will look like shown below



```
upgrad@upgrad-VirtualBox:~/workspace/Capstone_Project/pharma-network/network$ node .
Distributed Pharma Supply Chain app listening on port 3000!
```

- This indicates that the application is now ready to accept HTTP requests on port 3000

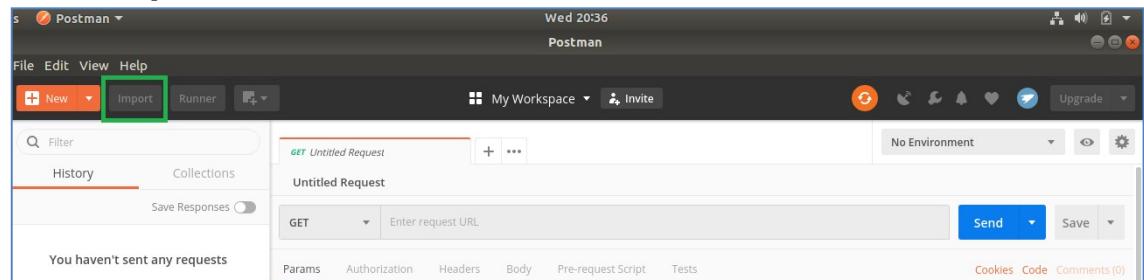
**Note that “identity” folder which stores various organization wallets is initially empty and wallets get created automatically as requests are submitted for each organization**

## 8. Testing Through Postman Collection Files

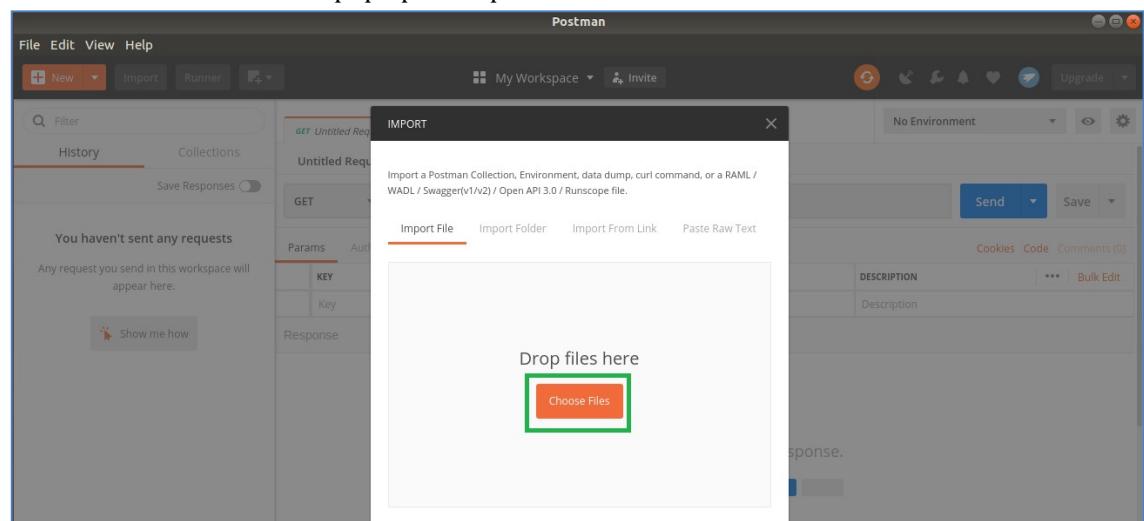
This section explains the steps to be followed to validate various smart contract transactions available in pharma-network by making HTTP API calls through Postman

### 8.1. Import Postman Collection Files

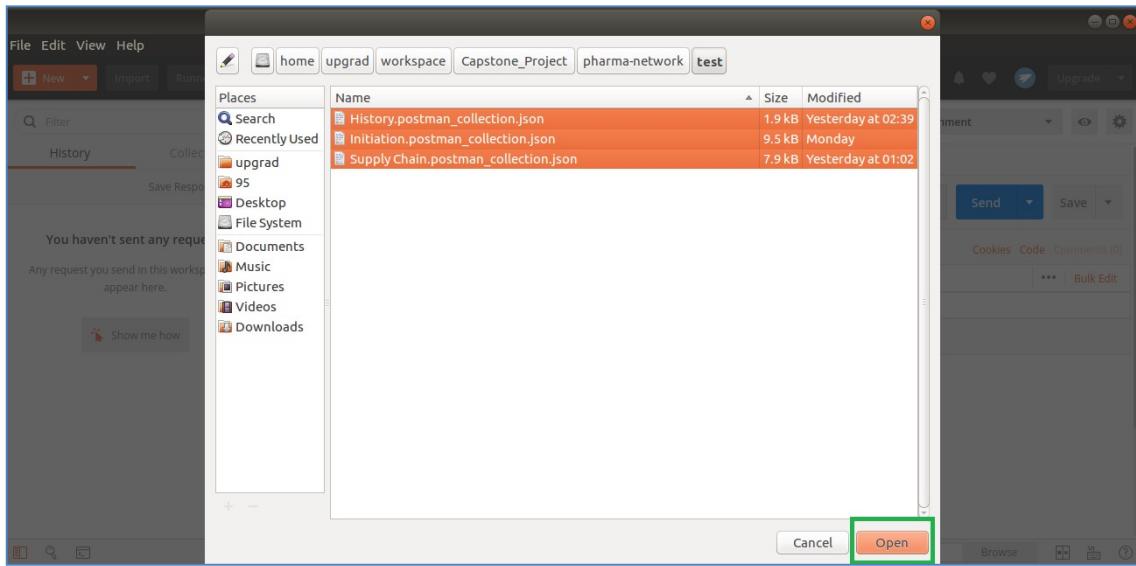
- Open Postman application on Ubuntu VM
- Click on “Import” button as shown below



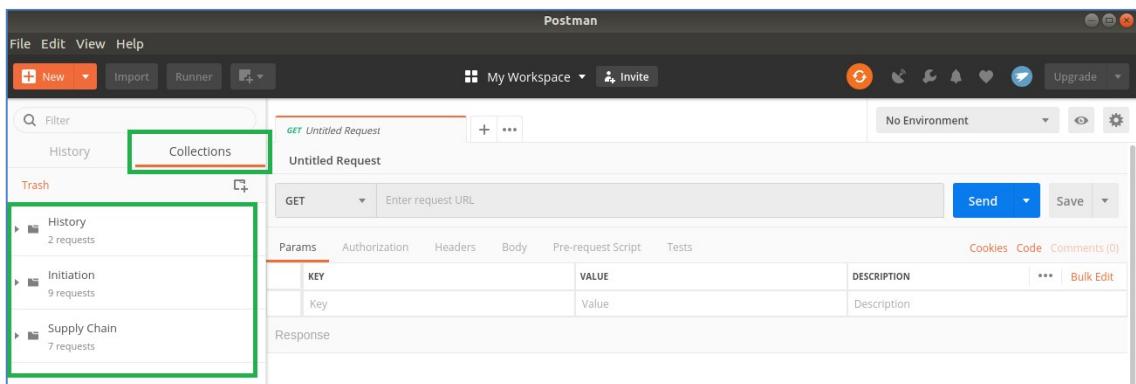
- Click on Choose Files in the pop up that opens



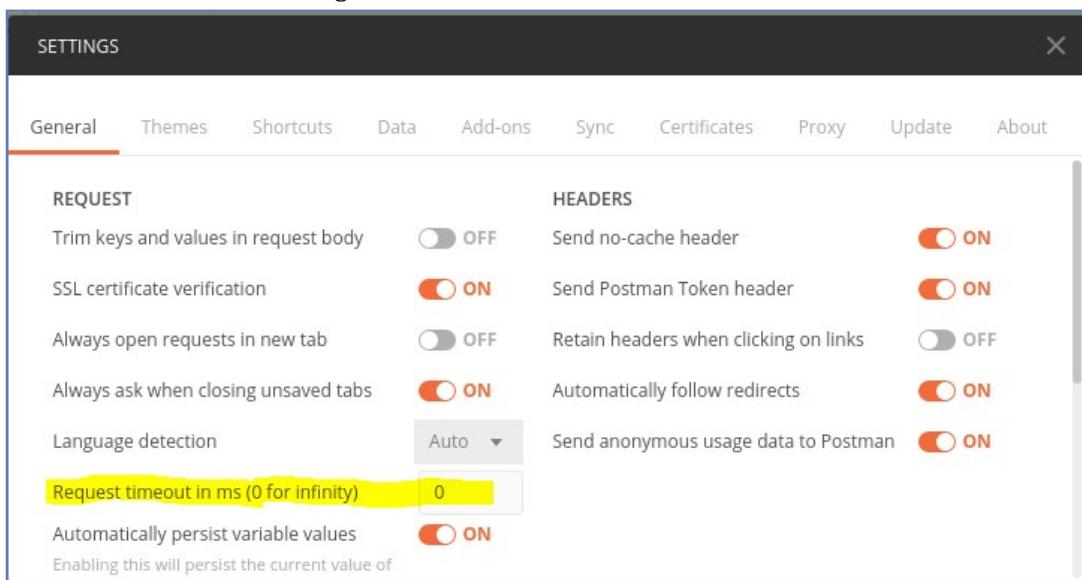
- Navigate to “test” folder available inside project directory in the file explorer window and select all 3 files by pressing “Shift” key and click “Open” as shown



- Click on “Collections” tab where all three collection files will be available as shown below



- Before submitting requests from Postman, go to File -> Settings -> General and ensure that “**Request timeout in (ms)**” is set to 0 (infinite) as shown below to prevent request timeout errors when running smart contracts



## 8.2. Initiation Test Cases

- This section explains various test cases available as part of “Initiation” collection
- Although all the test cases in a collection can be executed with the click of a single button, **DO NOT EXECUTE INITIATION TEST CASES IN A SINGLE GO**
- Each test case part of this collection will be triggered separately since the requests are submitted to fabric as different organizations
- **When first request for an organization is submitted, respective peer of that org builds its own chaincode container image where all dependencies of code are first installed through “npm install” before request is processed since pharma-network is running in Production mode**
- Hence initiation test cases are run one-by-one instead of all at once
- Expand “Initiation” collection by clicking on the small arrow before folder name as shown below

The screenshot shows the Postman application interface. The left sidebar has a tree view with 'Initiation' expanded, showing 9 requests: Sun Pharma, FedEx, Blue Dart, VG Pharma, upgrad, Paracetamol-001, Paracetamol-002, Paracetamol-003, and Paracetamol-004. The main workspace shows an 'Untitled Request' with a GET method and an 'Enter request URL' field. Below it is a table for 'Params' with a single row: KEY 'Key' and VALUE 'Value'. The status bar at the bottom says 'Hit the Send button to get a response.'

### 8.2.1. SV Pharma

- Click on SV Pharma request to open it in a new tab and click “Send” to submit the request as shown below

The screenshot shows the Postman application interface. The left sidebar has a tree view with 'Initiation' expanded, showing 9 requests, including 'Sun Pharma'. The main workspace shows a 'POST Sun Pharma' request with the URL 'localhost:3000/registerCompany'. The 'Send' button is highlighted with a green box. The status bar at the bottom says 'Hit the Send button to get a response.'

- Notice on terminal console output that the node application detects there is no wallet for "Manufacturer" organization and automatically creates it

```
upgrad@upgrad-VirtualBox:~/workspace/Capstone_Project/pharma-network/application$ node .
Distributed Pharma Supply Chain app listening on port 3000!
"/home/upgrad/workspace/Capstone_Project/pharma-network/application/identity/manufacturer/MANUFACTURER_ADMIN" does not exist!!!
.....Either wallet does not exist or does not have expected number of files
.....Creating wallet now for Manufacturer
.....Successfully created wallet for Manufacturer
.....Connecting to Fabric Gateway
.....Connecting to channel - pharmachannel
.....Connecting to Smart Contract in pharanet chaincode
.....Register company
.....Processing Register Company Transaction Response

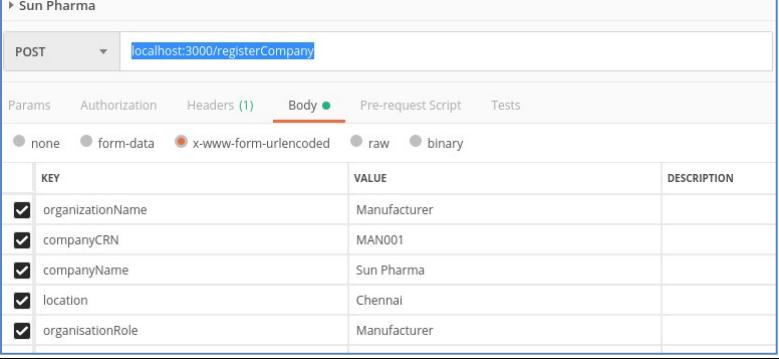
{ companyID: '\u0000org.pharma-network.pharanet.company\u0000MAN001\u0000Sun Pharma\u0000',
 name: 'Sun Pharma',
 location: 'Chennai',
 organisationRole: 'Manufacturer',
 hierarchyKey: 1 }

.....Register Company Transaction Complete!
.....Disconnecting from Fabric Gateway
New company registered
```

- Since this request is submitted as a Manufacturer, it is sent to peer0 of manufacturer organization for endorsement. As this same peer was used to instantiate chaincode on the channel its corresponding chaincode container is already created and the request completes in few seconds.

- After successful request execution, output is available on Postman under results section

Request details and expected output are explained below

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Request Purpose</b>     | Create new Manufacturer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Request URL</b>         | localhost:3000/registerCompany                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Request Type</b>        | POST                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Submitted As Client</b> | Manufacturer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Request Body</b>        |  <p>The screenshot shows a Postman request configuration for a POST to 'localhost:3000/registerCompany'. The 'Body' tab is selected, showing a 'form-data' type. The body contains five fields: 'organizationName' (value: 'Manufacturer'), 'companyCRN' (value: 'MAN001'), 'companyName' (value: 'Sun Pharma'), 'location' (value: 'Chennai'), and 'organisationRole' (value: 'Manufacturer').</p>                                                   |
| <b>Expected Output</b>     |  <p>The screenshot shows the Postman results section with a 200 OK status. The JSON response body is:</p> <pre> 1  { 2   "status": "success", 3   "message": "New company registered", 4   "company": { 5     "companyID": "\u0000org.pharma-network.pharanet.company\u0000MAN001\u0000Sun Pharma\u0000", 6     "name": "Sun Pharma", 7     "location": "Chennai", 8     "organisationRole": "Manufacturer", 9     "hierarchyKey": 1 10  } 11 }</pre> |

### 8.2.2. FedEx

- Click on FedEx request to open it in a new tab and click “Send” to submit the request as shown below

The screenshot shows the Postman application window. In the center, there is a request card for a POST method to the URL 'localhost:3000/registerCompany'. The 'Body' tab is selected, showing a single parameter 'Key' with the value 'Value'. At the bottom right of the request card, there is a blue 'Send' button, which is highlighted with a green rectangular box. The top navigation bar includes 'File', 'Edit', 'View', 'Help', and tabs for 'New', 'Import', 'Runner', and 'My Workspace'. The left sidebar shows a 'History' section with 9 requests, including a POST to 'Sun Pharma' and another to 'FedEx'.

- Notice on terminal console output that the node application detects there is no wallet for “Transporter” organization and automatically creates it

```
/home/upgrad/workspace/Capstone_Project/pharma-network/application/identity/transporter/TRANSPORTER_ADMIN" does not exist!!!
....Either wallet does not exist or does not have expected number of files
....Creating wallet now for Transporter
....Successfully created wallet for Transporter
....Connecting to Fabric Gateway
....Connecting to channel - pharmachannel
....Connecting to Smart Contract in pharmanet chaincode
....Reglster company
....Processing Register Company Transaction Response

{ companyID: '\u0000org.pharma-network.pharmanet.company\u0000TRA001\u0000FedEx\u0000',
 name: 'FedEx',
 location: 'Delhi',
 organisationRole: 'Transporter',
 hierarchyKey: null }

.....Register Company Transaction Complete!
.....Disconnecting from Fabric Gateway
New company registered
```

- Since this is the first request submitted as a Transporter, it is sent to peer0 of transporter organization for endorsement. peer0 of transporter then builds its own chaincode container image where all dependencies of code are first installed through “npm install” before request is processed since pharma-network is running in Production mode. Hence this request can take between 5 to 10 minutes to complete depending on machine configurations and network speed.
- After successful request execution, output is available on Postman under results section

Request details and expected output are explained below

|                            |                                  |
|----------------------------|----------------------------------|
| <b>Request Purpose</b>     | : Create new Transporter         |
| <b>Request URL</b>         | : localhost:3000/registerCompany |
| <b>Request Type</b>        | : POST                           |
| <b>Submitted As Client</b> | : Transporter                    |

**Request Body :**

**Expected Output**

```

1 {
2 "status": "success",
3 "message": "New company registered",
4 "company": {
5 "companyID": "\u0000org.pharma-network.pharmanet.company\u0000TRA001\u0000FedEx\u0000",
6 "name": "FedEx",
7 "location": "Delhi",
8 "organisationRole": "Transporter",
9 "hierarchyKey": null
10 }
11 }

```

### 8.2.3. Blue Dart

- Click on Blue Dart request to open it in a new tab and click “Send” to submit the request as shown below

**Creation time of "/home/upgrad/workspace/Capstone\_Project/pharma-network/network/crypto-config/peerOrganizations/transporter.pharma-network.com/users/Admin@transporter.pharma-network.com/msp/" is Wed May 06 2020 22:33:35 GMT+0530 (IST)**  
**Creation time of "/home/upgrad/workspace/Capstone\_Project/pharma-network/application/identity/transporter/TRANSPORTER\_ADMIN" is Wed May 06 2020 22:53:03 GMT+0530 (IST)**  
.....**Wallet exists for Transporter**  
.....Connecting to Fabric Gateway  
.....Connecting to channel - pharmachannel  
.....Connecting to Smart Contract in pharmanet chaincode  
.....Register company  
.....Processing Register Company Transaction Response

```

{ companyID: '\u0000org.pharma-network.pharmanet.company\u0000TRA002\u0000Blue Dart\u0000',
 name: 'Blue Dart',
 location: 'Bangalore',
 organisationRole: 'Transporter',
 hierarchyKey: null }

.....Register Company Transaction Complete!
.....Disconnecting from Fabric Gateway
New company registered

```

- Since this is the second request submitted as a Transporter which is sent to peer0 of transporter organization for endorsement, its corresponding chaincode container is already created from previous FedEx request and hence this execution completes in few seconds.

- After successful request execution, output is available on Postman under results section

Request details and expected output are explained below

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Request Purpose</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Create new Transporter                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Request URL</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                             | localhost:3000/registerCompany                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Request Type</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                            | POST                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Submitted As Client</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Transporter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Request Body</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <pre>▶ Blue Dart</pre> <p>The screenshot shows a Postman request configuration. Method: POST, URL: localhost:3000/registerCompany. Headers tab has 'x-www-form-urlencoded' selected. Body tab is active, showing a table with columns KEY, VALUE, and DESCRIPTION. Rows include organizationName (Value: Transporter), companyCRN (Value: TRA002), companyName (Value: Blue Dart), location (Value: Bangalore), and organisationRole (Value: Transporter). All keys have checkboxes checked.</p> |
| <b>Expected Output</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <p>The screenshot shows the Postman results tab with a status of 200 OK, time 7504 ms, and size 497 B. The Body tab is selected, showing a JSON response. The response is:</p> <pre>1 [ { "status": "success", "message": "New company registered", "company": { "companyID": "\u0000org.pharma-network.pharmanet.company\u0000TRA002\u0000Blue Dart\u0000", "name": "Blue Dart", "location": "Bangalore", "organisationRole": "Transporter", "hierarchyKey": null } } ]</pre> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

#### 8.2.4. VG Pharma

- Click on VG Pharma request to open it in a new tab and click “Send” to submit the request as shown below

The screenshot shows a Postman request configuration for 'VG Pharma'. Method: POST, URL: localhost:3000/registerCompany. The 'Send' button is highlighted with a green box.

- Notice on terminal console output that the node application detects there is no wallet for “Distributor” organization and automatically creates it

```

"/home/upgrad/workspace/Capstone_Project/pharma-network/application/identity/distributor/DISTRIBUTOR_ADMIN" does not exist!!!
.....Either wallet does not exist or does not have expected number of files
.....Creating wallet now for Distributor
.....Successfully created wallet for Distributor
.....Connecting to Fabric Gateway
.....Connecting to channel - pharmachannel
.....Connecting to Smart Contract in pharmanet chaincode
.....Register company
.....Processing Register Company Transaction Response

{
 companyID: '\u00000org.pharma-network.pharmanet.company\u00000DIST001\u00000VG Pharma\u0000',
 name: 'VG Pharma',
 location: 'Vizag',
 organisationRole: 'Distributor',
 hierarchyKey: 2
}

.....Register Company Transaction Complete!
.....Disconnecting from Fabric Gateway
New company registered

```

- Since this is the first request submitted as a Distributor, it is sent to peer0 of distributor organization for endorsement. peer0 of distributor then builds its own chaincode container image where all dependencies of code are first installed through “npm install” before request is processed since pharma-network is running in Production mode. Hence this request can take between 5 to 10 minutes to complete depending on machine configurations and network speed.
- After successful request execution, output is available on Postman under results section

Request details and expected output are explained below

| <b>Request Purpose</b>     | : Create new Distributor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |             |       |             |                  |             |  |            |         |  |             |           |  |          |       |  |                  |             |  |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------|-------------|------------------|-------------|--|------------|---------|--|-------------|-----------|--|----------|-------|--|------------------|-------------|--|
| <b>Request URL</b>         | : localhost:3000/registerCompany                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |       |             |                  |             |  |            |         |  |             |           |  |          |       |  |                  |             |  |
| <b>Request Type</b>        | : POST                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |             |       |             |                  |             |  |            |         |  |             |           |  |          |       |  |                  |             |  |
| <b>Submitted As Client</b> | Distributor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |             |       |             |                  |             |  |            |         |  |             |           |  |          |       |  |                  |             |  |
| <b>Request Body</b>        | <p>↳ VG Pharma</p> <p>The screenshot shows a Postman interface with a POST request to "localhost:3000/registerCompany". The "Body" tab is selected, showing an "x-www-form-urlencoded" type. The body parameters are:</p> <table border="1"> <thead> <tr> <th>KEY</th> <th>VALUE</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td>organizationName</td> <td>Distributor</td> <td></td> </tr> <tr> <td>companyCRN</td> <td>DIST001</td> <td></td> </tr> <tr> <td>companyName</td> <td>VG Pharma</td> <td></td> </tr> <tr> <td>location</td> <td>Vizag</td> <td></td> </tr> <tr> <td>organisationRole</td> <td>Distributor</td> <td></td> </tr> </tbody> </table> | KEY         | VALUE | DESCRIPTION | organizationName | Distributor |  | companyCRN | DIST001 |  | companyName | VG Pharma |  | location | Vizag |  | organisationRole | Distributor |  |
| KEY                        | VALUE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | DESCRIPTION |       |             |                  |             |  |            |         |  |             |           |  |          |       |  |                  |             |  |
| organizationName           | Distributor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |             |       |             |                  |             |  |            |         |  |             |           |  |          |       |  |                  |             |  |
| companyCRN                 | DIST001                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |             |       |             |                  |             |  |            |         |  |             |           |  |          |       |  |                  |             |  |
| companyName                | VG Pharma                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |             |       |             |                  |             |  |            |         |  |             |           |  |          |       |  |                  |             |  |
| location                   | Vizag                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |             |       |             |                  |             |  |            |         |  |             |           |  |          |       |  |                  |             |  |
| organisationRole           | Distributor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |             |       |             |                  |             |  |            |         |  |             |           |  |          |       |  |                  |             |  |

## Expected Output

The screenshot shows the Postman interface with the "Body" tab selected. The status bar at the top right indicates "Status: 200 OK Time: 497786 ms Size: 491 B". Below the tabs, there are buttons for "Pretty", "Raw", "Preview", and "JSON". The JSON response is displayed in a code editor-like format:

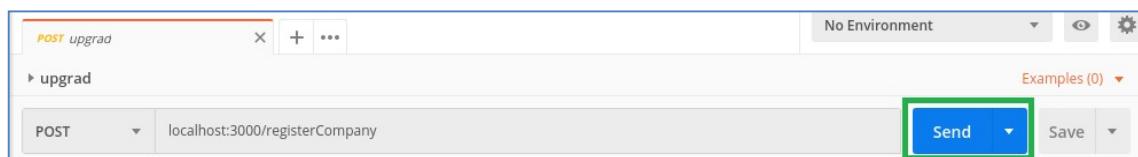
```

1 {
2 "status": "success",
3 "message": "New company registered",
4 "company": [
5 {
6 "companyID": "\u0000org.pharma-network.pharmanet.company\u0000DIST001\u0000VG Pharma\u0000",
7 "name": "VG Pharma",
8 "location": "Vizag",
9 "organisationRole": "Distributor",
10 "hierarchyKey": 2
11 }
12]

```

### 8.2.5. upgrad

- Click on upgrad request to open it in a new tab and click “Send” to submit the request as shown below



- Notice on terminal console output that the node application detects there is no wallet for “Retailer” organization and automatically creates it

```

"/home/upgrad/workspace/Capstone_Project/pharma-network/application/identity/retailer/RETAILER_ADMIN" does not exist!!!
....Either wallet does not exist or does not have expected number of files
....Creating wallet now for Retailer
....Successfully created wallet for Retailer
....Connecting to Fabric Gateway
....Connecting to channel - pharmachannel
....Connecting to Smart Contract in pharmanet chaincode
....Register company
....Processing Register Company Transaction Response

{
 companyID: '\u0000org.pharma-network.pharmanet.company\u0000RET002\u0000upgrad\u0000',
 name: 'upgrad',
 location: 'Mumbai',
 organisationRole: 'Retailer',
 hierarchyKey: 3
}

....Register Company Transaction Complete!
....Disconnecting from Fabric Gateway
New company registered

```

- Since this is the first request submitted as a Retailer, it is sent to peer0 of retailer organization for endorsement. peer0 of retailer then builds its own chaincode container image where all dependencies of code are first installed through “npm install” before request is processed since pharma-network is running in Production mode. Hence this request can take between 5 to 10 minutes to complete depending on machine configurations and network speed.
- After successful request execution, output is available on Postman under results section

Request details and expected output are explained below

|                        |                                  |
|------------------------|----------------------------------|
| <b>Request Purpose</b> | : Create new Retailer            |
| <b>Request URL</b>     | : localhost:3000/registerCompany |
| <b>Request Type</b>    | : POST                           |

| <b>Submitted As Client</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Retailer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                       |               |                    |              |                                                                                                                                                                                                                                                                                                                                |       |      |           |                       |     |        |  |         |       |             |  |      |  |                                                      |          |  |  |  |  |                                                |        |  |  |  |  |                                                 |        |  |  |  |  |                                              |        |  |  |  |  |                                                      |          |  |  |  |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------|--------------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------|-----------|-----------------------|-----|--------|--|---------|-------|-------------|--|------|--|------------------------------------------------------|----------|--|--|--|--|------------------------------------------------|--------|--|--|--|--|-------------------------------------------------|--------|--|--|--|--|----------------------------------------------|--------|--|--|--|--|------------------------------------------------------|----------|--|--|--|--|
| <b>Request Body</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <p>upgrad</p> <p>POST localhost:3000/registerCompany</p> <table border="1"> <thead> <tr> <th>Params</th> <th>Authorization</th> <th>Headers (1)</th> <th>Body</th> <th>Pre-request Script</th> <th>Tests</th> </tr> </thead> <tbody> <tr> <td>none</td> <td>form-data</td> <td>x-www-form-urlencoded</td> <td>raw</td> <td>binary</td> <td></td> </tr> <tr> <th>KEY</th> <th>VALUE</th> <th>DESCRIPTION</th> <td colspan="3"></td> </tr> <tr> <td><input checked="" type="checkbox"/> organizationName</td> <td>Retailer</td> <td></td> <td colspan="3"></td> </tr> <tr> <td><input checked="" type="checkbox"/> companyCRN</td> <td>RET002</td> <td></td> <td colspan="3"></td> </tr> <tr> <td><input checked="" type="checkbox"/> companyName</td> <td>upgrad</td> <td></td> <td colspan="3"></td> </tr> <tr> <td><input checked="" type="checkbox"/> location</td> <td>Mumbai</td> <td></td> <td colspan="3"></td> </tr> <tr> <td><input checked="" type="checkbox"/> organisationRole</td> <td>Retailer</td> <td></td> <td colspan="3"></td> </tr> </tbody> </table> | Params                | Authorization | Headers (1)        | Body         | Pre-request Script                                                                                                                                                                                                                                                                                                             | Tests | none | form-data | x-www-form-urlencoded | raw | binary |  | KEY     | VALUE | DESCRIPTION |  |      |  | <input checked="" type="checkbox"/> organizationName | Retailer |  |  |  |  | <input checked="" type="checkbox"/> companyCRN | RET002 |  |  |  |  | <input checked="" type="checkbox"/> companyName | upgrad |  |  |  |  | <input checked="" type="checkbox"/> location | Mumbai |  |  |  |  | <input checked="" type="checkbox"/> organisationRole | Retailer |  |  |  |  |
| Params                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Authorization                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Headers (1)           | Body          | Pre-request Script | Tests        |                                                                                                                                                                                                                                                                                                                                |       |      |           |                       |     |        |  |         |       |             |  |      |  |                                                      |          |  |  |  |  |                                                |        |  |  |  |  |                                                 |        |  |  |  |  |                                              |        |  |  |  |  |                                                      |          |  |  |  |  |
| none                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | form-data                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | x-www-form-urlencoded | raw           | binary             |              |                                                                                                                                                                                                                                                                                                                                |       |      |           |                       |     |        |  |         |       |             |  |      |  |                                                      |          |  |  |  |  |                                                |        |  |  |  |  |                                                 |        |  |  |  |  |                                              |        |  |  |  |  |                                                      |          |  |  |  |  |
| KEY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | VALUE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | DESCRIPTION           |               |                    |              |                                                                                                                                                                                                                                                                                                                                |       |      |           |                       |     |        |  |         |       |             |  |      |  |                                                      |          |  |  |  |  |                                                |        |  |  |  |  |                                                 |        |  |  |  |  |                                              |        |  |  |  |  |                                                      |          |  |  |  |  |
| <input checked="" type="checkbox"/> organizationName                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Retailer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                       |               |                    |              |                                                                                                                                                                                                                                                                                                                                |       |      |           |                       |     |        |  |         |       |             |  |      |  |                                                      |          |  |  |  |  |                                                |        |  |  |  |  |                                                 |        |  |  |  |  |                                              |        |  |  |  |  |                                                      |          |  |  |  |  |
| <input checked="" type="checkbox"/> companyCRN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | RET002                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                       |               |                    |              |                                                                                                                                                                                                                                                                                                                                |       |      |           |                       |     |        |  |         |       |             |  |      |  |                                                      |          |  |  |  |  |                                                |        |  |  |  |  |                                                 |        |  |  |  |  |                                              |        |  |  |  |  |                                                      |          |  |  |  |  |
| <input checked="" type="checkbox"/> companyName                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | upgrad                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                       |               |                    |              |                                                                                                                                                                                                                                                                                                                                |       |      |           |                       |     |        |  |         |       |             |  |      |  |                                                      |          |  |  |  |  |                                                |        |  |  |  |  |                                                 |        |  |  |  |  |                                              |        |  |  |  |  |                                                      |          |  |  |  |  |
| <input checked="" type="checkbox"/> location                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Mumbai                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                       |               |                    |              |                                                                                                                                                                                                                                                                                                                                |       |      |           |                       |     |        |  |         |       |             |  |      |  |                                                      |          |  |  |  |  |                                                |        |  |  |  |  |                                                 |        |  |  |  |  |                                              |        |  |  |  |  |                                                      |          |  |  |  |  |
| <input checked="" type="checkbox"/> organisationRole                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Retailer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                       |               |                    |              |                                                                                                                                                                                                                                                                                                                                |       |      |           |                       |     |        |  |         |       |             |  |      |  |                                                      |          |  |  |  |  |                                                |        |  |  |  |  |                                                 |        |  |  |  |  |                                              |        |  |  |  |  |                                                      |          |  |  |  |  |
| <b>Expected Output</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                       |               |                    |              |                                                                                                                                                                                                                                                                                                                                |       |      |           |                       |     |        |  |         |       |             |  |      |  |                                                      |          |  |  |  |  |                                                |        |  |  |  |  |                                                 |        |  |  |  |  |                                              |        |  |  |  |  |                                                      |          |  |  |  |  |
| <p>Status: 200 OK Time: 546596 ms Size: 482 B</p> <table border="1"> <thead> <tr> <th>Body</th> <th>Cookies</th> <th>Headers (7)</th> <th>Test Results</th> </tr> </thead> <tbody> <tr> <td>Pretty<br/>1 {<br/>2 "status": "success",<br/>3 "message": "New company registered",<br/>4 "company": {<br/>5 "companyID": "\u0000org.pharma-network.pharanet.company\u0000RET002\u0000upgrad\u0000",<br/>6 "name": "upgrad",<br/>7 "location": "Mumbai",<br/>8 "organisationRole": "Retailer",<br/>9 "hierarchyKey": 3<br/>10 }<br/>11 }</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Raw</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Preview</td> <td></td> <td></td> <td></td> </tr> <tr> <td>JSON</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Body                  | Cookies       | Headers (7)        | Test Results | Pretty<br>1 {<br>2 "status": "success",<br>3 "message": "New company registered",<br>4 "company": {<br>5 "companyID": "\u0000org.pharma-network.pharanet.company\u0000RET002\u0000upgrad\u0000",<br>6 "name": "upgrad",<br>7 "location": "Mumbai",<br>8 "organisationRole": "Retailer",<br>9 "hierarchyKey": 3<br>10 }<br>11 } |       |      |           | Raw                   |     |        |  | Preview |       |             |  | JSON |  |                                                      |          |  |  |  |  |                                                |        |  |  |  |  |                                                 |        |  |  |  |  |                                              |        |  |  |  |  |                                                      |          |  |  |  |  |
| Body                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Cookies                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Headers (7)           | Test Results  |                    |              |                                                                                                                                                                                                                                                                                                                                |       |      |           |                       |     |        |  |         |       |             |  |      |  |                                                      |          |  |  |  |  |                                                |        |  |  |  |  |                                                 |        |  |  |  |  |                                              |        |  |  |  |  |                                                      |          |  |  |  |  |
| Pretty<br>1 {<br>2 "status": "success",<br>3 "message": "New company registered",<br>4 "company": {<br>5 "companyID": "\u0000org.pharma-network.pharanet.company\u0000RET002\u0000upgrad\u0000",<br>6 "name": "upgrad",<br>7 "location": "Mumbai",<br>8 "organisationRole": "Retailer",<br>9 "hierarchyKey": 3<br>10 }<br>11 }                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                       |               |                    |              |                                                                                                                                                                                                                                                                                                                                |       |      |           |                       |     |        |  |         |       |             |  |      |  |                                                      |          |  |  |  |  |                                                |        |  |  |  |  |                                                 |        |  |  |  |  |                                              |        |  |  |  |  |                                                      |          |  |  |  |  |
| Raw                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                       |               |                    |              |                                                                                                                                                                                                                                                                                                                                |       |      |           |                       |     |        |  |         |       |             |  |      |  |                                                      |          |  |  |  |  |                                                |        |  |  |  |  |                                                 |        |  |  |  |  |                                              |        |  |  |  |  |                                                      |          |  |  |  |  |
| Preview                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                       |               |                    |              |                                                                                                                                                                                                                                                                                                                                |       |      |           |                       |     |        |  |         |       |             |  |      |  |                                                      |          |  |  |  |  |                                                |        |  |  |  |  |                                                 |        |  |  |  |  |                                              |        |  |  |  |  |                                                      |          |  |  |  |  |
| JSON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                       |               |                    |              |                                                                                                                                                                                                                                                                                                                                |       |      |           |                       |     |        |  |         |       |             |  |      |  |                                                      |          |  |  |  |  |                                                |        |  |  |  |  |                                                 |        |  |  |  |  |                                              |        |  |  |  |  |                                                      |          |  |  |  |  |

#### 8.2.6. Paracetamol-001 to Paracetamol-004

- There are 4 requests under “Initiation” collection that are used to create four drug entities with name “Paracetamol” and serial numbers 001 to 004 as shown below

Initiation

9 requests

POST Sun Pharma

POST FedEx

POST Blue Dart

POST VG Pharma

POST upgrad

POST Paracetamol-001

POST Paracetamol-002

POST Paracetamol-003

POST Paracetamol-004

- Open each of these requests individually and click on Send button to submit the requests
- Notice on terminal console output that the node application detects wallet is available for “Manufacturer” organization and does not create it again for any of these requests

```

Creation time of "/home/upgrad/workspace/capstone_Project/pharma-network/network/crypto-config/peerOrganizations/manufacturer.pharma-network.com/users/Admin@manufacturer.pharma-network.com/msp/" is Wed May 06 2020 22:33:35 GMT+0530 (IST)
Creation time of "/home/upgrad/workspace/capstone_Project/pharma-network/application/identity/manufacturer/MANUFACTURER_ADMIN" is Wed May 06 2020 22:52:10 GMT+0530 (IST)
.....Wallet exists for Manufacturer
.....Connecting to Fabric Gateway
.....Connecting to channel - pharmachannel
.....Connecting to Smart Contract in pharmanet chaincode
.....Add drug
.....Processing Add Drug Transaction Response

{
 productID: '\u0000org.pharma-network.pharmanet.drug\u0000Paracetamol\u0000001\u0000',
 name: 'Paracetamol',
 manufacturer: '\u0000org.pharma-network.pharmanet.company\u0000MAN001\u0000Sun Pharma\u0000',
 manufacturingDate: '2020-05-04T00:00:00.000Z',
 expiryDate: '\u0000-05-04T00:00:00.000Z',
 owner: '\u0000org.pharma-network.pharmanet.company\u0000MAN001\u0000Sun Pharma\u0000',
 shipment: [],
 createdAt: '2020-05-06T18:09:40.673Z',
 updatedAt: '2020-05-06T18:09:40.673Z'
}

.....Add Drug Transaction Complete!
.....Disconnecting from Fabric Gateway
New drug added

```

- Since these requests are submitted as Manufacturer, each request is sent to peer0 of manufacturer organization for endorsement and the requests complete in few seconds since chaincode container is already created as explained above
- After successful execution, output is available on Postman under results section of respective request

Request details and expected output are shown below

|                            |                          |
|----------------------------|--------------------------|
| <b>Request Purpose</b>     | : Create new drug        |
| <b>Request URL</b>         | : localhost:3000/addDrug |
| <b>Request Type</b>        | : POST                   |
| <b>Submitted As Client</b> | : Manufacturer           |

#### 8.2.6.1. Paracetamol-001

| <b>Request Body</b>                                  | <div style="border: 1px solid #ccc; padding: 10px;"> <p>▶ Paracetamol-001</p> <p>POST    <input type="text" value="localhost:3000/addDrug"/></p> <p>Params    Authorization    Headers (1)    <b>Body</b> ●    Pre-request Script    Tests</p> <p><input type="radio"/> none    <input type="radio"/> form-data    <input checked="" type="radio"/> x-www-form-urlencoded    <input type="radio"/> raw    <input type="radio"/> binary</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>KEY</th> <th>VALUE</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td><input checked="" type="checkbox"/> organizationName</td> <td>Manufacturer</td> <td></td> </tr> <tr> <td><input checked="" type="checkbox"/> drugName</td> <td>Paracetamol</td> <td></td> </tr> <tr> <td><input checked="" type="checkbox"/> serialNo</td> <td>001</td> <td></td> </tr> <tr> <td><input checked="" type="checkbox"/> mfgDate</td> <td>2020-05-04</td> <td></td> </tr> <tr> <td><input checked="" type="checkbox"/> expDate</td> <td>2022-05-04</td> <td></td> </tr> <tr> <td><input checked="" type="checkbox"/> companyCRN</td> <td>MAN001</td> <td></td> </tr> </tbody> </table> </div> | KEY         | VALUE | DESCRIPTION | <input checked="" type="checkbox"/> organizationName | Manufacturer |  | <input checked="" type="checkbox"/> drugName | Paracetamol |  | <input checked="" type="checkbox"/> serialNo | 001 |  | <input checked="" type="checkbox"/> mfgDate | 2020-05-04 |  | <input checked="" type="checkbox"/> expDate | 2022-05-04 |  | <input checked="" type="checkbox"/> companyCRN | MAN001 |  |
|------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------|-------------|------------------------------------------------------|--------------|--|----------------------------------------------|-------------|--|----------------------------------------------|-----|--|---------------------------------------------|------------|--|---------------------------------------------|------------|--|------------------------------------------------|--------|--|
| KEY                                                  | VALUE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | DESCRIPTION |       |             |                                                      |              |  |                                              |             |  |                                              |     |  |                                             |            |  |                                             |            |  |                                                |        |  |
| <input checked="" type="checkbox"/> organizationName | Manufacturer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |             |       |             |                                                      |              |  |                                              |             |  |                                              |     |  |                                             |            |  |                                             |            |  |                                                |        |  |
| <input checked="" type="checkbox"/> drugName         | Paracetamol                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |             |       |             |                                                      |              |  |                                              |             |  |                                              |     |  |                                             |            |  |                                             |            |  |                                                |        |  |
| <input checked="" type="checkbox"/> serialNo         | 001                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |             |       |             |                                                      |              |  |                                              |             |  |                                              |     |  |                                             |            |  |                                             |            |  |                                                |        |  |
| <input checked="" type="checkbox"/> mfgDate          | 2020-05-04                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |             |       |             |                                                      |              |  |                                              |             |  |                                              |     |  |                                             |            |  |                                             |            |  |                                                |        |  |
| <input checked="" type="checkbox"/> expDate          | 2022-05-04                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |             |       |             |                                                      |              |  |                                              |             |  |                                              |     |  |                                             |            |  |                                             |            |  |                                                |        |  |
| <input checked="" type="checkbox"/> companyCRN       | MAN001                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |             |       |             |                                                      |              |  |                                              |             |  |                                              |     |  |                                             |            |  |                                             |            |  |                                                |        |  |

### Expected Output

The screenshot shows the 'Expected Output' tab in Postman. The status bar at the top indicates 'Status: 200 OK' and 'Time: 5778 ms'. The body of the response is displayed in JSON format:

```
1 {
2 "status": "success",
3 "message": "New drug added",
4 "drug": {
5 "productID": "\u0000org.pharma-network.pharmanet.drug\u0000Paracetamol\u0000001\u0000",
6 "name": "Paracetamol",
7 "manufacturer": "\u0000org.pharma-network.pharmanet.company\u0000MAN001\u0000Sun Pharma\u0000",
8 "manufacturingDate": "2020-05-04T00:00:00.000Z",
9 "expiryDate": "2022-05-04T00:00:00.000Z",
10 "owner": "\u0000org.pharma-network.pharmanet.company\u0000MAN001\u0000Sun Pharma\u0000",
11 "shipment": [],
12 "createdAt": "2020-05-06T18:09:40.673Z",
13 "updatedAt": "2020-05-06T18:09:40.673Z"
14 }
15 }
```

### 8.2.6.2. Paracetamol-002

The screenshot shows the 'Request Body' tab in Postman. The method is set to 'POST' and the URL is 'localhost:3000/addDrug'. The 'Body' tab is selected, showing the following parameters:

|                                     | KEY              | VALUE        | DESCRIPTION |
|-------------------------------------|------------------|--------------|-------------|
| <input checked="" type="checkbox"/> | organizationName | Manufacturer |             |
| <input checked="" type="checkbox"/> | drugName         | Paracetamol  |             |
| <input checked="" type="checkbox"/> | serialNo         | 002          |             |
| <input checked="" type="checkbox"/> | mfgDate          | 2020-05-04   |             |
| <input checked="" type="checkbox"/> | expDate          | 2022-05-04   |             |
| <input checked="" type="checkbox"/> | companyCRN       | MAN001       |             |

### Expected Output

The screenshot shows the 'Expected Output' tab in Postman. The status bar at the top indicates 'Status: 200 OK' and 'Time: 9293 ms'. The body of the response is displayed in JSON format:

```
1 {
2 "status": "success",
3 "message": "New drug added",
4 "drug": {
5 "productID": "\u0000org.pharma-network.pharmanet.drug\u0000Paracetamol\u0000002\u0000",
6 "name": "Paracetamol",
7 "manufacturer": "\u0000org.pharma-network.pharmanet.company\u0000MAN001\u0000Sun Pharma\u0000",
8 "manufacturingDate": "2020-05-04T00:00:00.000Z",
9 "expiryDate": "2022-05-04T00:00:00.000Z",
10 "owner": "\u0000org.pharma-network.pharmanet.company\u0000MAN001\u0000Sun Pharma\u0000",
11 "shipment": [],
12 "createdAt": "2020-05-06T18:12:36.500Z",
13 "updatedAt": "2020-05-06T18:12:36.500Z"
14 }
15 }
```

### 8.2.6.3. Paracetamol-003

**Request Body**

▶ Paracetamol-003

POST localhost:3000/addDrug

| Params                                               | Authorization | Headers (1)           | Body | Pre-request Script | Tests |
|------------------------------------------------------|---------------|-----------------------|------|--------------------|-------|
| none                                                 | form-data     | x-www-form-urlencoded | raw  | binary             |       |
| KEY                                                  | VALUE         | DESCRIPTION           |      |                    |       |
| <input checked="" type="checkbox"/> organizationName | Manufacturer  |                       |      |                    |       |
| <input checked="" type="checkbox"/> drugName         | Paracetamol   |                       |      |                    |       |
| <input checked="" type="checkbox"/> serialNo         | 003           |                       |      |                    |       |
| <input checked="" type="checkbox"/> mfgDate          | 2020-05-04    |                       |      |                    |       |
| <input checked="" type="checkbox"/> expDate          | 2022-05-04    |                       |      |                    |       |
| <input checked="" type="checkbox"/> companyCRN       | MAN001        |                       |      |                    |       |

**Expected Output**

Body Cookies Headers (7) Test Results Status: 200 OK Time: 10017 ms Size: 769 B

Pretty Raw Preview JSON ↗

```

1 {
2 "status": "success",
3 "message": "New drug added",
4 "drug": [
5 {
6 "productID": "\u0000org.pharma-network.pharmanet.drug\u0000Paracetamol\u0000003\u0000",
7 "name": "Paracetamol",
8 "manufacturer": "\u0000org.pharma-network.pharmanet.company\u0000MAN001\u0000Sun Pharma\u0000",
9 "manufacturingDate": "2020-05-04T00:00:00.000Z",
10 "expiryDate": "2022-05-04T00:00:00.000Z",
11 "owner": "\u0000org.pharma-network.pharmanet.company\u0000MAN001\u0000Sun Pharma\u0000",
12 "shipment": [],
13 "createdAt": "2020-05-06T18:14:25.848Z",
14 "updatedAt": "2020-05-06T18:14:25.848Z"
15 }
16]

```

#### 8.2.6.4. Paracetamol-004

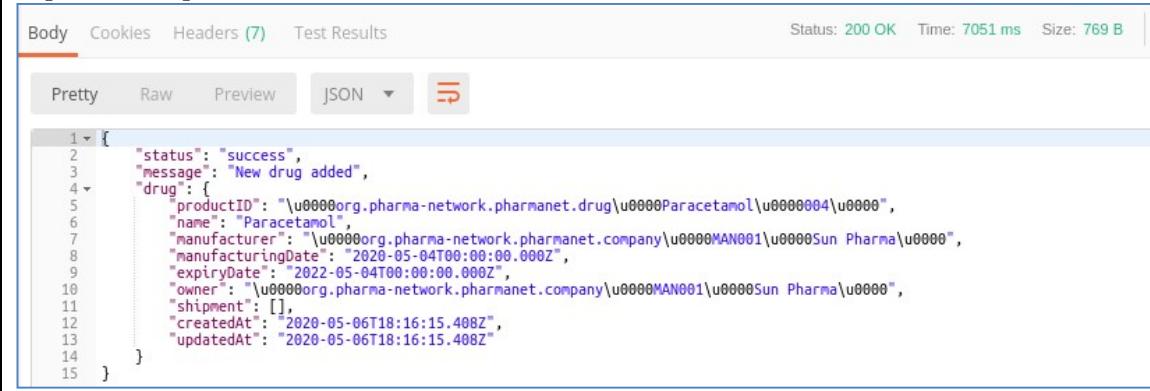
**Request Body**

▶ Paracetamol-004

POST localhost:3000/addDrug

| Params                                               | Authorization | Headers (1)           | Body | Pre-request Script | Tests |
|------------------------------------------------------|---------------|-----------------------|------|--------------------|-------|
| none                                                 | form-data     | x-www-form-urlencoded | raw  | binary             |       |
| KEY                                                  | VALUE         | DESCRIPTION           |      |                    |       |
| <input checked="" type="checkbox"/> organizationName | Manufacturer  |                       |      |                    |       |
| <input checked="" type="checkbox"/> drugName         | Paracetamol   |                       |      |                    |       |
| <input checked="" type="checkbox"/> serialNo         | 004           |                       |      |                    |       |
| <input checked="" type="checkbox"/> mfgDate          | 2020-05-04    |                       |      |                    |       |
| <input checked="" type="checkbox"/> expDate          | 2022-05-04    |                       |      |                    |       |
| <input checked="" type="checkbox"/> companyCRN       | MAN001        |                       |      |                    |       |

## Expected Output

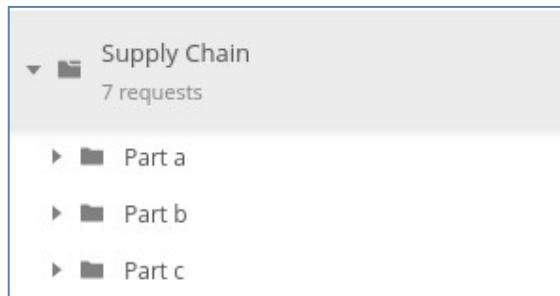


The screenshot shows a Postman collection named "Supply Chain" with 7 requests. One request has been run, and its response is displayed in the "Body" tab. The response is a JSON object:

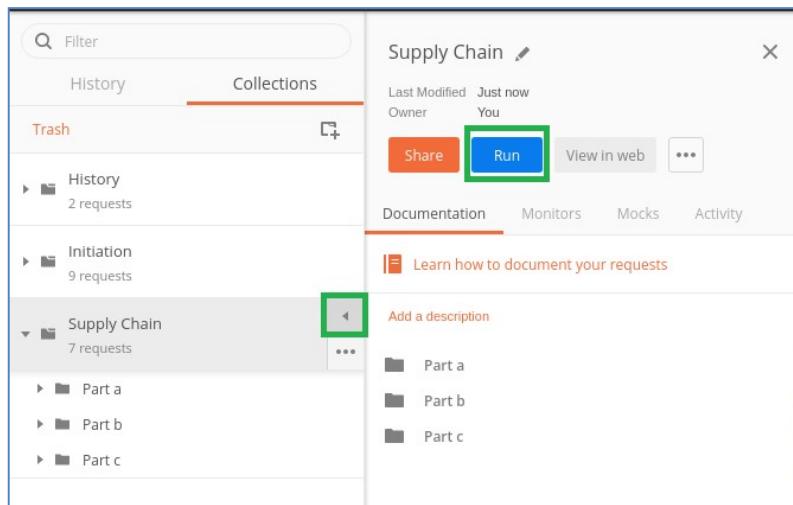
```
1 {
2 "status": "success",
3 "message": "New drug added",
4 "drug": {
5 "productID": "\u0000org.pharma-network.pharmanet.drug\u0000Paracetamol\u0000004\u0000",
6 "name": "Paracetamol",
7 "manufacturer": "\u0000org.pharma-network.pharmanet.company\u0000MAN001\u0000Sun Pharma\u0000",
8 "manufacturingDate": "2020-05-04T00:00:00.000Z",
9 "expiryDate": "2022-05-04T00:00:00.000Z",
10 "owner": "\u0000org.pharma-network.pharmanet.company\u0000MAN001\u0000Sun Pharma\u0000",
11 "shipment": [],
12 "createdAt": "2020-05-06T18:16:15.408Z",
13 "updatedAt": "2020-05-06T18:16:15.408Z"
14 }
15 }
```

### 8.3. Supply Chain Test Cases

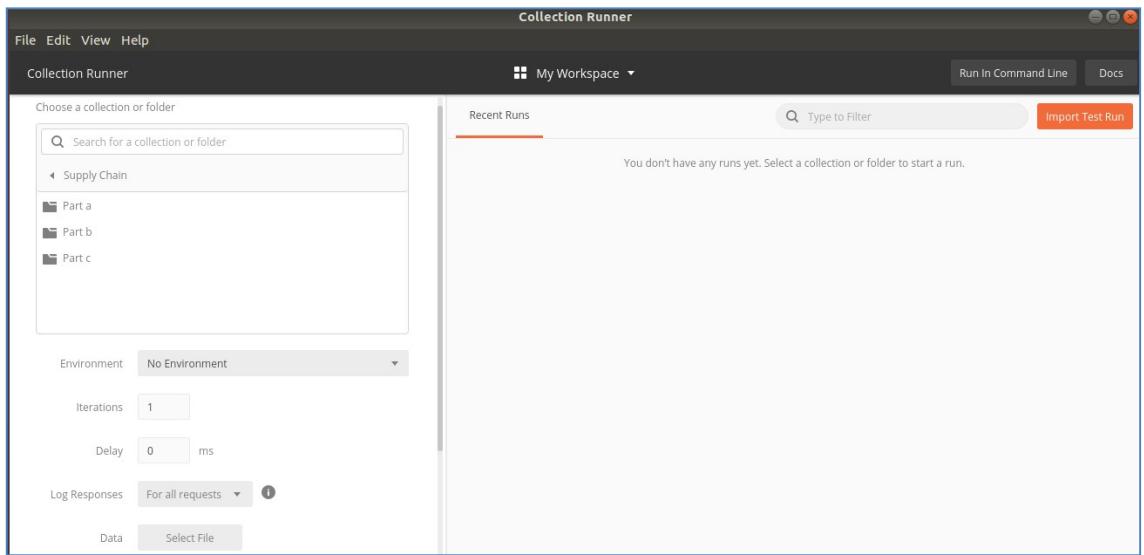
- This section explains various test cases available as part of “Supply Chain” collection
- The collection is divided into three parts grouped under three folders as shown below



- These collections can be triggered at once with appropriate time delay between each request since they are submitted as orgs that have peer chaincode containers already created from Initiation section as explained above and hence complete in few seconds
- Wallets for all these orgs are also created from Initiation section and hence are not re-created as explained above
- Click on arrow button on Supply Chain collection and in the fly out menu click “Run” as shown below



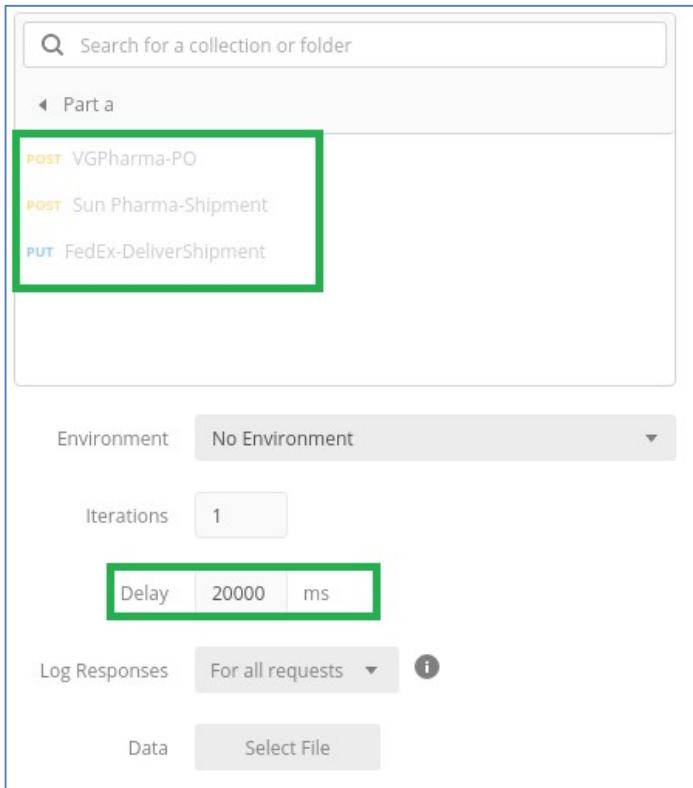
- This will launch Postman collection runner in a separate window as shown below



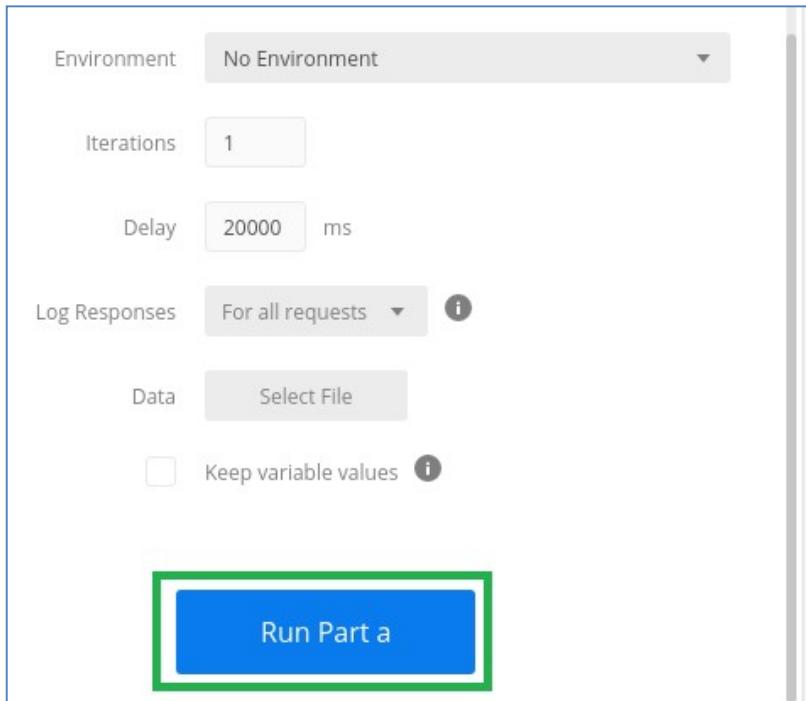
- Each folder in the collection will be executed separately from collection runner

### 8.3.1. Part a

- Click on Part a folder on Collection Runner window
- Ensure settings are as shown below and note that delay between requests is set at 20000 ms which is 20 seconds



- Scroll down and click “Run Part a” as shown below



- This will open Run Results tab where the run progress can be monitored

- Once the run completes, screen will look like below

Collection Runner

Collection Runner Run Results My Workspace Run In Command Line Docs

Part a No Environment 3 mins ago

Iteration 1

- POST VGPharma-PO** localhost:3000/createPO ...ply Chain / Part a / VGPharma-PO 200 OK 4678 ms 462 B
- This request does not have any tests.
- POST Sun Pharma-Shipment** localhost:3000/createShi... n / Part a / Sun Pharma-Shipment 200 OK 9758 ms 671 B
- This request does not have any tests.
- PUT FedEx-DeliverShipment** localhost:3000/updateSh... / Part a / FedEx-DeliverShipment 200 OK 11400 ms 1.71 KB
- This request does not have any tests.

- The request parameters and response body for each request can be viewed by clicking on method name in Run Results tab as shown below

Collection Runner

Collection Runner Run Results My Workspace Run In Command Line Docs

Part a No Environment 3 mins ago

Iteration 1

- POST VGPharma-PO** localhost:3000/createPO ...ply Chain / Part a / VGPharma-PO 200 OK 4678 ms 462 B
- This request does not have any tests.
- Request URL**
- Request Headers (8)**
- Request Body (5)**
- Response Headers (7)**
- Response Body**

### 8.3.1.1. VGPharma-PO

|                            |                                                                                                                            |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------|
| <b>Request Purpose</b>     | Purchase order raised by VGPharma distributor to Sun Pharma Maunfacturer for purchasing 3 Paracetamol drugs                |
| <b>Request URL</b>         | localhost:3000/createPO                                                                                                    |
| <b>Request Type</b>        | POST                                                                                                                       |
| <b>Submitted As Client</b> | Distributor                                                                                                                |
| <b>Request Body</b>        | <pre>Request Body (5) buyerCRN DIST001 drugName Paracetamol organizationName Distributor quantity 3 sellerCRN MAN001</pre> |

### Expected Output

#### Response Body

```
{
 "status": "success",
 "message": "New purchase order created",
 "purchaseorder": {
 "poID": "\u0000org.pharma-
network.pharmanet.purchaseorder\u0000DIST001\u0000Paracetam
ol\u0000",
 "drugName": "Paracetamol",
 "quantity": 3,
 "buyer": "\u0000org.pharma-
network.pharmanet.company\u0000DIST001\u0000VG
Pharma\u0000",
 "seller": "\u0000org.pharma-
network.pharmanet.company\u0000MAN001\u0000Sun
Pharma\u0000",
 "createdAt": "2020-05-06T18:30:12.177Z",
 "updatedAt": "2020-05-06T18:30:12.178Z"
 }
}
```

#### 8.3.1.2. SunPharma-Shipment

|                            |                                                                                                                                                                                                         |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Request Purpose</b>     | : Shipment created by Sun Pharma Maufacturer for 3 Paracetamol drugs with serial numbers 001, 002, 003 in response to purchase order raised by VGPharma distributor with FedEx as transporter           |
| <b>Request URL</b>         | : localhost:3000/createShipment                                                                                                                                                                         |
| <b>Request Type</b>        | : POST                                                                                                                                                                                                  |
| <b>Submitted As Client</b> | : Manufacturer                                                                                                                                                                                          |
| <b>Request Body</b>        | Request Body (5)<br><b>buyerCRN</b> DIST001<br><b>drugName</b> Paracetamol<br><b>listOfAssets</b> "[\"001\", \"002\", \"003\"]"<br><b>organizationName</b> Manufacturer<br><b>transporterCRN</b> TRA001 |

### Expected Output

#### Response Body

```
{
 "status": "success",
 "message": "New shipment created",
 "shipment": {
 "shipmentID": "\u0000org.pharma-
network.pharmanet.shipment\u0000DIST001\u0000Paracetamol\u0
000",
 "creator": "\u0000org.pharma-
network.pharmanet.company\u0000MAN001\u0000Sun
Pharma\u0000",
 "assets": ["\u0000org.pharma-
network.pharmanet.drug\u0000Paracetamol\u0000001\u0000",
"\u0000org.pharma-
network.pharmanet.drug\u0000Paracetamol\u0000002\u0000",
"\u0000org.pharma-
network.pharmanet.drug\u0000Paracetamol\u0000003\u0000"],
 "transporter": "\u0000org.pharma-
network.pharmanet.company\u0000TRA001\u0000FedEx\u0000",
 "status": "in-transit",
 "createdAt": "2020-05-06T18:30:46.001Z",
 "updatedAt": "2020-05-06T18:30:46.001Z"
 }
}
```

#### 8.3.1.3. FedEx-DeliverShipment

**Request Purpose** : Shipment delivered by FedEx Transporter to VGPharma distributor

**Request URL** : localhost:3000/updateShipment

**Request Type** : PUT

**Submitted As Client** : Transporter

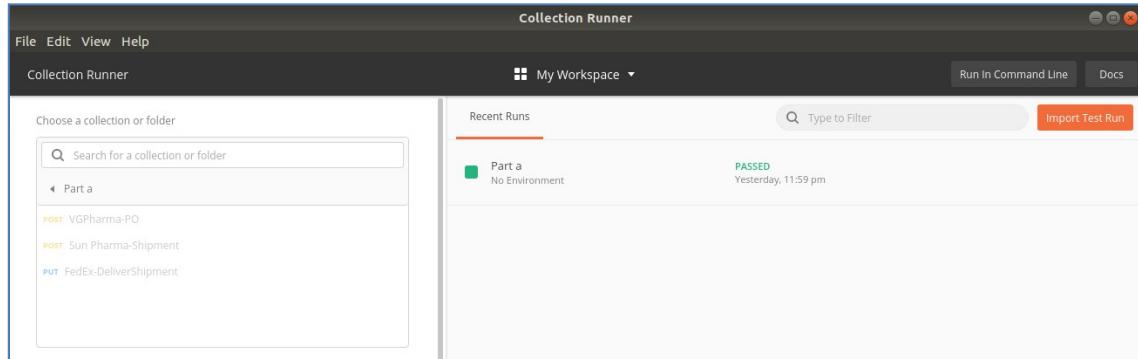
**Request Body** :   
Request Body (4)  
**buyerCRN** DIST001  
**drugName** Paracetamol  
**organizationName** Transporter  
**transporterCRN** TRA001

## Expected Output

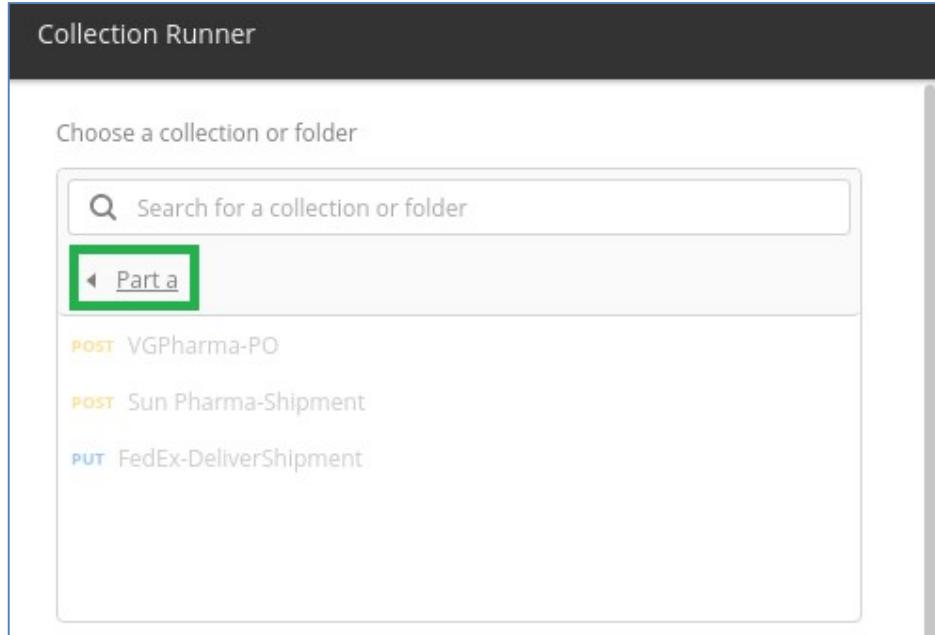
```
{
 "status": "success",
 "message": "Shipment updated",
 "assets": [{
 "productID": "\u0000org.pharma-
network.pharmanet.drug\u0000Paracetamol\u0000001\u0000",
 "name": "Paracetamol",
 "manufacturer": "\u0000org.pharma-
network.pharmanet.company\u0000MAN001\u0000Sun
Pharma\u0000",
 "manufacturingDate": "2020-05-04T00:00:00.000Z",
 "expiryDate": "2022-05-04T00:00:00.000Z",
 "owner": "\u0000org.pharma-
network.pharmanet.company\u0000DIST001\u0000VG
Pharma\u0000",
 "shipment": ["\u0000org.pharma-
network.pharmanet.shipment\u0000DIST001\u0000Paracetamol\u0000"],
 "createdAt": "2020-05-06T18:09:40.673Z",
 "updatedAt": "2020-05-06T18:31:16.018Z"
 }, {
 "productID": "\u0000org.pharma-
network.pharmanet.drug\u0000Paracetamol\u0000002\u0000",
 "name": "Paracetamol",
 "manufacturer": "\u0000org.pharma-
network.pharmanet.company\u0000MAN001\u0000Sun
Pharma\u0000",
 "manufacturingDate": "2020-05-04T00:00:00.000Z",
 "expiryDate": "2022-05-04T00:00:00.000Z",
 "owner": "\u0000org.pharma-
network.pharmanet.company\u0000DIST001\u0000VG
Pharma\u0000",
 "shipment": ["\u0000org.pharma-
network.pharmanet.shipment\u0000DIST001\u0000Paracetamol\u0000"],
 "createdAt": "2020-05-06T18:12:36.500Z",
 "updatedAt": "2020-05-06T18:31:16.499Z"
 }, {
 "productID": "\u0000org.pharma-
network.pharmanet.drug\u0000Paracetamol\u0000003\u0000",
 "name": "Paracetamol",
 "manufacturer": "\u0000org.pharma-
network.pharmanet.company\u0000MAN001\u0000Sun
Pharma\u0000",
 "manufacturingDate": "2020-05-04T00:00:00.000Z",
 "expiryDate": "2022-05-04T00:00:00.000Z",
 "owner": "\u0000org.pharma-
network.pharmanet.company\u0000DIST001\u0000VG
Pharma\u0000",
 "shipment": ["\u0000org.pharma-
network.pharmanet.shipment\u0000DIST001\u0000Paracetamol\u0000"],
 "createdAt": "2020-05-06T18:14:25.848Z",
 "updatedAt": "2020-05-06T18:31:16.618Z"
 }]
}
```

### 8.3.2. Part b

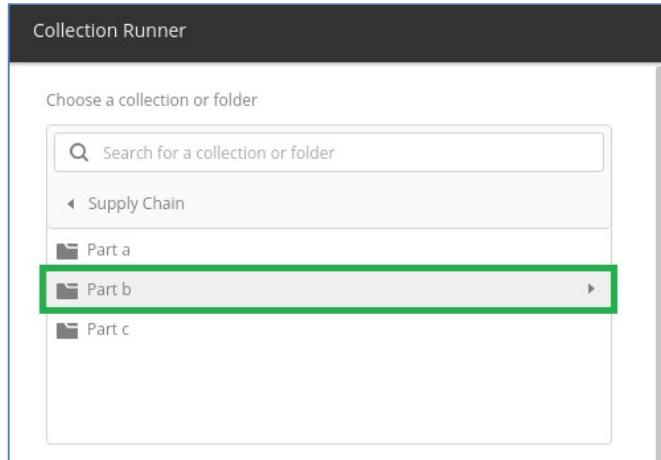
- Click on Collection Runner tab after Part a completes which will bring back collection runner window as shown below



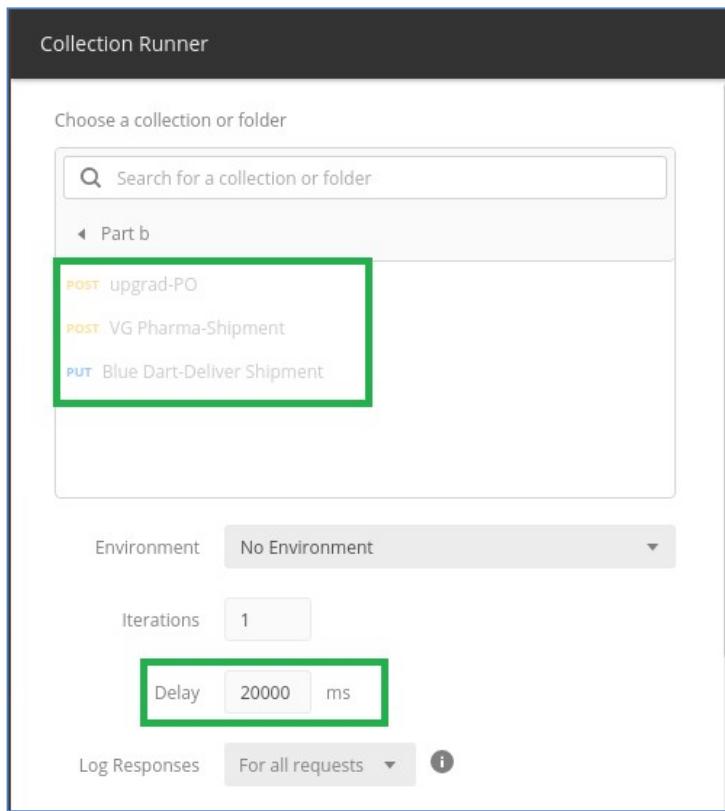
- Click on Part a folder to go back to Supply Chain collection as shown below



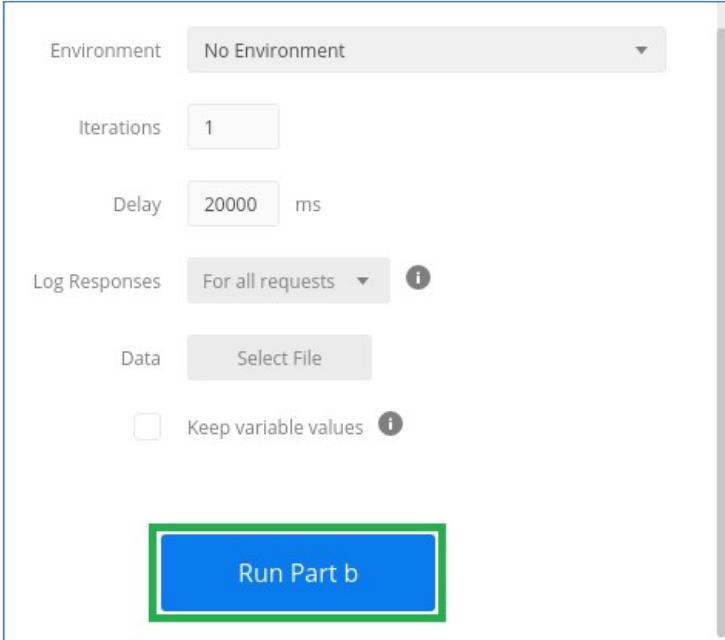
- Click on Part b folder under Supply Chain collection as shown below



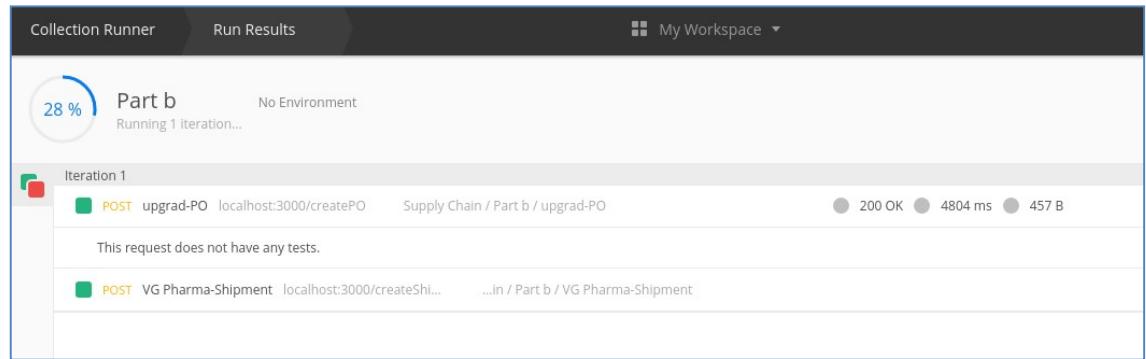
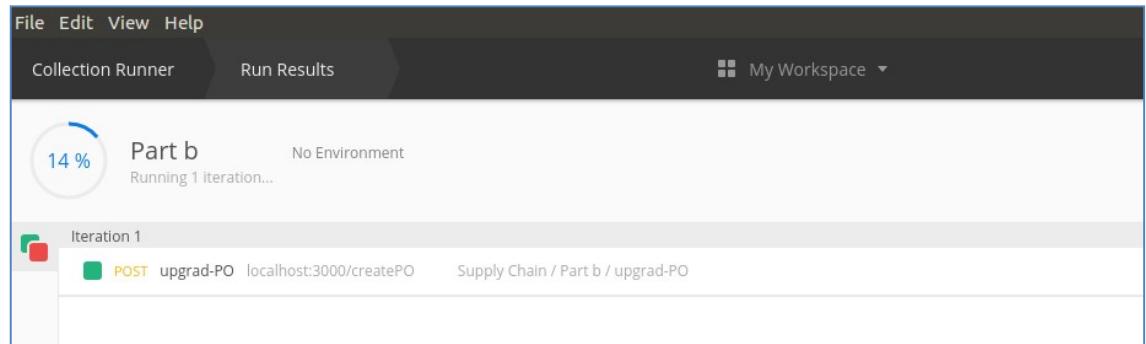
- Ensure settings are as shown below and note that delay between requests is set at 20000 ms which is 20 seconds



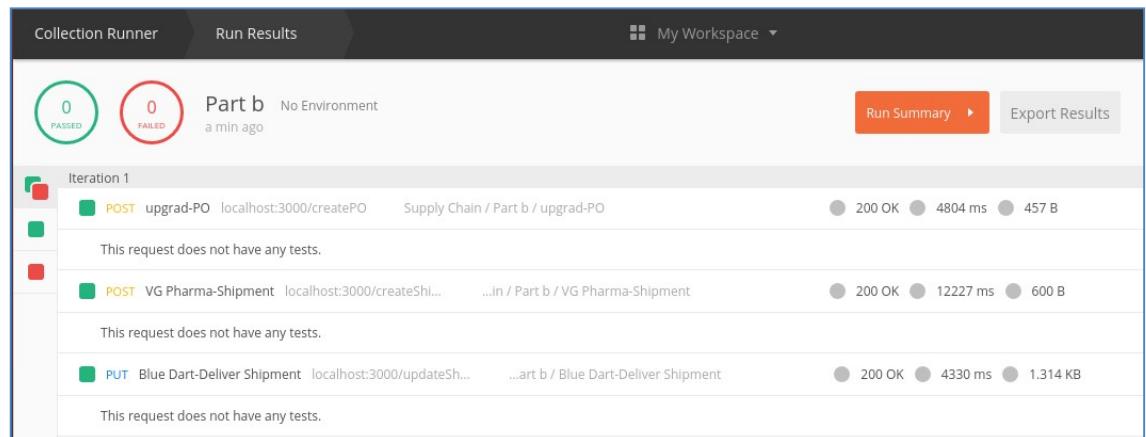
- Scroll down and click “Run Part b” as shown below



- This will open Run Results tab where run progress can be monitored



- Once the run completes, screen will look like below



- The request parameters and response body for each request can be viewed by clicking on method name in Run Results tab as shown below

Collection Runner Run Results My Workspace ▾

0 PASSED 0 FAILED Part b No Environment a min ago

Iteration 1

|               |                                  |                         |                                   |
|---------------|----------------------------------|-------------------------|-----------------------------------|
|               | POST <a href="#">upgrad-PO</a>   | localhost:3000/createPO | Supply Chain / Part b / upgrad-PO |
|               | Request URL                      |                         |                                   |
|               | Request Headers (8)              |                         |                                   |
|               | Request Body (5)                 |                         |                                   |
|               | Response Headers (7)             |                         |                                   |
|               | PUT <a href="#">End Shipment</a> |                         |                                   |
| Response Body |                                  |                         |                                   |

This request does not have any tests.

#### 8.3.2.1. upgrad-PO

|                            |                                                                                                                         |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Request Purpose</b>     | : Purchase order raised by upgrad Retailer to VGPharma distributor for purchasing 2 Paracetamol drugs                   |
| <b>Request URL</b>         | : localhost:3000/createPO                                                                                               |
| <b>Request Type</b>        | : POST                                                                                                                  |
| <b>Submitted As Client</b> | : Retailer                                                                                                              |
| <b>Request Body</b>        | <pre>Request Body (5) buyerCRN RET002 drugName Paracetamol organizationName Retailer quantity 2 sellerCRN DIST001</pre> |

### Expected Output

#### Response Body

```
{
 "status": "success",
 "message": "New purchase order created",
 "purchaseorder": {
 "poID": "\u0000org.pharma-
network.pharmanet.purchaseorder\u0000RET002\u0000Paracetamo
1\u0000",
 "drugName": "Paracetamol",
 "quantity": 2,
 "buyer": "\u0000org.pharma-
network.pharmanet.company\u0000RET002\u0000upgrad\u0000",
 "seller": "\u0000org.pharma-
network.pharmanet.company\u0000DIST001\u0000VG
Pharma\u0000",
 "createdAt": "2020-05-06T19:04:10.384Z",
 "updatedAt": "2020-05-06T19:04:10.384Z"
 }
}
```

### 8.3.2.2.VG Pharma-Shipment

|                            |                                                                                                                                                                                                             |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Request Purpose</b>     | : Shipment created by VGPharma distributor for 2 Paracetamol drugs with serial numbers 001, 002 in response to purchase order raised by upgrad retailer with Blue Dart as transporter                       |
| <b>Request URL</b>         | : localhost:3000/createShipment                                                                                                                                                                             |
| <b>Request Type</b>        | : POST                                                                                                                                                                                                      |
| <b>Submitted As Client</b> | Distributor                                                                                                                                                                                                 |
| <b>Request Body</b>        | <pre>Request Body (5)<br/><b>buyerCRN</b> RET002<br/><b>drugName</b> Paracetamol<br/><b>listOfAssets</b> "["001\", \"002\"]"<br/><b>organizationName</b> Distributor<br/><b>transporterCRN</b> TRA002</pre> |

### Expected Output

#### Response Body

```
{
 "status": "success",
 "message": "New shipment created",
 "shipment": {
 "shipmentID": "\u0000org.pharma-
network.pharmanet.shipment\u0000RET002\u0000Paracetamol\u00
00",
 "creator": "\u0000org.pharma-
network.pharmanet.company\u0000DIST001\u0000VG
Pharma\u0000",
 "assets": ["\u0000org.pharma-
network.pharmanet.drug\u0000Paracetamol\u0000001\u0000",
"\u0000org.pharma-
network.pharmanet.drug\u0000Paracetamol\u0000002\u0000"],
 "transporter": "\u0000org.pharma-
network.pharmanet.company\u0000TRA002\u0000Blue
Dart\u0000",
 "status": "in-transit",
 "createdAt": "2020-05-06T19:04:42.371Z",
 "updatedAt": "2020-05-06T19:04:42.371Z"
 }
}
```

#### 8.3.1.3. Blue Dart-DeliverShipment

**Request Purpose** : Shipment delivered by Blue Dart Transporter to upgrad Retailer

**Request URL** : localhost:3000/updateShipment

**Request Type** : PUT

**Submitted As Client** : Transporter

**Request Body** :  
Request Body (4)  
**buyerCRN** RET002  
**drugName** Paracetamol  
**organizationName** Transporter  
**transporterCRN** TRA002

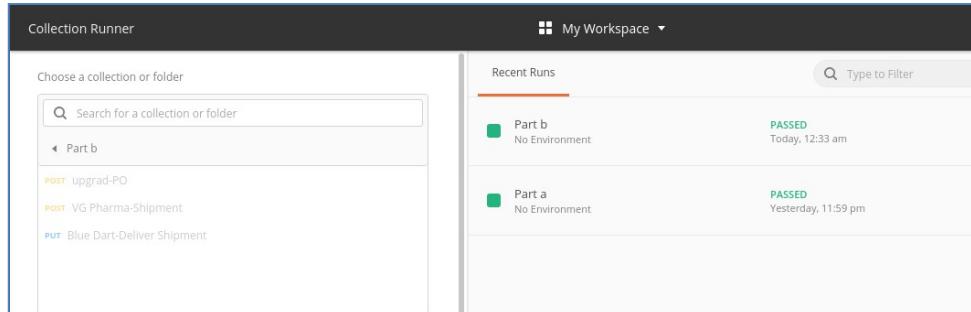
### Expected Output

#### Response Body

```
{
 "status": "success",
 "message": "Shipment updated",
 "assets": [
 {"productID": "\u00000org.pharma-
network.pharmanet.drug\u0000Paracetamol\u0000001\u0000",
 "name": "Paracetamol",
 "manufacturer": "\u0000org.pharma-
network.pharmanet.company\u0000MAN001\u0000Sun
Pharma\u0000",
 "manufacturingDate": "2020-05-04T00:00:00.000Z",
 "expiryDate": "2022-05-04T00:00:00.000Z",
 "owner": "\u0000org.pharma-
network.pharmanet.company\u0000RET002\u0000upgrad\u0000",
 "shipment": ["\u0000org.pharma-
network.pharmanet.shipment\u0000DIST001\u0000Paracetamol\u0000", "\u0000org.pharma-
network.pharmanet.shipment\u0000RET002\u0000Paracetamol\u0000"],
 "createdAt": "2020-05-06T18:09:40.673Z",
 "updatedAt": "2020-05-06T19:05:08.092Z"
 }, {
 "productID": "\u0000org.pharma-
network.pharmanet.drug\u0000Paracetamol\u0000002\u0000",
 "name": "Paracetamol",
 "manufacturer": "\u0000org.pharma-
network.pharmanet.company\u0000MAN001\u0000Sun
Pharma\u0000",
 "manufacturingDate": "2020-05-04T00:00:00.000Z",
 "expiryDate": "2022-05-04T00:00:00.000Z",
 "owner": "\u0000org.pharma-
network.pharmanet.company\u0000RET002\u0000upgrad\u0000",
 "shipment": ["\u0000org.pharma-
network.pharmanet.shipment\u0000DIST001\u0000Paracetamol\u0000", "\u0000org.pharma-
network.pharmanet.shipment\u0000RET002\u0000Paracetamol\u0000"],
 "createdAt": "2020-05-06T18:12:36.500Z",
 "updatedAt": "2020-05-06T19:05:08.098Z"
 }]
}
```

### 8.3.3. Part c

- Click on Collection Runner tab after Part b completes which will bring back collection runner window as shown below



- Click on Part b folder to go back to Supply Chain collection as shown below

The screenshot shows the 'Collection Runner' interface. At the top, it says 'Choose a collection or folder'. Below that is a search bar with the placeholder 'Search for a collection or folder'. Underneath the search bar, there is a list of items. The item 'Part b' is highlighted with a green border. Other items listed are 'upgrad-PO', 'VG Pharma-Shipment', and 'Blue Dart-Deliver Shipment'. Each item has a small icon to its left.

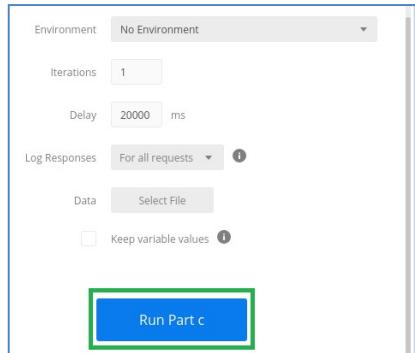
- Click on Part c folder under Supply Chain collection as shown below

The screenshot shows the 'Collection Runner' interface. At the top, it says 'Choose a collection or folder'. Below that is a search bar with the placeholder 'Search for a collection or folder'. Underneath the search bar, there is a list of items. The item 'Supply Chain' is at the top. Below it, 'Part a' and 'Part b' are listed. 'Part c' is listed further down and is highlighted with a green border. Each item has a small icon to its left.

- Ensure settings are as shown below and note that there is only one test case in this folder

The screenshot shows the 'Collection Runner' interface with the 'Part c' folder selected. At the top, it says 'Choose a collection or folder'. Below that is a search bar with the placeholder 'Search for a collection or folder'. Underneath the search bar, there is a list of items. The item 'Part c' is highlighted with a green border. Below the list, there are several configuration options: 'Environment' set to 'No Environment', 'Iterations' set to '1', 'Delay' set to '20000 ms', and 'Log Responses' set to 'For all requests'. There is also a small info icon.

- Scroll down and click “Run Part c” as shown below



- This will open Run Results tab where run progress can be monitored

The screenshot shows the 'Run Results' tab for 'Part c'. It displays a progress bar at 14% completion. Below it, 'Iteration 1' is shown with a green icon and the text 'PUT upgrad-Retail Drug localhost:3000/retailDrug ...hain / Part c / upgrad-Retail Drug'. A status message says 'This request does not have any tests.'

- Once the run completes, screen will look like below

The screenshot shows the 'Run Results' tab after the run has completed. It displays '0 PASSED' and '0 FAILED' test counts. The 'Run Summary' section shows 'Iteration 1' with a green icon, 'PUT upgrad-Retail Drug localhost:3000/retailDrug ...hain / Part c / upgrad-Retail Drug', and metrics: 200 OK, 5564 ms, 614 B. A note says 'This request does not have any tests.'

- The request parameters and response body can be viewed by clicking on method name in Run Results tab as shown below

The screenshot shows the 'Run Results' tab for 'Part c'. It displays '0 PASSED' and '0 FAILED' test counts. The 'Run Summary' section shows 'Iteration 1' with a green icon, 'PUT upgrad-Retail Drug localhost:3000/retailDrug ...hain / Part c / upgrad-Retail Drug', and metrics: 200 OK, 5564 ms, 614 B. A note says 'This request does not have any tests.' A context menu is open over the 'PUT' method, listing options: Request URL, Request Headers (8), Request Body (5), Response Headers (7), and Response Body.

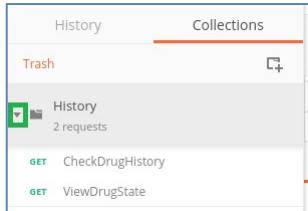
#### 8.3.3.1. upgrad-Retail Drug

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Request Purpose</b>     | : Sale of 1 Paracetamol drug with serial number 001 by upgrad Retailer to Customer Aakash with Aadhar number AAD001                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Request URL</b>         | : localhost:3000/retailDrug                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Request Type</b>        | : PUT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Submitted As Client</b> | : Retailer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Request Body</b>        | <p>Request Body (5)</p> <pre>customerAadhar AAD001 drugName Paracetamol organizationName Retailer retailerCRN RET002 serialNo 001</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Expected Output</b>     | <p>Response Body</p> <pre>{   "status": "success",   "message": "Drug retailed",   "drug": {     "productID": "\u0000org.pharma-network.pharmanet.drug\u0000Paracetamol\u0000001\u0000",     "name": "Paracetamol",     "manufacturer": "\u0000org.pharma-network.pharmanet.company\u0000MAN001\u0000Sun Pharma\u0000",     "manufacturingDate": "2020-05-04T00:00:00.000Z",     "expiryDate": "2022-05-04T00:00:00.000Z",     "owner": "AAD001",     "shipment": ["\u0000org.pharma-network.pharmanet.shipment\u0000DIST001\u0000Paracetamol\u0000", "\u0000org.pharma-network.pharmanet.shipment\u0000RET002\u0000Paracetamol\u0000"],     "createdAt": "2020-05-06T18:09:40.673Z",     "updatedAt": "2020-05-06T19:24:17.600Z"   } }</pre> |

#### 8.4. History Test Cases

- This section explains various test cases available as part of “History” collection
- Although all test cases in a collection can be executed with the click of a single button, **DO NOT EXECUTE HISTORY TEST CASES IN A SINGLE GO**
- The test cases part of this collection will be triggered separately since the requests are submitted to fabric as Consumer organization
- **Since Consumer requests are not submitted so far, peer0 which is endorser of Consumer org will build its own chaincode container image where all dependencies of code are first installed through “npm install” before request is processed since pharma-network is running in Production mode**
- Hence history test cases are run one-by-one instead of all at once

- Close Postman collection runner opened in last section and come back to Postman tool
- Expand “History” collection by clicking on the small arrow before folder name as shown below



#### 8.4.1. ViewDrugState

- Click on ViewDrugState request to open it in a new tab and click “Send” to submit the request as shown below

| Params | Authorization | Headers (1) | Body  | Pre-request Script | Tests       | Cookies | Code |
|--------|---------------|-------------|-------|--------------------|-------------|---------|------|
|        |               |             |       |                    |             |         |      |
| KEY    |               |             | VALUE |                    | DESCRIPTION |         |      |
| Key    |               |             | Value |                    | Description |         |      |

- Notice on terminal console output that the node application detects there is no wallet for “Consumer” organization and automatically creates it

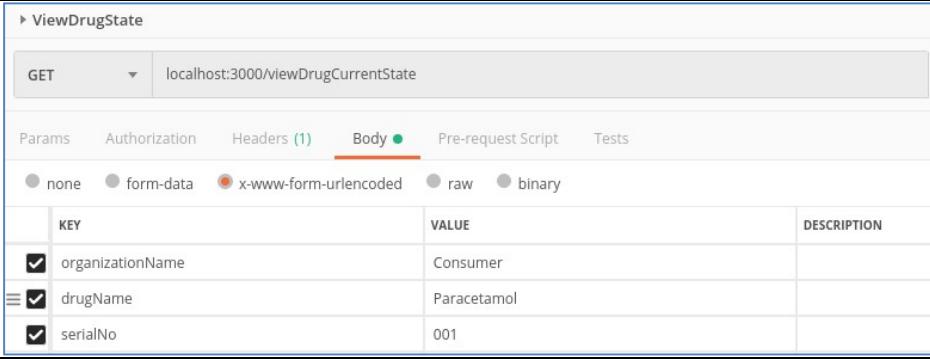
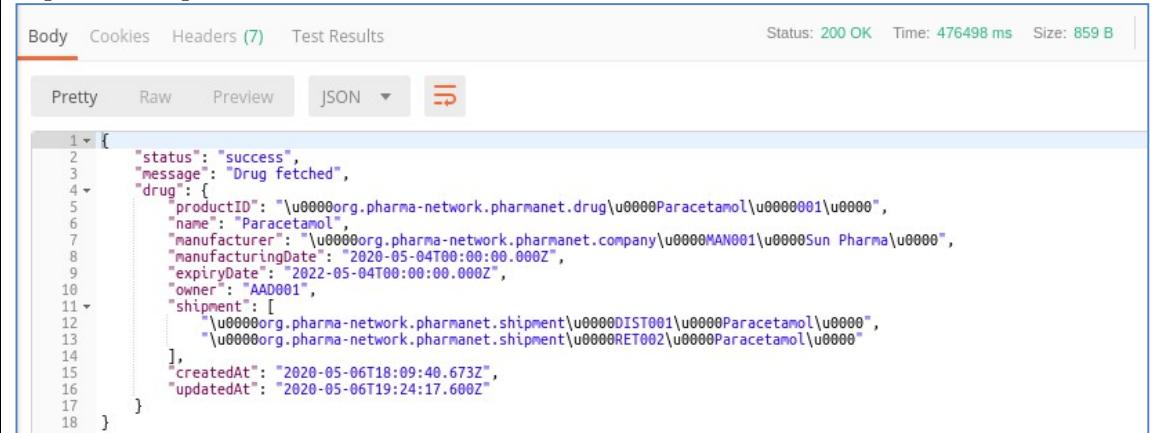
```
"/home/upgrad/workspace/Capstone_Project/pharma-network/application/identity/consumer/CONSUMER_ADMIN" does not exist!!!
.....Either wallet does not exist or does not have expected number of files
.....Creating wallet now for Consumer
.....Successfully created wallet for Consumer
.....Connecting to Fabric Gateway
.....Connecting to channel - pharmachannel
.....Connecting to Smart Contract in pharanet chaincode
.....View Drug
.....Processing View Drug Transaction Response

{ productID: '\u0000org.pharma-network.pharanet.drug\u0000Paracetamol\u00000001\u0000',
 name: 'Paracetamol',
 manufacturer: '\u0000org.pharma-network.pharanet.company\u0000MAN001\u0000Sun Pharma\u0000',
 manufacturingDate: '2020-05-04T00:00:00.000Z',
 expiryDate: '2022-05-04T00:00:00.000Z',
 owner: 'AAD001',
 shipment:
 ['\u0000org.pharma-network.pharanet.shipment\u0000DIST001\u0000Paracetamol\u0000',
 '\u0000org.pharma-network.pharanet.shipment\u0000RET002\u0000Paracetamol\u0000'],
 createdat: '2020-05-06T18:09:40.673Z',
 updatedAt: '2020-05-06T19:24:17.600Z' }

.....View Drug Transaction Complete!
.....Disconnecting from Fabric Gateway
Drug fetched
```

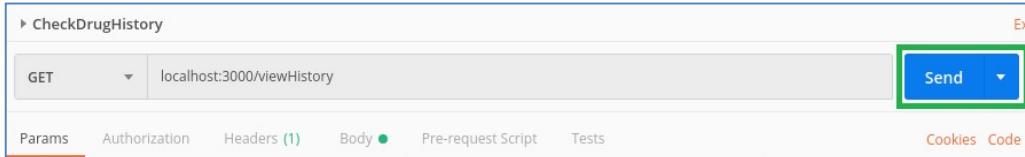
- Since this is the first request submitted as a Consumer, it is sent to peer0 of consumer organization for endorsement. peer0 of consumer then builds its own chaincode container image where all dependencies of code are first installed through “npm install” before request is processed since pharma-network is running in Production mode. Hence this request can take between 5 to 10 minutes to complete depending on machine configurations and network speed.
- After successful request execution, output is available on Postman under results section

Request details and expected output are explained below

| <b>Request Purpose</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | : View current state of drug Paracetamol with serial number 001                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |             |       |             |                  |          |  |          |             |  |          |     |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------|-------------|------------------|----------|--|----------|-------------|--|----------|-----|--|
| <b>Request URL</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | : localhost:3000/viewDrugCurrentState                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             |       |             |                  |          |  |          |             |  |          |     |  |
| <b>Request Type</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | : GET                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             |       |             |                  |          |  |          |             |  |          |     |  |
| <b>Submitted As Client</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Consumer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |             |       |             |                  |          |  |          |             |  |          |     |  |
| <b>Request Body</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  <p>The screenshot shows a Postman request configuration for a GET method. The URL is set to localhost:3000/viewDrugCurrentState. In the 'Body' tab, there are three parameters defined:</p> <table border="1"> <thead> <tr> <th>KEY</th> <th>VALUE</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td>organizationName</td> <td>Consumer</td> <td></td> </tr> <tr> <td>drugName</td> <td>Paracetamol</td> <td></td> </tr> <tr> <td>serialNo</td> <td>001</td> <td></td> </tr> </tbody> </table> | KEY         | VALUE | DESCRIPTION | organizationName | Consumer |  | drugName | Paracetamol |  | serialNo | 001 |  |
| KEY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | VALUE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | DESCRIPTION |       |             |                  |          |  |          |             |  |          |     |  |
| organizationName                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Consumer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |             |       |             |                  |          |  |          |             |  |          |     |  |
| drugName                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Paracetamol                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |             |       |             |                  |          |  |          |             |  |          |     |  |
| serialNo                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 001                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |             |       |             |                  |          |  |          |             |  |          |     |  |
| <b>Expected Output</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |             |       |             |                  |          |  |          |             |  |          |     |  |
|  <p>The screenshot shows the JSON response body from the API call. The response is a success message with the drug's details.</p> <pre> 1  { 2   "status": "success", 3   "message": "Drug fetched", 4   "drug": { 5     "productID": "\u0000org.pharma-network.pharmanet.drug\u0000Paracetamol\u0000001\u0000", 6     "name": "Paracetamol", 7     "manufacturer": "\u0000org.pharma-network.pharmanet.company\u0000MAN001\u0000Sun Pharma\u0000", 8     "manufacturingDate": "2020-05-04T00:00:00.000Z", 9     "expiryDate": "2022-05-04T00:00:00.000Z", 10    "owner": "AAD001", 11    "shipment": [ 12      "\u0000org.pharma-network.pharmanet.shipment\u0000DIST001\u0000Paracetamol\u0000", 13      "\u0000org.pharma-network.pharmanet.shipment\u0000RET002\u0000Paracetamol\u0000" 14    ], 15    "createdAt": "2020-05-06T18:09:40.673Z", 16    "updatedAt": "2020-05-06T19:24:17.600Z" 17  } </pre> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |             |       |             |                  |          |  |          |             |  |          |     |  |

#### 8.4.2. CheckDrugHistory

- Click on CheckDrugHistory request to open it in a new tab and click “Send” to submit the request as shown below



The screenshot shows a Postman request configuration for a GET method. The URL is set to localhost:3000/viewHistory. In the bottom right corner of the interface, there is a large green 'Send' button.

- Notice on terminal console output that the node application detects wallet is already available for “Consumer” organization (created from previous ViewDrugState request) and does not create it again

```

Creation time of "/home/upgrad/workspace/Capstone_Project/pharma-network/network/crypto-config/peerOrganizations/consumer.pharma-network.com/users/Admin@consumer.pharma-network.com/msp/" is Wed May 06 2020 22:33:35 GMT+0530 (IST)
Creation time of "/home/upgrad/workspace/Capstone_Project/pharma-network/application/identity/consumer/CONSUMER_ADMIN" is Thu May 07 2020 01:07:56 GMT+0530 (IST)
.....Wallet exists for Consumer
.....Connecting to Fabric Gateway
.....Connecting to channel - pharmachannel
.....Connecting to Smart Contract in pharmanet chaincode
.....View Lifecycle
.....Processing View Lifecycle Transaction Response

[{ TransactionId: 'a28436a763b8439a2ea1d66170595f573cce531a959973732dd599bbc838bb',
 Timestamp: '2020-05-06T18:09:40.372Z',
 Data: '{"productID": "\u0000org.pharma-network.pharmanet.drug\\u0000Paracetamol\\u0000001\\u0000", "name": "Paracetamol", "manufacturer": "\u0000org.pharma-network.pharmanet.company\\u0000MAN001\\u0000Sun Pharma\\u0000", "manufacturingDate": "2020-05-04T00:00:00.000Z", "expiryDate": "2022-05-04T00:00:00.000Z", "owner": "\u0000org.pharma-network.pharmanet.company\\u0000MAN001\\u0000Sun Pharma\\u0000", "shipment": [], "createdAt": "2020-05-06T18:09:40.673Z", "updatedAt": "2020-05-06T18:09:40.673Z"}' },
 { TransactionId: '8aba901613c6aea37cbe0d50167b8e97ab9a5820e8f3c90d229eb4b352aeee8',
 Timestamp: '2020-05-06T18:30:41.109Z',
 Data: '{"productID": "\u0000org.pharma-network.pharmanet.drug\\u0000Paracetamol\\u0000001\\u0000", "name": "Paracetamol", "manufacturer": "\u0000org.pharma-network.pharmanet.company\\u0000MAN001\\u0000Sun Pharma\\u0000", "manufacturingDate": "2020-05-04T00:00:00.000Z", "expiryDate": "2022-05-04T00:00:00.000Z", "owner": "\u0000org.pharma-network.pharmanet.company\\u0000TRA001\\u0000FedEx\\u0000", "shipment": [], "createdAt": "2020-05-06T18:09:40.673Z", "updatedAt": "2020-05-06T18:30:45.462Z"}' }
]

```

- Since this is the second request submitted as a Consumer which is sent to peer0 of Consumer organization for endorsement, its corresponding chaincode container is already created from previous ViewDrugState request and hence this execution completes in few seconds.
- After successful request execution, output is available on Postman under results section

Request details and expected output are explained below

| <b>Request Purpose</b>                               | : View history or lifecycle of Paracetamol drug with serial number 001                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                        |                           |                              |       |                    |       |                            |                                 |                                                        |                           |                              |  |     |       |             |  |  |  |                                                      |          |  |  |  |  |                                              |             |  |  |  |  |                                              |     |  |  |  |  |
|------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|---------------------------|------------------------------|-------|--------------------|-------|----------------------------|---------------------------------|--------------------------------------------------------|---------------------------|------------------------------|--|-----|-------|-------------|--|--|--|------------------------------------------------------|----------|--|--|--|--|----------------------------------------------|-------------|--|--|--|--|----------------------------------------------|-----|--|--|--|--|
| <b>Request URL</b>                                   | : localhost:3000/viewHistory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                        |                           |                              |       |                    |       |                            |                                 |                                                        |                           |                              |  |     |       |             |  |  |  |                                                      |          |  |  |  |  |                                              |             |  |  |  |  |                                              |     |  |  |  |  |
| <b>Request Type</b>                                  | : GET                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                        |                           |                              |       |                    |       |                            |                                 |                                                        |                           |                              |  |     |       |             |  |  |  |                                                      |          |  |  |  |  |                                              |             |  |  |  |  |                                              |     |  |  |  |  |
| <b>Submitted As Client</b>                           | : Consumer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                        |                           |                              |       |                    |       |                            |                                 |                                                        |                           |                              |  |     |       |             |  |  |  |                                                      |          |  |  |  |  |                                              |             |  |  |  |  |                                              |     |  |  |  |  |
| <b>Request Body</b>                                  | <div style="border: 1px solid #ccc; padding: 10px;"> <p>▶ CheckDrugHistory</p> <p>GET    localhost:3000/viewHistory</p> <hr/> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Params</th> <th style="text-align: left;">Authorization</th> <th style="text-align: left;">Headers (1)</th> <th style="text-align: left;">Body</th> <th style="text-align: left;">Pre-request Script</th> <th style="text-align: left;">Tests</th> </tr> </thead> <tbody> <tr> <td><input type="radio"/> none</td> <td><input type="radio"/> form-data</td> <td><input checked="" type="radio"/> x-www-form-urlencoded</td> <td><input type="radio"/> raw</td> <td><input type="radio"/> binary</td> <td></td> </tr> <tr> <th>KEY</th> <th>VALUE</th> <th>DESCRIPTION</th> <td colspan="3"></td> </tr> <tr> <td><input checked="" type="checkbox"/> organizationName</td> <td>Consumer</td> <td></td> <td colspan="3"></td> </tr> <tr> <td><input checked="" type="checkbox"/> drugName</td> <td>Paracetamol</td> <td></td> <td colspan="3"></td> </tr> <tr> <td><input checked="" type="checkbox"/> serialNo</td> <td>001</td> <td></td> <td colspan="3"></td> </tr> </tbody> </table> </div> | Params                                                 | Authorization             | Headers (1)                  | Body  | Pre-request Script | Tests | <input type="radio"/> none | <input type="radio"/> form-data | <input checked="" type="radio"/> x-www-form-urlencoded | <input type="radio"/> raw | <input type="radio"/> binary |  | KEY | VALUE | DESCRIPTION |  |  |  | <input checked="" type="checkbox"/> organizationName | Consumer |  |  |  |  | <input checked="" type="checkbox"/> drugName | Paracetamol |  |  |  |  | <input checked="" type="checkbox"/> serialNo | 001 |  |  |  |  |
| Params                                               | Authorization                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Headers (1)                                            | Body                      | Pre-request Script           | Tests |                    |       |                            |                                 |                                                        |                           |                              |  |     |       |             |  |  |  |                                                      |          |  |  |  |  |                                              |             |  |  |  |  |                                              |     |  |  |  |  |
| <input type="radio"/> none                           | <input type="radio"/> form-data                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <input checked="" type="radio"/> x-www-form-urlencoded | <input type="radio"/> raw | <input type="radio"/> binary |       |                    |       |                            |                                 |                                                        |                           |                              |  |     |       |             |  |  |  |                                                      |          |  |  |  |  |                                              |             |  |  |  |  |                                              |     |  |  |  |  |
| KEY                                                  | VALUE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | DESCRIPTION                                            |                           |                              |       |                    |       |                            |                                 |                                                        |                           |                              |  |     |       |             |  |  |  |                                                      |          |  |  |  |  |                                              |             |  |  |  |  |                                              |     |  |  |  |  |
| <input checked="" type="checkbox"/> organizationName | Consumer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                        |                           |                              |       |                    |       |                            |                                 |                                                        |                           |                              |  |     |       |             |  |  |  |                                                      |          |  |  |  |  |                                              |             |  |  |  |  |                                              |     |  |  |  |  |
| <input checked="" type="checkbox"/> drugName         | Paracetamol                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                        |                           |                              |       |                    |       |                            |                                 |                                                        |                           |                              |  |     |       |             |  |  |  |                                                      |          |  |  |  |  |                                              |             |  |  |  |  |                                              |     |  |  |  |  |
| <input checked="" type="checkbox"/> serialNo         | 001                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                        |                           |                              |       |                    |       |                            |                                 |                                                        |                           |                              |  |     |       |             |  |  |  |                                                      |          |  |  |  |  |                                              |             |  |  |  |  |                                              |     |  |  |  |  |

## Expected Output

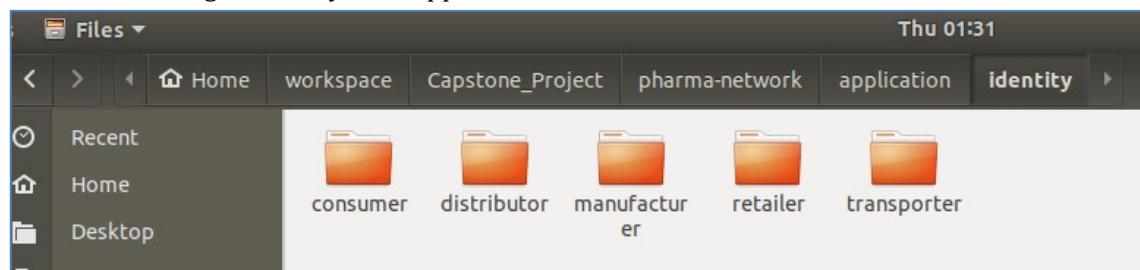
```

Pretty Raw Preview JSON ▾
1 {
2 "status": "success",
3 "message": "Drug history fetched",
4 "drughistory": [
5 {
6 "TransactionId": "a28436a763b8439a2e1d66170595f573cea531a959973732dd599bbc838bb",
7 "Timestamp": "2020-05-06T18:09:40.372Z",
8 "Data": "{\"productID\":\"\\u0000org.pharma-network.pharanet.drug\\u0000Paracetamol\\u00000001\\u0000\", \"name\":\"Paracetamol\", \"manufacturer\":\"\\u0000org.pharma-network.pharanet.company\\u0000MAN001\\u0000Sun Pharma\\u0000\", \"manufacturingDate\":\"2020-05-04T00:00:00.000Z\", \"expiryDate\":\"2022-05-04T00:00:00.000Z\", \"owner\":\"\\u0000org.pharma-network.pharanet.company\\u0000MAN001\\u0000Sun Pharma\\u0000\", \"shipment\":[], \"createdAt\":\"2020-05-06T18:09:40.673Z\", \"updatedAt\":\"2020-05-06T18:09:40.673Z\"}",
9 },
10 {
11 "TransactionId": "8aba901613c6aea37cb6e0d50167b8e97ab9a5820ef3c90d229eb4b352aeee8",
12 "Timestamp": "2020-05-06T18:09:41.109Z",
13 "Data": "{\"productID\":\"\\u0000org.pharma-network.pharanet.drug\\u0000Paracetamol\\u00000001\\u0000\", \"name\":\"Paracetamol\", \"manufacturer\":\"\\u0000org.pharma-network.pharanet.company\\u0000MAN001\\u0000Sun Pharma\\u0000\", \"manufacturingDate\":\"2020-05-04T00:00:00.000Z\", \"expiryDate\":\"2022-05-04T00:00:00.000Z\", \"owner\":\"\\u0000org.pharma-network.pharanet.company\\u0000TRA001\\u0000FedEx\\u0000\", \"shipment\":[], \"createdAt\":\"2020-05-06T18:09:40.673Z\", \"updatedAt\":\"2020-05-06T18:30:45.462Z\"}",
14 },
15 {
16 "TransactionId": "d7274092ebecebaa98e7ac840c3fcfa5fb49577ff231add56a287cd374162153",
17 "Timestamp": "2020-05-06T18:31:11.623Z",
18 "Data": "{\"productID\":\"\\u0000org.pharma-network.pharanet.drug\\u0000Paracetamol\\u00000001\\u0000\", \"name\":\"Paracetamol\", \"manufacturer\":\"\\u0000org.pharma-network.pharanet.company\\u0000MAN001\\u0000Sun Pharma\\u0000\", \"manufacturingDate\":\"2020-05-04T00:00:00.000Z\", \"expiryDate\":\"2022-05-04T00:00:00.000Z\", \"owner\":\"\\u0000org.pharma-network.pharanet.company\\u0000DIST001\\u0000VG Pharma\\u0000\", \"shipment\":[], \"createdAt\":\"2020-05-06T18:09:40.673Z\", \"updatedAt\":\"2020-05-06T18:31:08.182Z\"}",
19 },
20 {
21 "TransactionId": "edbc89bbe676db0e38c8fd5d00d88e0b666ab4bd6f6cf39c3598d99465c690",
22 "Timestamp": "2020-05-06T19:04:35.431Z",
23 "Data": "{\"productID\":\"\\u0000org.pharma-network.pharanet.drug\\u0000Paracetamol\\u00000001\\u0000\", \"name\":\"Paracetamol\", \"manufacturer\":\"\\u0000org.pharma-network.pharanet.company\\u0000MAN001\\u0000Sun Pharma\\u0000\", \"manufacturingDate\":\"2020-05-04T00:00:00.000Z\", \"expiryDate\":\"2022-05-04T00:00:00.000Z\", \"owner\":\"\\u0000org.pharma-network.pharanet.company\\u0000TRA002\\u0000Lue Dart\\u0000\", \"shipment\":[], \"createdAt\":\"2020-05-06T18:09:40.673Z\", \"updatedAt\":\"2020-05-06T19:04:42.252Z\"}",
24 },
25 {
26 "TransactionId": "d67259577254988636041247ad4656eb05ade14f4f123fd0e7a157a450cabd52",
27 "Timestamp": "2020-05-06T19:05:07.840Z",
28 "Data": "{\"productID\":\"\\u0000org.pharma-network.pharanet.drug\\u0000Paracetamol\\u00000001\\u0000\", \"name\":\"Paracetamol\", \"manufacturer\":\"\\u0000org.pharma-network.pharanet.company\\u0000MAN001\\u0000Sun Pharma\\u0000\", \"manufacturingDate\":\"2020-05-04T00:00:00.000Z\", \"expiryDate\":\"2022-05-04T00:00:00.000Z\", \"owner\":\"\\u0000org.pharma-network.pharanet.company\\u0000RETE002\\u0000upgrade\\u0000\", \"shipment\":[], \"createdAt\":\"2020-05-06T18:09:40.673Z\", \"updatedAt\":\"2020-05-06T19:05:08.092Z\"}",
29 },
30 {
31 "TransactionId": "e3378b1628d0ba7dcc5caaf0b71ef16c5d7b3e5241fe418c3bb0439d9222557",
32 "Timestamp": "2020-05-06T19:24:16.675Z",
33 "Data": "{\"productID\":\"\\u0000org.pharma-network.pharanet.drug\\u0000Paracetamol\\u00000001\\u0000\", \"name\":\"Paracetamol\", \"manufacturer\":\"\\u0000org.pharma-network.pharanet.company\\u0000MAN001\\u0000Sun Pharma\\u0000\", \"manufacturingDate\":\"2020-05-04T00:00:00.000Z\", \"expiryDate\":\"2022-05-04T00:00:00.000Z\", \"owner\":\"AA0001\", \"shipment\":[], \"createdAt\":\"2020-05-06T18:09:40.673Z\", \"updatedAt\":\"2020-05-06T19:24:17.600Z\"}",
34 },
35],
36 }

```

## 8.5. View Wallets

- Navigate to “identity” folder inside the “application” folder of project in file explorer to view the wallets generate by node application as shown below



- Sample structure of one the wallet folders is shown below

