Property Registration System

This assignment employs the test-network provided from hyperledger fabric. We presume the Org1 as the registrar organization and the Org2 as the user organisation. The network has been referred to as **propertyRegistration.** Correspondingly, the chaincode involves two smart contracts, referred to as **propertyRegistration.registrar** and **propertyRegistration.user,** respectively.

Initial Setup and installation.

We have included the test-network, bin, config folders and the file install-fabric.sh along with the solution. In case if they are corrupted, or not functional, delete them and run below scripts.

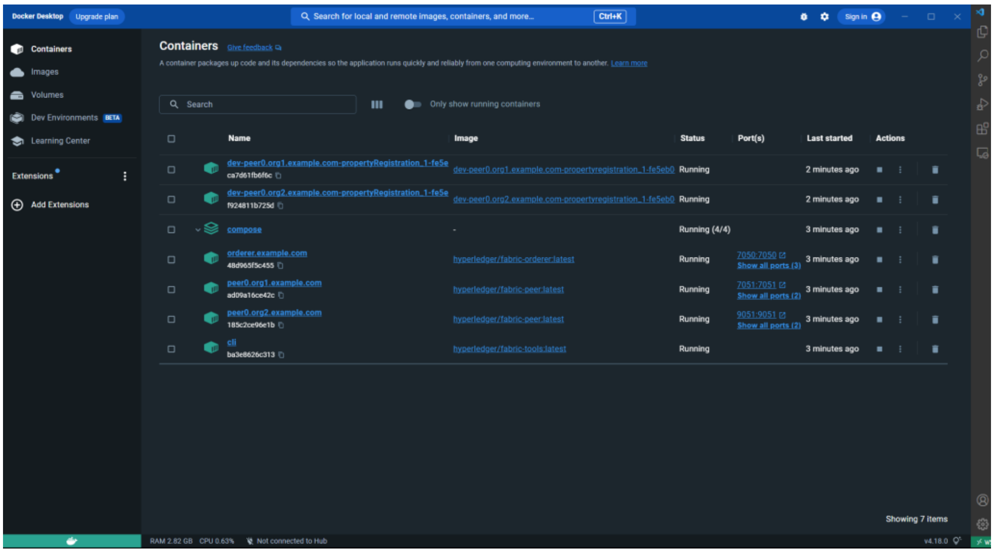
- curl -sSLO https://raw.githubusercontent.com/hyperledger/fabric/main/scripts/install-fabric.sh && chmod +x install-fabric.sh
- ./install-fabric.sh docker samples binary

Then you need to run the npm I command from the folder chaincode, to acquire the necessary npm packages.

This should be followed by the below commands to set up the test network, create the channel (mychannel), and deploy the chaincode propertyRegistration on to it.

- ./network.sh up createChannel
- ./network.sh deployCC -ccn propertyRegistration -ccl javascript -ccp ../chaincode -ccv 1 -ccs 1

Once done, the docker screen shall yield the following result.



Containers

A container packages up code and its dependencies so the application runs quickly and reliably from one computing environment to another. Learn more

Search

Only show running containers

Name	Image	Status	Port(s)	Last started
dev-peer0.org1.example.com-propertyRegistration_1-fe5e ca7d61fb6f6c	dev-peer0.org1.example.com-propertyregistration_1-fe5eb0	Running		2 minutes ago
dev-peer0.org2.example.com-propertyRegistration_1-fe5e f924811b725d	dev-peer0.org2.example.com-propertyregistration_1-fe5eb0	Running		2 minutes ago
compose	-	Running (4/4)		3 minutes ago
orderer.example.com 48d965f5c455	hyperledger/fabric-orderer:latest	Running	7050:7050 Show all ports (3)	3 minutes ago
peer0.org1.example.com ad09a16ce42c	hyperledger/fabric-peer:latest	Running	7051:7051 Show all ports (2)	3 minutes ago
peer0.org2.example.com 185c2ce96e1b	hyperledger/fabric-peer:latest	Running	9051:9051 Show all ports (2)	3 minutes ago
cli ba3e8626c313	hyperledger/fabric-tools:latest	Running		3 minutes ago

Showing 7 items

RAM 2.82 GB CPU 0.63% Not connected to Hub v4.18.0

Execute below commands, to set up the necessary global variables for accessing the chaincode

- export PATH=${PWD}/../bin:$PATH
- export FABRIC_CFG_PATH=$PWD/../config/
- export CORE_PEER_TLS_ENABLED=true

Commands to interact as Peer0 of Org1

- export CORE_PEER_LOCALMSPID="Org1MSP"
- export CORE_PEER_TLS_ROOTCERT_FILE=${PWD}/organizations/peerOrganizations/org1.example.com/peers/peer0.org1.example.com/tls/ca.crt
- export CORE_PEER_MSPCONFIGPATH=${PWD}/organizations/peerOrganizations/org1.example.com/users/Admin@org1.example.com/msp
- export CORE_PEER_ADDRESS=localhost:7051

Commands to interact as Peer0 of Org2

- export CORE_PEER_LOCALMSPID="Org2MSP"
- export CORE_PEER_TLS_ROOTCERT_FILE=${PWD}/organizations/peerOrganizations/org2.example.com/peers/peer0.org2.example.com/tls/ca.crt
- export CORE_PEER_MSPCONFIGPATH=${PWD}/organizations/peerOrganizations/org2.example.com/users/Admin@org2.example.com/msp
- export CORE_PEER_ADDRESS=localhost:9051

Chaincode functionalty

Function: requestNewUser

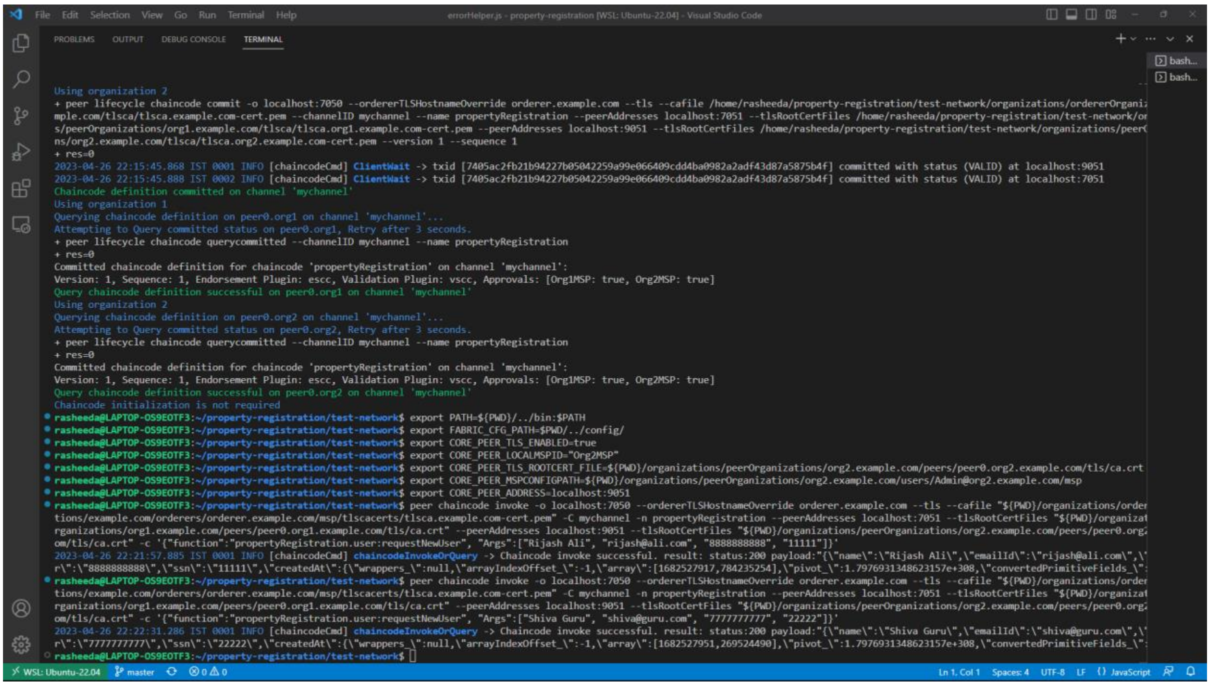
Initially we shall perform as a user and raise two requests for new users. Hence, execute the above **Commands to interact as Peer0 of Org2** (mentioned above). Once done, execute below commands to raise new user requests.

- peer chaincode invoke -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com --tls --cafile "${PWD}/organizations/ordererOrganizations/example.com/orderers/orderer.example.com/msp/tlscacerts/tlsca.example.com-cert.pem" -C mychannel -n propertyRegistration --peerAddresses localhost:7051 --tlsRootCertFiles

"${PWD}/organizations/peerOrganizations/org1.example.com/peers/peer0.org1.example.com/tls/ca.crt" --peerAddresses localhost:9051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/org2.example.com/peers/peer0.org2.example.com/tls/ca.crt" -c '{"function":"propertyRegistration.user:requestNewUser", "Args":["Rijash Ali", "rijash@ali.com", "8888888888", "11111"]}'

- peer chaincode invoke -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com --tls --cafile "${PWD}/organizations/ordererOrganizations/example.com/orderers/orderer.example.com/msp/tlscacerts/tlsca.example.com-cert.pem" -C mychannel -n propertyRegistration --peerAddresses localhost:7051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/org1.example.com/peers/peer0.org1.example.com/tls/ca.crt" --peerAddresses localhost:9051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/org2.example.com/peers/peer0.org2.example.com/tls/ca.crt" -c '{"function":"propertyRegistration.user:requestNewUser", "Args":["Shiva Guru", "shiva@guru.com", "7777777777", "22222"]}'

  Screenshot of result from above commands:



File Edit Selection View Go Run Terminal Help
errorHelper.js - property-registration [WSL: Ubuntu-22.04] - Visual Studio Code
PROBLEMS
OUTPUT
DEBUG CONSOLE
TERMINAL
bash...
bash...
WSL: Ubuntu-22.04
master
⊗ 0 ⚠ 0
Ln 1, Col 1
Spaces: 4
UTF-8
LF
{} JavaScript

```
Using organization 2
+ peer lifecycle chaincode commit -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com --tls --cafile /home/rasheeda/property-registration/test-network/organizations/ordererOrgani
mple.com/tlsca/tlsca.example.com-cert.pem --channelID mychannel --name propertyRegistration --peerAddresses localhost:7051 --tlsRootCertFiles /home/rasheeda/property-registration/test-network/or
s/peerOrganizations/org1.example.com/tlsca/tlsca.org1.example.com-cert.pem --peerAddresses localhost:9051 --tlsRootCertFiles /home/rasheeda/property-registration/test-network/organizations/peer
ns/org2.example.com/tlsca/tlsca.org2.example.com-cert.pem --version 1 --sequence 1
+ res=0
2023-04-26 22:15:45.868 IST 0001 INFO [chaincodeCmd] ClientWait -> txid [7405ac2fb21b94227b05042259a99e066409cdd4ba0982a2adf43d87a5875b4f] committed with status (VALID) at localhost:9051
2023-04-26 22:15:45.888 IST 0002 INFO [chaincodeCmd] ClientWait -> txid [7405ac2fb21b94227b05042259a99e066409cdd4ba0982a2adf43d87a5875b4f] committed with status (VALID) at localhost:7051
Chaincode definition committed on channel 'mychannel'
Using organization 1
Querying chaincode definition on peer0.org1 on channel 'mychannel'...
Attempting to Query committed status on peer0.org1, Retry after 3 seconds.
+ peer lifecycle chaincode querycommitted --channelID mychannel --name propertyRegistration
+ res=0
Committed chaincode definition for chaincode 'propertyRegistration' on channel 'mychannel':
Version: 1, Sequence: 1, Endorsement Plugin: escc, Validation Plugin: vscc, Approvals: [Org1MSP: true, Org2MSP: true]
Query chaincode definition successful on peer0.org1 on channel 'mychannel'
Using organization 2
Querying chaincode definition on peer0.org2 on channel 'mychannel'...
Attempting to Query committed status on peer0.org2, Retry after 3 seconds.
+ peer lifecycle chaincode querycommitted --channelID mychannel --name propertyRegistration
+ res=0
Committed chaincode definition for chaincode 'propertyRegistration' on channel 'mychannel':
Version: 1, Sequence: 1, Endorsement Plugin: escc, Validation Plugin: vscc, Approvals: [Org1MSP: true, Org2MSP: true]
Query chaincode definition successful on peer0.org2 on channel 'mychannel'
Chaincode initialization is not required
rasheeda@LAPTOP-OS9EOTF3:~/property-registration/test-network$ export PATH=${PWD}/../bin:$PATH
rasheeda@LAPTOP-OS9EOTF3:~/property-registration/test-network$ export FABRIC_CFG_PATH=$PWD/../config/
rasheeda@LAPTOP-OS9EOTF3:~/property-registration/test-network$ export CORE_PEER_TLS_ENABLED=true
rasheeda@LAPTOP-OS9EOTF3:~/property-registration/test-network$ export CORE_PEER_LOCALMSPID="Org2MSP"
rasheeda@LAPTOP-OS9EOTF3:~/property-registration/test-network$ export CORE_PEER_TLS_ROOTCERT_FILE=${PWD}/organizations/peerOrganizations/org2.example.com/peers/peer0.org2.example.com/tls/ca.crt
rasheeda@LAPTOP-OS9EOTF3:~/property-registration/test-network$ export CORE_PEER_MSPCONFIGPATH=${PWD}/organizations/peerOrganizations/org2.example.com/users/Admin@org2.example.com/msp
rasheeda@LAPTOP-OS9EOTF3:~/property-registration/test-network$ export CORE_PEER_ADDRESS=localhost:9051
rasheeda@LAPTOP-OS9EOTF3:~/property-registration/test-network$ peer chaincode invoke -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com --tls --cafile "${PWD}/organizations/order
tions/example.com/orderers/orderer.example.com/msp/tlscacerts/tlsca.example.com-cert.pem" -C mychannel -n propertyRegistration --peerAddresses localhost:7051 --tlsRootCertFiles "${PWD}/organizat
rganizations/org1.example.com/peers/peer0.org1.example.com/tls/ca.crt" --peerAddresses localhost:9051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/org2.example.com/peers/peer0.org2
om/tls/ca.crt" -c '{"function":"propertyRegistration.user:requestNewUser", "Args":["Rijash Ali", "rijash@ali.com", "8888888888", "11111"]}'
2023-04-26 22:21:57.885 IST 0001 INFO [chaincodeCmd] chaincodeInvokeOrQuery -> Chaincode invoke successful. result: status:200 payload:"{\"name\":\"Rijash Ali\",\"emailId\":\"rijash@ali.com\",\
r\":\"8888888888\",\"ssn\":\"11111\",\"createdAt\":{\"wrappers_\":null,\"arrayIndexOffset_\":-1,\"array\":[1682527917,784235254],\"pivot_\":1.7976931348623157e+308,\"convertedPrimitiveFields_\":
rasheeda@LAPTOP-OS9EOTF3:~/property-registration/test-network$ peer chaincode invoke -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com --tls --cafile "${PWD}/organizations/order
tions/example.com/orderers/orderer.example.com/msp/tlscacerts/tlsca.example.com-cert.pem" -C mychannel -n propertyRegistration --peerAddresses localhost:7051 --tlsRootCertFiles "${PWD}/organizat
rganizations/org1.example.com/peers/peer0.org1.example.com/tls/ca.crt" --peerAddresses localhost:9051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/org2.example.com/peers/peer0.org2
om/tls/ca.crt" -c '{"function":"propertyRegistration.user:requestNewUser", "Args":["Shiva Guru", "shiva@guru.com", "7777777777", "22222"]}'
2023-04-26 22:22:31.286 IST 0001 INFO [chaincodeCmd] chaincodeInvokeOrQuery -> Chaincode invoke successful. result: status:200 payload:"{\"name\":\"Shiva Guru\",\"emailId\":\"shiva@guru.com\",\
r\":\"7777777777\",\"ssn\":\"22222\",\"createdAt\":{\"wrappers_\":null,\"arrayIndexOffset_\":-1,\"array\":[1682527951,269524490],\"pivot_\":1.7976931348623157e+308,\"convertedPrimitiveFields_\":
rasheeda@LAPTOP-OS9EOTF3:~/property-registration/test-network$ 
```

Function: approveNewUser

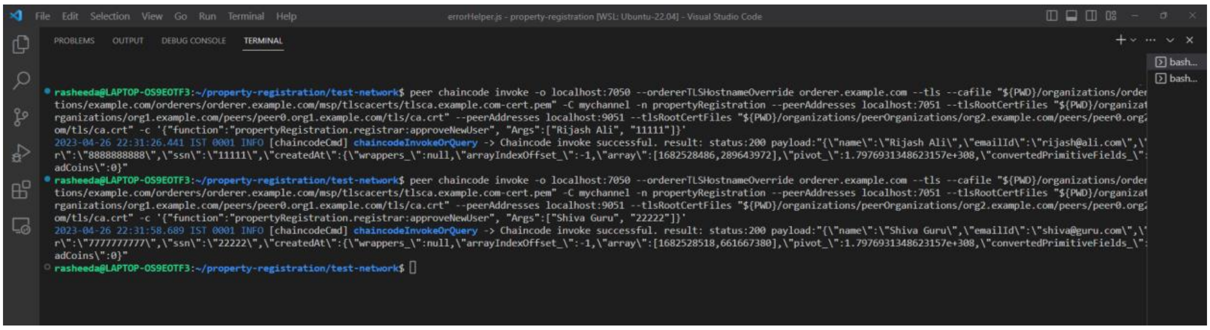
Once the user requests are successful, registrar shall be notified by the event - 'REQUEST_NEW_USER_EVENT'. Registrar can hence approve these requests, after verification. Execute the **Commands to interact as Peer0 of Org1** (mentioned above). Then execute the following commands.

- peer chaincode invoke -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com --tls --cafile

"${PWD}/organizations/ordererOrganizations/example.com/orderers/orderer.example.com/msp/tlscacerts/tlsca.example.com-cert.pem" -C mychannel -n propertyRegistration --peerAddresses localhost:7051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/org1.example.com/peers/peer0.org1.example.com/tls/ca.crt" --peerAddresses localhost:9051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/org2.example.com/peers/peer0.org2.example.com/tls/ca.crt" -c '{"function":"propertyRegistration.registrar:approveNewUser", "Args":["Rijash Ali", "11111"]}'

- peer chaincode invoke -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com --tls --cafile "${PWD}/organizations/ordererOrganizations/example.com/orderers/orderer.example.com/msp/tlscacerts/tlsca.example.com-cert.pem" -C mychannel -n propertyRegistration --peerAddresses localhost:7051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/org1.example.com/peers/peer0.org1.example.com/tls/ca.crt" --peerAddresses localhost:9051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/org2.example.com/peers/peer0.org2.example.com/tls/ca.crt" -c '{"function":"propertyRegistration.registrar:approveNewUser", "Args":["Shiva Guru", "22222"]}'

Screenshot of result from above commands:

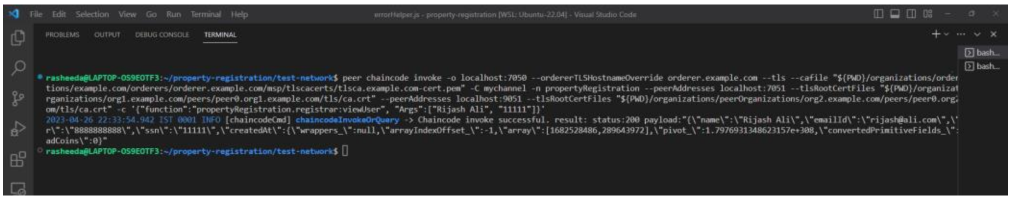


```
rasheeda@LAPTOP-OS9EOTF3:~/property-registration/test-network$ peer chaincode invoke -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com --tls --cafile "${PWD}/organizations/order
tions/example.com/orderers/orderer.example.com/msp/tlscacerts/tlsca.example.com-cert.pem" -C mychannel -n propertyRegistration --peerAddresses localhost:7051 --tlsRootCertFiles "${PWD}/organizat
rganizations/org1.example.com/peers/peer0.org1.example.com/tls/ca.crt" --peerAddresses localhost:9051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/org2.example.com/peers/peer0.org2
om/tls/ca.crt" -c '{"function":"propertyRegistration.registrar:approveNewUser", "Args":["Rijash Ali", "11111"]}'
2023-04-26 22:31:26.441 IST 0001 INFO [chaincodeCmd] chaincodeInvokeOrQuery -> Chaincode invoke successful. result: status:200 payload:"{\"name\":\"Rijash Ali\",\"emailId\":\"rijash@ali.com\",\
r\":\"8888888888\",\"ssn\":\"11111\",\"createdAt\":{\"wrappers_\":null,\"arrayIndexOffset_\":-1,\"array\":[1682528486,289643972],\"pivot_\":1.7976931348623157e+308,\"convertedPrimitiveFields_\":
adCoins\":0}"
rasheeda@LAPTOP-OS9EOTF3:~/property-registration/test-network$ peer chaincode invoke -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com --tls --cafile "${PWD}/organizations/order
tions/example.com/orderers/orderer.example.com/msp/tlscacerts/tlsca.example.com-cert.pem" -C mychannel -n propertyRegistration --peerAddresses localhost:7051 --tlsRootCertFiles "${PWD}/organizat
rganizations/org1.example.com/peers/peer0.org1.example.com/tls/ca.crt" --peerAddresses localhost:9051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/org2.example.com/peers/peer0.org2
om/tls/ca.crt" -c '{"function":"propertyRegistration.registrar:approveNewUser", "Args":["Shiva Guru", "22222"]}'
2023-04-26 22:31:58.689 IST 0001 INFO [chaincodeCmd] chaincodeInvokeOrQuery -> Chaincode invoke successful. result: status:200 payload:"{\"name\":\"Shiva Guru\",\"emailId\":\"shiva@guru.com\",\
r\":\"7777777777\",\"ssn\":\"22222\",\"createdAt\":{\"wrappers_\":null,\"arrayIndexOffset_\":-1,\"array\":[1682528518,661667380],\"pivot_\":1.7976931348623157e+308,\"convertedPrimitiveFields_\":
adCoins\":0}"
rasheeda@LAPTOP-OS9EOTF3:~/property-registration/test-network$ 
```

Function: viewUser

Once approval, the user is informed via event, ‘APPROVED_NEW_USER_EVENT’. We can execute the function viewUser, either from User contract or Registrar contract as follows and verify the results.

- peer chaincode invoke -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com --tls --cafile "${PWD}/organizations/ordererOrganizations/example.com/orderers/orderer.example.com/msp/tlscacerts/tlsca.example.com-cert.pem" -C mychannel -n propertyRegistration --peerAddresses localhost:7051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/org1.example.com/peers/peer0.org1.example.com/tls/ca.crt" --peerAddresses localhost:9051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/org2.example.com/peers/peer0.org2.example.com/tls/ca.crt" -c '{"function":"propertyRegistration.registrar:viewUser", "Args":["Rijash Ali", "11111"]}'



```
rasheeda@LAPTOP-OS9EOTF3:~/property-registration/test-network$ peer chaincode invoke -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com --tls --cafile "${PWD}/organizations/order
tions/example.com/orderers/orderer.example.com/msp/tlscacerts/tlsca.example.com-cert.pem" -C mychannel -n propertyRegistration --peerAddresses localhost:7051 --tlsRootCertFiles "${PWD}/organizat
rganizations/org1.example.com/peers/peer0.org1.example.com/tls/ca.crt" --peerAddresses localhost:9051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/org2.example.com/peers/peer0.org2
om/tls/ca.crt" -c '{"function":"propertyRegistration.registrar:viewUser", "Args":["Rijash Ali", "11111"]}'
2023-04-26 22:33:54.942 IST 0001 INFO [chaincodeCmd] chaincodeInvokeOrQuery -> Chaincode invoke successful. result: status:200 payload:"{\"name\":\"Rijash Ali\",\"emailId\":\"rijash@ali.com\",\"
r\":\"8888888888\",\"ssn\":\"11111\",\"createdAt\":{\"wrappers_\":null,\"arrayIndexOffset_\":-1,\"array\":[1682528486,289643972],\"pivot_\":1.7976931348623157e+308,\"convertedPrimitiveFields_\":
adCoins\":0}"
rasheeda@LAPTOP-OS9EOTF3:~/property-registration/test-network$ 
```

Function: propertyRegistrationRequest

The next step is to add a property to the system. We shall add it for the user – Rijash Ali with ssn 11111. Kindly execute **Commands to interact as Peer0 of Org2**

- peer chaincode invoke -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com --tls --cafile "${PWD}/organizations/ordererOrganizations/example.com/orderers/orderer.example.com/msp/tlscacerts/tlsca.example.com-cert.pem" -C mychannel -n propertyRegistration --peerAddresses localhost:7051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/org1.example.com/peers/peer0.org1.example.com/tls/ca.crt" --peerAddresses localhost:9051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/org2.example.com/peers/peer0.org2.example.com/tls/ca.crt" -c '{"function":"propertyRegistration.user:propertyRegistrationRequest", "Args":["property1", "Rijash Ali", "100", "Registered", "11111"]}'

Function: rechargeAccount

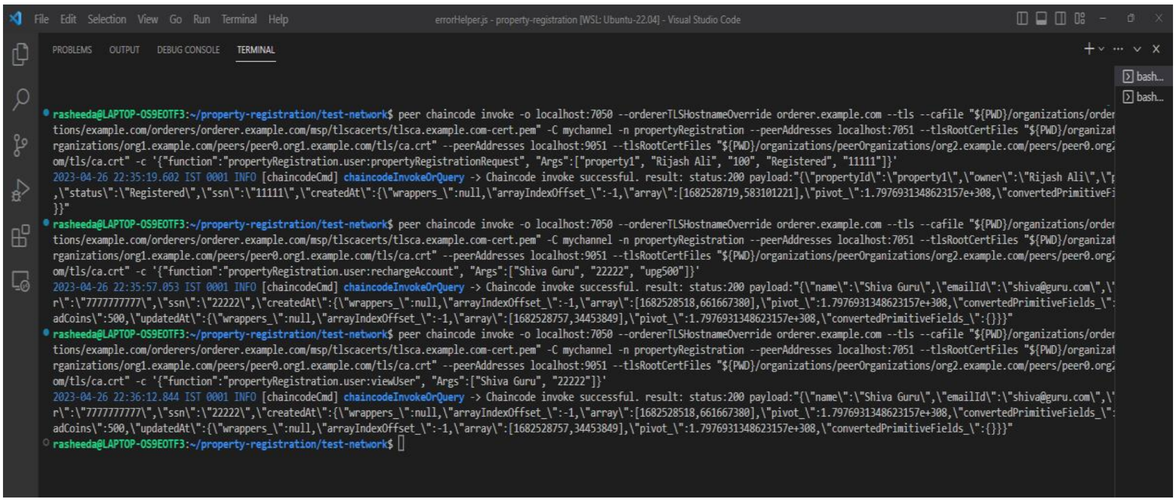
We shall also update the user ("Shiva Guru", "22222"), so that he would have sufficient balance to purchase the properties on the network.

- peer chaincode invoke -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com --tls --cafile "${PWD}/organizations/ordererOrganizations/example.com/orderers/orderer.example.com/msp/tlscacerts/tlsca.example.com-cert.pem" -C mychannel -n propertyRegistration --peerAddresses localhost:7051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/org1.example.com/peers/peer0.org1.example.com/tls/ca.crt" --peerAddresses localhost:9051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/org2.example.com/peers/peer0.org2.example.com/tls/ca.crt" -c '{"function":"propertyRegistration.user:rechargeAccount", "Args":["Shiva Guru", "22222", "upg500"]}'

We can further execute the viewUser (from the User Contract) function to check if the balance has been updated as 500 UpgradCoins.

- peer chaincode invoke -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com --tls --cafile "${PWD}/organizations/ordererOrganizations/example.com/orderers/orderer.example.com/msp/tlscacerts/tlsca.example.com-cert.pem" -C mychannel -n propertyRegistration --peerAddresses localhost:7051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/org1.example.com/peers/peer0.org1.example.com/tls/ca.crt" --peerAddresses localhost:9051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/org2.example.com/peers/peer0.org2.example.com/tls/ca.crt" -c '{"function":"propertyRegistration.user:viewUser", "Args":["Shiva Guru", "22222"]}'

Below screenshot holds results for functions - propertyRegistrationRequest, rechargeAccount and viewUser (User contract)


File Edit Selection View Go Run Terminal Help
errorHelper.js - property-registration [WSL: Ubuntu-22.04] - Visual Studio Code
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
bash...
bash...

```
rasheeda@LAPTOP-OS9EOTF3:~/property-registration/test-network$ peer chaincode invoke -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com --tls --cafile "${PWD}/organizations/order
tions/example.com/orderers/orderer.example.com/msp/tlscacerts/tlsca.example.com-cert.pem" -C mychannel -n propertyRegistration --peerAddresses localhost:7051 --tlsRootCertFiles "${PWD}/organizat
rganizations/org1.example.com/peers/peer0.org1.example.com/tls/ca.crt" --peerAddresses localhost:9051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/org2.example.com/peers/peer0.org2
om/tls/ca.crt" -c '{"function":"propertyRegistration.user:propertyRegistrationRequest", "Args":["property1", "Rijash Ali", "100", "Registered", "11111"]}'
2023-04-26 22:35:19.602 IST 0001 INFO [chaincodeCmd] chaincodeInvokeOrQuery -> Chaincode invoke successful. result: status:200 payload:"{\"propertyId\":\"property1\",\"owner\":\"Rijash Ali\",\"p
,\"status\":\"Registered\",\"ssn\":\"11111\",\"createdAt\":{\"wrappers_\":null,\"arrayIndexOffset_\":-1,\"array\":[1682528719,583101221],\"pivot_\":1.7976931348623157e+308,\"convertedPrimitiveFi
}}"
rasheeda@LAPTOP-OS9EOTF3:~/property-registration/test-network$ peer chaincode invoke -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com --tls --cafile "${PWD}/organizations/order
tions/example.com/orderers/orderer.example.com/msp/tlscacerts/tlsca.example.com-cert.pem" -C mychannel -n propertyRegistration --peerAddresses localhost:7051 --tlsRootCertFiles "${PWD}/organizat
rganizations/org1.example.com/peers/peer0.org1.example.com/tls/ca.crt" --peerAddresses localhost:9051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/org2.example.com/peers/peer0.org2
om/tls/ca.crt" -c '{"function":"propertyRegistration.user:rechargeAccount", "Args":["Shiva Guru", "22222", "upg500"]}'
2023-04-26 22:35:57.053 IST 0001 INFO [chaincodeCmd] chaincodeInvokeOrQuery -> Chaincode invoke successful. result: status:200 payload:"{\"name\":\"Shiva Guru\",\"emailId\":\"shiva@guru.com\",\"
r\":\"7777777777\",\"ssn\":\"22222\",\"createdAt\":{\"wrappers_\":null,\"arrayIndexOffset_\":-1,\"array\":[1682528518,661667380],\"pivot_\":1.7976931348623157e+308,\"convertedPrimitiveFields_\":
adCoins\":500,\"updatedAt\":{\"wrappers_\":null,\"arrayIndexOffset_\":-1,\"array\":[1682528757,34453849],\"pivot_\":1.7976931348623157e+308,\"convertedPrimitiveFields_\":{}}}"
rasheeda@LAPTOP-OS9EOTF3:~/property-registration/test-network$ peer chaincode invoke -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com --tls --cafile "${PWD}/organizations/order
tions/example.com/orderers/orderer.example.com/msp/tlscacerts/tlsca.example.com-cert.pem" -C mychannel -n propertyRegistration --peerAddresses localhost:7051 --tlsRootCertFiles "${PWD}/organizat
rganizations/org1.example.com/peers/peer0.org1.example.com/tls/ca.crt" --peerAddresses localhost:9051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/org2.example.com/peers/peer0.org2
om/tls/ca.crt" -c '{"function":"propertyRegistration.user:viewUser", "Args":["Shiva Guru", "22222"]}'
2023-04-26 22:36:12.844 IST 0001 INFO [chaincodeCmd] chaincodeInvokeOrQuery -> Chaincode invoke successful. result: status:200 payload:"{\"name\":\"Shiva Guru\",\"emailId\":\"shiva@guru.com\",\"
r\":\"7777777777\",\"ssn\":\"22222\",\"createdAt\":{\"wrappers_\":null,\"arrayIndexOffset_\":-1,\"array\":[1682528518,661667380],\"pivot_\":1.7976931348623157e+308,\"convertedPrimitiveFields_\":
adCoins\":500,\"updatedAt\":{\"wrappers_\":null,\"arrayIndexOffset_\":-1,\"array\":[1682528757,34453849],\"pivot_\":1.7976931348623157e+308,\"convertedPrimitiveFields_\":{}}}"
rasheeda@LAPTOP-OS9EOTF3:~/property-registration/test-network$
```

Function: approvePropertyRegistration

Once a request to register a property is made, the registrar shall be notified via an event 'REQUEST_PROPERTY_REGISTRATION_EVENT'. The registrar can then verify the request and approve it, using following command. Kindly execute **Commands to interact as Peer0 of Org1**

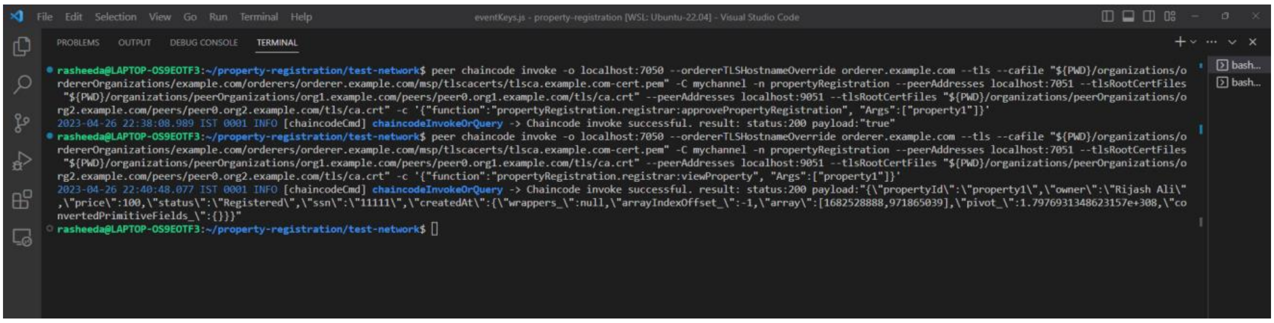
- peer chaincode invoke -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com --tls --cafile "${PWD}/organizations/ordererOrganizations/example.com/orderers/orderer.example.com/msp/tlscacerts/tlsca.example.com-cert.pem" -C mychannel -n propertyRegistration --peerAddresses localhost:7051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/org1.example.com/peers/peer0.org1.example.com/tls/ca.crt" --peerAddresses localhost:9051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/org2.example.com/peers/peer0.org2.example.com/tls/ca.crt" -c '{"function":"propertyRegistration.registrar:approvePropertyRegistration", "Args":["property1"]}'

Function: viewProperty

Once the registrar approves the request for property, the user shall be notified via the event - 'APPROVED_PROPERTY_REGISTRATION_EVENT'. We can execute the below command to view the property (from Registrar contract).

- peer chaincode invoke -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com --tls --cafile "${PWD}/organizations/ordererOrganizations/example.com/orderers/orderer.example.com/msp/tlscacerts/tlsca.example.com-cert.pem" -C mychannel -n propertyRegistration --peerAddresses localhost:7051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/org1.example.com/peers/peer0.org1.example.com/tls/ca.crt" --peerAddresses localhost:9051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/org2.example.com/peers/peer0.org2.example.com/tls/ca.crt" -c '{"function":"propertyRegistration.registrar:viewProperty", "Args":["property1"]}'

Below screenshot holds results for approvePropertyRegistration and viewProperty.



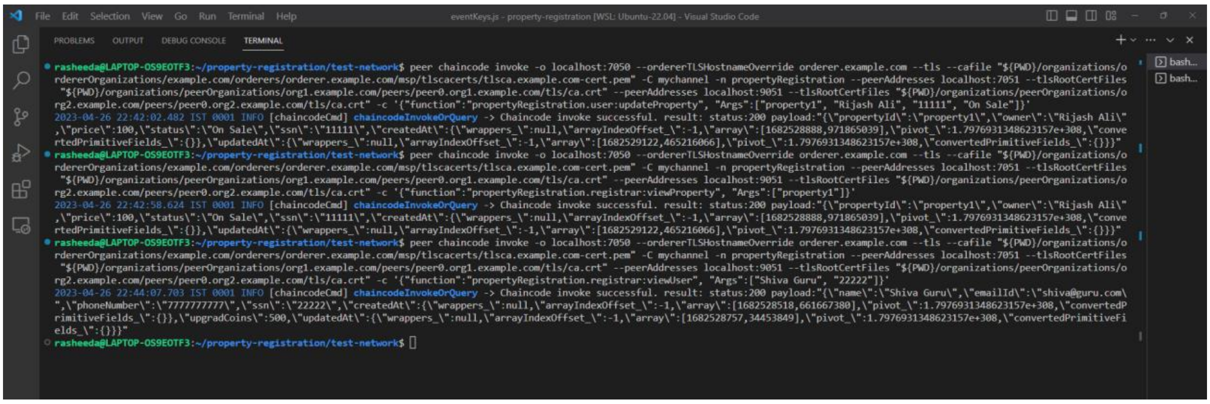
```
rasheeda@LAPTOP-OS9EOTF3:~/property-registration/test-network$ peer chaincode invoke -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com --tls --cafile "${PWD}/organizations/o
rdererOrganizations/example.com/orderers/orderer.example.com/msp/tlscacerts/tlsca.example.com-cert.pem" -C mychannel -n propertyRegistration --peerAddresses localhost:7051 --tlsRootCertFiles
 "${PWD}/organizations/peerOrganizations/org1.example.com/peers/peer0.org1.example.com/tls/ca.crt" --peerAddresses localhost:9051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/o
rg2.example.com/peers/peer0.org2.example.com/tls/ca.crt" -c '{"function":"propertyRegistration.registrar:approvePropertyRegistration", "Args":["property1"]}'
2023-04-26 22:38:08.989 IST 0001 INFO [chaincodeCmd] chaincodeInvokeOrQuery -> Chaincode invoke successful. result: status:200 payload:"true"
rasheeda@LAPTOP-OS9EOTF3:~/property-registration/test-network$ peer chaincode invoke -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com --tls --cafile "${PWD}/organizations/o
rdererOrganizations/example.com/orderers/orderer.example.com/msp/tlscacerts/tlsca.example.com-cert.pem" -C mychannel -n propertyRegistration --peerAddresses localhost:7051 --tlsRootCertFiles
 "${PWD}/organizations/peerOrganizations/org1.example.com/peers/peer0.org1.example.com/tls/ca.crt" --peerAddresses localhost:9051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/o
rg2.example.com/peers/peer0.org2.example.com/tls/ca.crt" -c '{"function":"propertyRegistration.registrar:viewProperty", "Args":["property1"]}'
2023-04-26 22:40:48.077 IST 0001 INFO [chaincodeCmd] chaincodeInvokeOrQuery -> Chaincode invoke successful. result: status:200 payload:"{\"propertyId\":\"property1\",\"owner\":\"Rijash Ali\"
,\"price\":100,\"status\":\"Registered\",\"ssn\":\"11111\",\"createdAt\":{\"wrappers_\":null,\"arrayIndexOffset_\":-1,\"array\":[1682528888,971865039],\"pivot_\":1.7976931348623157e+308,\"co
nvertedPrimitiveFields_\":{}}}"
rasheeda@LAPTOP-OS9EOTF3:~/property-registration/test-network$ 
```

Function: updateProperty

At this point the user Rijash Ali shall put on his property for sale. Kindly execute **Commands to interact as Peer0 of Org2**, followed by below command.

- peer chaincode invoke -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com --tls --cafile "${PWD}/organizations/ordererOrganizations/example.com/orderers/orderer.example.com/msp/tlscacerts/tlsca.example.com-cert.pem" -C mychannel -n propertyRegistration --peerAddresses localhost:7051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/org1.example.com/peers/peer0.org1.example.com/tls/ca.crt" --peerAddresses localhost:9051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/org2.example.com/peers/peer0.org2.example.com/tls/ca.crt" -c '{"function":"propertyRegistration.user:updateProperty", "Args":["property1", "Rijash Ali", "11111", "On Sale"]}'

Below screenshot shows current state of the ledger, with Property that's been put on sale, and Shiva hold 500 upgradCoins for purchase.

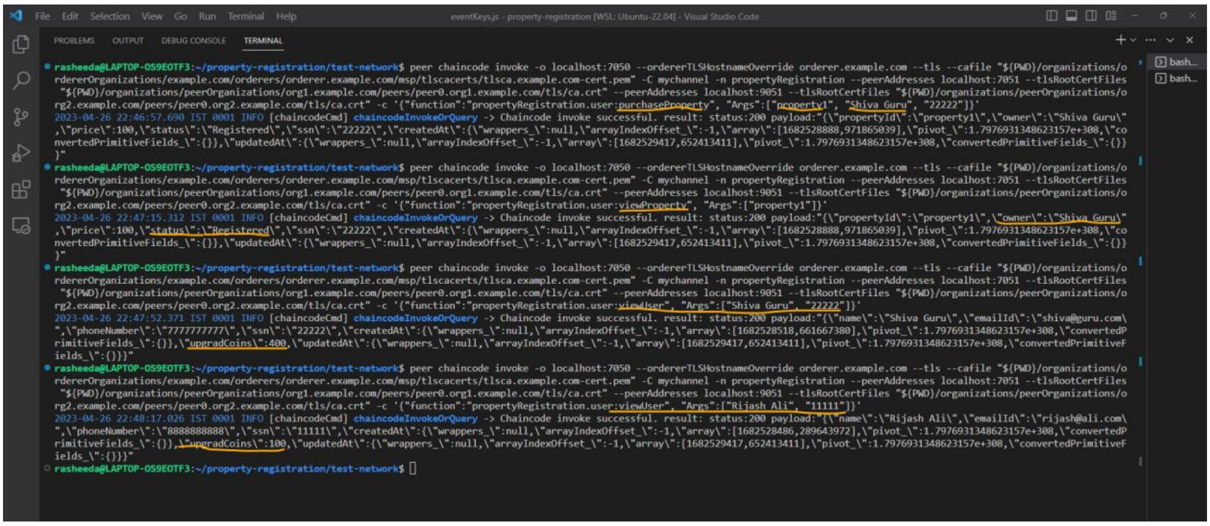


```
rasheeda@LAPTOP-OS9EOTF3:~/property-registration/test-network$ peer chaincode invoke -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com --tls --cafile "${PWD}/organizations/o
rdererOrganizations/example.com/orderers/orderer.example.com/msp/tlscacerts/tlsca.example.com-cert.pem" -C mychannel -n propertyRegistration --peerAddresses localhost:7051 --tlsRootCertFiles
 "${PWD}/organizations/peerOrganizations/org1.example.com/peers/peer0.org1.example.com/tls/ca.crt" --peerAddresses localhost:9051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/o
rg2.example.com/peers/peer0.org2.example.com/tls/ca.crt" -c '{"function":"propertyRegistration.user:updateProperty", "Args":["property1", "Rijash Ali", "11111", "On Sale"]}'
2023-04-26 22:42:02.482 IST 0001 INFO [chaincodeCmd] chaincodeInvokeOrQuery -> Chaincode invoke successful. result: status:200 payload:"{\"propertyId\":\"property1\",\"owner\":\"Rijash Ali\"
,\"price\":100,\"status\":\"On Sale\",\"ssn\":\"11111\",\"createdAt\":{\"wrappers_\":null,\"arrayIndexOffset_\":-1,\"array\":[1682528888,971865039],\"pivot_\":1.7976931348623157e+308,\"conve
rtedPrimitiveFields_\":{}},\"updatedAt\":{\"wrappers_\":null,\"arrayIndexOffset_\":-1,\"array\":[1682529122,465216066],\"pivot_\":1.7976931348623157e+308,\"convertedPrimitiveFields_\":{}}}"
rasheeda@LAPTOP-OS9EOTF3:~/property-registration/test-network$ peer chaincode invoke -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com --tls --cafile "${PWD}/organizations/o
rdererOrganizations/example.com/orderers/orderer.example.com/msp/tlscacerts/tlsca.example.com-cert.pem" -C mychannel -n propertyRegistration --peerAddresses localhost:7051 --tlsRootCertFiles
 "${PWD}/organizations/peerOrganizations/org1.example.com/peers/peer0.org1.example.com/tls/ca.crt" --peerAddresses localhost:9051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/o
rg2.example.com/peers/peer0.org2.example.com/tls/ca.crt" -c '{"function":"propertyRegistration.registrar:viewProperty", "Args":["property1"]}'
2023-04-26 22:42:58.624 IST 0001 INFO [chaincodeCmd] chaincodeInvokeOrQuery -> Chaincode invoke successful. result: status:200 payload:"{\"propertyId\":\"property1\",\"owner\":\"Rijash Ali\"
,\"price\":100,\"status\":\"On Sale\",\"ssn\":\"11111\",\"createdAt\":{\"wrappers_\":null,\"arrayIndexOffset_\":-1,\"array\":[1682528888,971865039],\"pivot_\":1.7976931348623157e+308,\"conve
rtedPrimitiveFields_\":{}},\"updatedAt\":{\"wrappers_\":null,\"arrayIndexOffset_\":-1,\"array\":[1682529122,465216066],\"pivot_\":1.7976931348623157e+308,\"convertedPrimitiveFields_\":{}}}"
rasheeda@LAPTOP-OS9EOTF3:~/property-registration/test-network$ peer chaincode invoke -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com --tls --cafile "${PWD}/organizations/o
rdererOrganizations/example.com/orderers/orderer.example.com/msp/tlscacerts/tlsca.example.com-cert.pem" -C mychannel -n propertyRegistration --peerAddresses localhost:7051 --tlsRootCertFiles
 "${PWD}/organizations/peerOrganizations/org1.example.com/peers/peer0.org1.example.com/tls/ca.crt" --peerAddresses localhost:9051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/o
rg2.example.com/peers/peer0.org2.example.com/tls/ca.crt" -c '{"function":"propertyRegistration.registrar:viewUser", "Args":["Shiva Guru", "22222"]}'
2023-04-26 22:44:07.703 IST 0001 INFO [chaincodeCmd] chaincodeInvokeOrQuery -> Chaincode invoke successful. result: status:200 payload:"{\"name\":\"Shiva Guru\",\"emailId\":\"shiva@guru.com\
",\"phoneNumber\":\"7777777777\",\"ssn\":\"22222\",\"createdAt\":{\"wrappers_\":null,\"arrayIndexOffset_\":-1,\"array\":[1682528518,661667380],\"pivot_\":1.7976931348623157e+308,\"convertedP
rimitiveFields_\":{}},\"upgradCoins\":500,\"updatedAt\":{\"wrappers_\":null,\"arrayIndexOffset_\":-1,\"array\":[1682528757,34453849],\"pivot_\":1.7976931348623157e+308,\"convertedPrimitiveFi
elds_\":{}}}"
rasheeda@LAPTOP-OS9EOTF3:~/property-registration/test-network$
```

Function: purchaseProperty

Now that this property has been put on sale, this shall emit an event to the network as 'PROPERTY_ON_SALE_EVENT'. Any user can now purchase this property, via the information received on this event. Let’s say, user ("Shiva Guru", "22222") prefers to purchase this property, he can execute below command.

- peer chaincode invoke -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com --tls --cafile "${PWD}/organizations/ordererOrganizations/example.com/orderers/orderer.example.com/msp/tlscacerts/tlsca.example.com-cert.pem" -C mychannel -n propertyRegistration --peerAddresses localhost:7051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/org1.example.com/peers/peer0.org1.example.com/tls/ca.crt" --peerAddresses localhost:9051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/org2.example.com/peers/peer0.org2.example.com/tls/ca.crt" -c '{"function":"propertyRegistration.user:purchaseProperty", "Args":["property1", "Shiva Guru", "22222"]}'

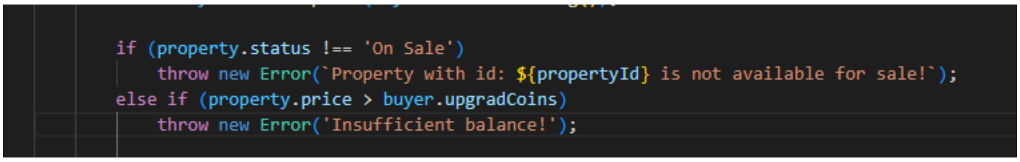


```
rasheeda@LAPTOP-OS9EOTF3:~/property-registration/test-network$ peer chaincode invoke -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com --tls --cafile "${PWD}/organizations/o
rdererOrganizations/example.com/orderers/orderer.example.com/msp/tlscacerts/tlsca.example.com-cert.pem" -C mychannel -n propertyRegistration --peerAddresses localhost:7051 --tlsRootCertFiles
 "${PWD}/organizations/peerOrganizations/org1.example.com/peers/peer0.org1.example.com/tls/ca.crt" --peerAddresses localhost:9051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/o
rg2.example.com/peers/peer0.org2.example.com/tls/ca.crt" -c '{"function":"propertyRegistration.user:purchaseProperty", "Args":["property1", "Shiva Guru", "22222"]}'
2023-04-26 22:46:57.690 IST 0001 INFO [chaincodeCmd] chaincodeInvokeOrQuery -> Chaincode invoke successful. result: status:200 payload:"{\"propertyId\":\"property1\",\"owner\":\"Shiva Guru\"
,\"price\":100,\"status\":\"Registered\",\"ssn\":\"22222\",\"createdAt\":{\"wrappers_\":null,\"arrayIndexOffset_\":-1,\"array\":[1682528888,971865039],\"pivot_\":1.7976931348623157e+308,\"co
nvertedPrimitiveFields_\":{}},\"updatedAt\":{\"wrappers_\":null,\"arrayIndexOffset_\":-1,\"array\":[1682529417,652413411],\"pivot_\":1.7976931348623157e+308,\"convertedPrimitiveFields_\":{}}
}"
rasheeda@LAPTOP-OS9EOTF3:~/property-registration/test-network$ peer chaincode invoke -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com --tls --cafile "${PWD}/organizations/o
rdererOrganizations/example.com/orderers/orderer.example.com/msp/tlscacerts/tlsca.example.com-cert.pem" -C mychannel -n propertyRegistration --peerAddresses localhost:7051 --tlsRootCertFiles
 "${PWD}/organizations/peerOrganizations/org1.example.com/peers/peer0.org1.example.com/tls/ca.crt" --peerAddresses localhost:9051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/o
rg2.example.com/peers/peer0.org2.example.com/tls/ca.crt" -c '{"function":"propertyRegistration.user:viewProperty", "Args":["property1"]}'
2023-04-26 22:47:15.312 IST 0001 INFO [chaincodeCmd] chaincodeInvokeOrQuery -> Chaincode invoke successful. result: status:200 payload:"{\"propertyId\":\"property1\",\"owner\":\"Shiva Guru\"
,\"price\":100,\"status\":\"Registered\",\"ssn\":\"22222\",\"createdAt\":{\"wrappers_\":null,\"arrayIndexOffset_\":-1,\"array\":[1682528888,971865039],\"pivot_\":1.7976931348623157e+308,\"co
nvertedPrimitiveFields_\":{}},\"updatedAt\":{\"wrappers_\":null,\"arrayIndexOffset_\":-1,\"array\":[1682529417,652413411],\"pivot_\":1.7976931348623157e+308,\"convertedPrimitiveFields_\":{}}
}"
rasheeda@LAPTOP-OS9EOTF3:~/property-registration/test-network$ peer chaincode invoke -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com --tls --cafile "${PWD}/organizations/o
rdererOrganizations/example.com/orderers/orderer.example.com/msp/tlscacerts/tlsca.example.com-cert.pem" -C mychannel -n propertyRegistration --peerAddresses localhost:7051 --tlsRootCertFiles
 "${PWD}/organizations/peerOrganizations/org1.example.com/peers/peer0.org1.example.com/tls/ca.crt" --peerAddresses localhost:9051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/o
rg2.example.com/peers/peer0.org2.example.com/tls/ca.crt" -c '{"function":"propertyRegistration.user:viewUser", "Args":["Shiva Guru", "22222"]}'
2023-04-26 22:47:52.371 IST 0001 INFO [chaincodeCmd] chaincodeInvokeOrQuery -> Chaincode invoke successful. result: status:200 payload:"{\"name\":\"Shiva Guru\",\"emailId\":\"shiva@guru.com\
",\"phoneNumber\":\"7777777777\",\"ssn\":\"22222\",\"createdAt\":{\"wrappers_\":null,\"arrayIndexOffset_\":-1,\"array\":[1682528518,661667380],\"pivot_\":1.7976931348623157e+308,\"convertedP
rimitiveFields_\":{}},\"upgradCoins\":400,\"updatedAt\":{\"wrappers_\":null,\"arrayIndexOffset_\":-1,\"array\":[1682529417,652413411],\"pivot_\":1.7976931348623157e+308,\"convertedPrimitiveF
ields_\":{}}}"
rasheeda@LAPTOP-OS9EOTF3:~/property-registration/test-network$ peer chaincode invoke -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com --tls --cafile "${PWD}/organizations/o
rdererOrganizations/example.com/orderers/orderer.example.com/msp/tlscacerts/tlsca.example.com-cert.pem" -C mychannel -n propertyRegistration --peerAddresses localhost:7051 --tlsRootCertFiles
 "${PWD}/organizations/peerOrganizations/org1.example.com/peers/peer0.org1.example.com/tls/ca.crt" --peerAddresses localhost:9051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/o
rg2.example.com/peers/peer0.org2.example.com/tls/ca.crt" -c '{"function":"propertyRegistration.user:viewUser", "Args":["Rijash Ali", "11111"]}'
2023-04-26 22:48:17.026 IST 0001 INFO [chaincodeCmd] chaincodeInvokeOrQuery -> Chaincode invoke successful. result: status:200 payload:"{\"name\":\"Rijash Ali\",\"emailId\":\"rijash@ali.com\
",\"phoneNumber\":\"8888888888\",\"ssn\":\"11111\",\"createdAt\":{\"wrappers_\":null,\"arrayIndexOffset_\":-1,\"array\":[1682528486,289643972],\"pivot_\":1.7976931348623157e+308,\"convertedP
rimitiveFields_\":{}},\"upgradCoins\":100,\"updatedAt\":{\"wrappers_\":null,\"arrayIndexOffset_\":-1,\"array\":[1682529417,652413411],\"pivot_\":1.7976931348623157e+308,\"convertedPrimitiveF
ields_\":{}}}"
rasheeda@LAPTOP-OS9EOTF3:~/property-registration/test-network$
```

As observed in above screenshot, after purchasing the property, user Shiva has been

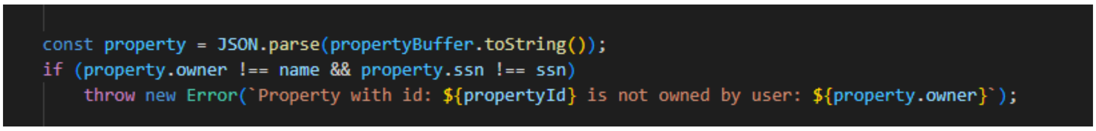
marked as the owner, and his balance of upgradCoins has been decremented from 500 to 400, for the purchase of 100. The property's status has been switched from "On Sale" to "Registered" as well. Further, user Rijash's balance has been incremented from 0 to 100.

Any variation or descrepancies in above signature shall be reported as errors. Say, if user tries to purchase a property that's not on sale, or if user has insufficient balance, transaction shall revert with following error message



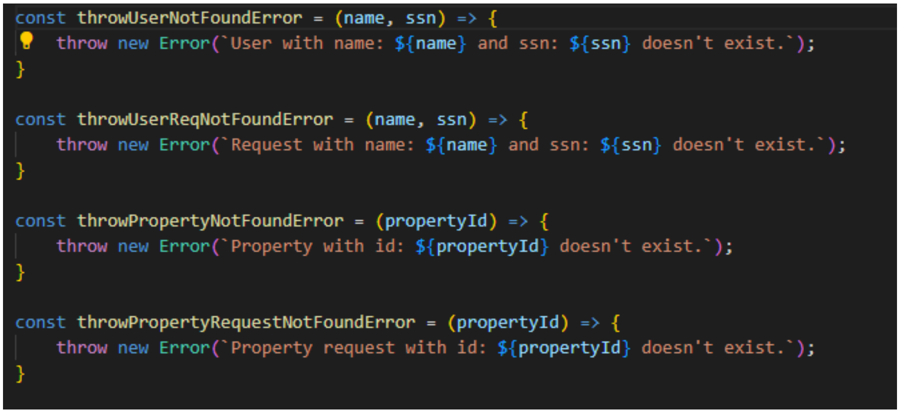
```
    if (property.status !== 'On Sale')
        throw new Error(`Property with id: ${propertyId} is not available for sale!`);
    else if (property.price > buyer.upgradCoins)
        throw new Error('Insufficient balance!');
```

Similarly, if a user tries to update a property not owned by him, transaction shall revert with following error message.



```
const property = JSON.parse(propertyBuffer.toString());
if (property.owner !== name && property.ssn !== ssn)
    throw new Error(`Property with id: ${propertyId} is not owned by user: ${property.owner}`);
```

System also holds the following error messages in case of discrepancies.



```
const throwUserNotFoundError = (name, ssn) => {
    throw new Error(`User with name: ${name} and ssn: ${ssn} doesn't exist.`);
}

const throwUserReqNotFoundError = (name, ssn) => {
    throw new Error(`Request with name: ${name} and ssn: ${ssn} doesn't exist.`);
}

const throwPropertyNotFoundError = (propertyId) => {
    throw new Error(`Property with id: ${propertyId} doesn't exist.`);
}

const throwPropertyRequestNotFoundError = (propertyId) => {
    throw new Error(`Property request with id: ${propertyId} doesn't exist.`);
}
```