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BCT PRACTICAL 7

AIM : To perform a thorough study of blockchain development on Hyperledger Fabric using Composer.

Installing Curl:

```
param@ubuntu:~/Desktop$ sudo apt install curl
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  libfprint-2-tod1 libllvm9
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  libcurl4
The following NEW packages will be installed:
  curl
The following packages will be upgraded:
  libcurl4
1 upgraded, 1 newly installed, 0 to remove and 601 not upgraded.
Need to get 396 kB of archives.
After this operation, 419 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 libcurl4 amd64 7.68.0-1ubuntu2.14 [235 kB]
Get:2 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 curl amd64 7.68.0-1ubuntu2.14 [161 kB]
Fetched 396 kB in 3s (129 kB/s)
(Reading database ... 225281 files and directories currently installed.)
Preparing to unpack .../libcurl4_7.68.0-1ubuntu2.14_amd64.deb ...
Unpacking libcurl4:amd64 (7.68.0-1ubuntu2.14) over (7.68.0-1ubuntu2.2) ...
Selecting previously unselected package curl.
Preparing to unpack .../curl_7.68.0-1ubuntu2.14_amd64.deb ...
Unpacking curl (7.68.0-1ubuntu2.14) ...
Setting up libcurl4:amd64 (7.68.0-1ubuntu2.14) ...
Setting up curl (7.68.0-1ubuntu2.14) ...
Processing triggers for man-db (2.9.1-1) ...
Processing triggers for libc-bin (2.31-0ubuntu9.1) ...
param@ubuntu:~/Desktop$
```

Installing docker.io

```
param@ubuntu:~/Desktop$ sudo apt install docker.io -y
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  libfprint-2-tod1 libllvm9
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  bridge-utils containerd libseccomp2 pigz runc ubuntu-fan
Suggested packages:
  ifupdown aufs-tools btrfs-progs cgroupfs-mount | cgroup-lite debootstrap docker-doc rinse zfs-fuse | zfsutils
The following NEW packages will be installed:
  bridge-utils containerd docker.io pigz runc ubuntu-fan
The following packages will be upgraded:
  libseccomp2
1 upgraded, 6 newly installed, 0 to remove and 600 not upgraded.
Need to get 68.9 MB of archives.
After this operation, 333 MB of additional disk space will be used.
Get:1 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 pigz amd64 2.4-1 [57.4 kB]
Get:2 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 libseccomp2 amd64 2.5.1-1ubuntu1~20.04.2 [42.5 kB]
Get:3 http://us.archive.ubuntu.com/ubuntu focal/main amd64 bridge-utils amd64 1.6-2ubuntu1 [30.5 kB]
Get:4 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 runc amd64 1.1.0-0ubuntu1~20.04.1 [3,892 kB]
Get:5 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 containerd amd64 1.5.9-0ubuntu1~20.04.4 [33.0 MB]
Get:6 http://us.archive.ubuntu.com/ubuntu focal-updates/universe amd64 docker.io amd64 20.10.12-0ubuntu2~20.04.1 [31.8 MB]
Get:7 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 ubuntu-fan all 0.12.13ubuntu0.1 [34.4 kB]
Fetched 68.9 MB in 31s (2,238 kB/s)
```

Installing python3 and python2

```

param@ubuntu:~/Desktop$ sudo apt install python3-pip ipython3
Reading package lists... Done
Building dependency tree
Reading state information... Done
python3 is already the newest version (3.8.2-0ubuntu2).
python3 set to manually installed.
The following packages were automatically installed and are no longer required:
  libfprint-2-tod1 liblvm2
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  libxapian1 libxapian-dev libpython3.8 libpython3.8-dev libpython3.8-minimal libpython3.8-stdlib python-pip-whl python3-backcall python3-decorator python3-dev python3-ipython
python3-ipython-genutils python3-jedi python3-parso python3-pickleshare python3-prompt-toolkit python3-pygments python3-traitls python3-wcwidth python3-wheel python3.8 python3.8-dev
python3.8-minimal zlib1g zlib1g-dev
Suggested packages:
  python-ipython-doc python-pygments-doc ttf-bitstream-vera python3.8-venv python3.8-doc binfmt-support
The following NEW packages will be installed:
  ipython3 libxapian1-dev libpython3.8-dev libpython3.8-stdlib python-pip-whl python3-backcall python3-decorator python3-dev python3-ipython python3-ipython-genutils python3-jedi python3-parso
python3-pickleshare python3-prompt-toolkit python3-pygments python3-traitls python3-wcwidth python3-wheel python3.8-dev zlib1g-dev
The following packages will be upgraded:
  libpython3.8 libpython3.8-minimal libpython3.8-stdlib python3.8 python3.8-minimal zlib1g
7 upgraded, 21 newly installed, 0 to remove and 592 not upgraded.
Need to get 15.2 MB of archives.
After this operation, 37.7 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 python3.8 amd64 3.8.10-0ubuntu1-20.04.5 [387 kB]
Get:2 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 libpython3.8 amd64 3.8.10-0ubuntu1-20.04.5 [1,625 kB]
Get:3 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 libpython3.8-stdlib amd64 3.8.10-0ubuntu1-20.04.5 [1,075 kB]
Get:4 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 python3.8-minimal amd64 3.8.10-0ubuntu1-20.04.5 [1,205 kB]
Get:5 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 libpython3.8-minimal amd64 3.8.10-0ubuntu1-20.04.5 [717 kB]
Get:6 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 libxapian1 amd64 1.2.2.9-1ubuntu0.4 [74.4 kB]
Get:7 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 zlib1g amd64 1:1.2.11.dfsg-2ubuntu1.5 [54.2 kB]
Get:8 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 python3-backcall all 0.4.0-2 [11.2 kB]
Get:9 http://us.archive.ubuntu.com/ubuntu focal/main amd64 python3-decorator all 4.4.2-0ubuntu1 [10.3 kB]
Get:10 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 python3-parso all 0.5.2-1ubuntu1 [62.8 kB]
Get:11 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 python3-jedi all 0.15.2-1 [502 kB]

```

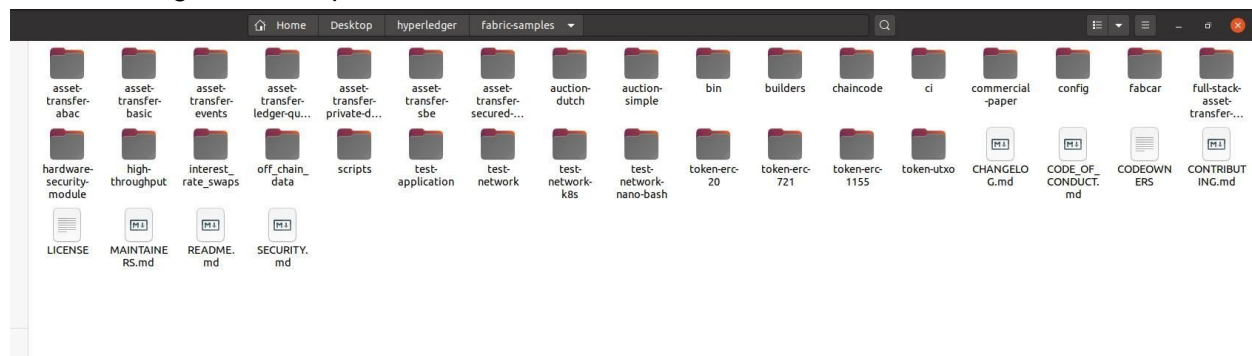
Installing golang

```
Processing triggers for desktop ...
param@ubuntu:~/Desktop$ sudo apt install golang-go
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  libffprint-2-todi liblvm9
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  golang-1.13-go golang-1.13-race-detector-runtime golang-1.13-src golang-race-detector-runtime golang-src
Suggested packages:
  bzr | brz mercurial subversion
The following NEW packages will be installed:
  golang-1.13-go golang-1.13-race-detector-runtime golang-1.13-src golang-go golang-race-detector-runtime golang-src
0 upgraded, 6 newly installed, 0 to remove and 592 not upgraded.
Need to get 60.9 MB of archives.
After this operation, 324 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 golang-1.13-src amd64 1.13.8-1ubuntu1.1 [12.6 MB]
Get:2 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 golang-1.13-go amd64 1.13.8-1ubuntu1.1 [47.6 MB]
Get:3 http://us.archive.ubuntu.com/ubuntu focal/main amd64 golang-1.13-race-detector-runtime amd64 0.0+svn332029-0ubuntu2 [713 kB]
Get:4 http://us.archive.ubuntu.com/ubuntu focal/main amd64 golang-src amd64 2:1.13-1ubuntu2 [4,044 B]
Get:5 http://us.archive.ubuntu.com/ubuntu focal/main amd64 golang-go amd64 2:1.13-1ubuntu2 [22.0 kB]
Get:6 http://us.archive.ubuntu.com/ubuntu focal/main amd64 golang-race-detector-runtime amd64 2:1.13-1ubuntu2 [3,836 B]
Fetched 60.9 MB in 1min 5s (934 kB/s)
Selecting previously unselected package golang-1.13-src.
(Reading database ... 229709 files and directories currently installed.)
Preparing to unpack .../0-golang-1.13-src_1.13.8-1ubuntu1.1_amd64.deb ...
Unpacking golang-1.13-src (1.13.8-1ubuntu1.1) ...
Selecting previously unselected package golang-1.13-go.
Preparing to unpack .../1-golang-1.13-go_1.13.8-1ubuntu1.1_amd64.deb ...
Unpacking golang-1.13-go (1.13.8-1ubuntu1.1) ...
Selecting previously unselected package golang-1.13-race-detector-runtime.
Preparing to unpack .../2-golang-1.13-race-detector-runtime_0.0+svn332029-0ubuntu2_amd64.deb ...
Unpacking golang-1.13-race-detector-runtime (0.0+svn332029-0ubuntu2) ...
Selecting previously unselected package golang-src.
Preparing to unpack .../3-golang-src_2%3a1.13-1ubuntu2_amd64.deb ...
Unpacking golang-src (2:1.13-1ubuntu2) ...
Selecting previously unselected package golang-go.
Preparing to unpack .../4-golang-go_2%3a1.13-1ubuntu2_amd64.deb ...
Unpacking golang-go (2:1.13-1ubuntu2) ...
Selecting previously unselected package golang-race-detector-runtime.
Preparing to unpack .../5-golang-race-detector-runtime_2%3a1.13-1ubuntu2_amd64.deb ...
Unpacking golang-race-detector-runtime (2:1.13-1ubuntu2) ...
```

Installing nodejs

```
param@ubuntu:~/Desktop$ sudo apt install nodejs
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  libfprint-2-tod1 libllvm9
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  libc-ares2 libnode64 nodejs-doc
Suggested packages:
  npm
The following NEW packages will be installed:
  libc-ares2 libnode64 nodejs nodejs-doc
0 upgraded, 4 newly installed, 0 to remove and 592 not upgraded.
Need to get 6,807 kB of archives.
After this operation, 30.7 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://us.archive.ubuntu.com/ubuntu focal-updates/main amd64 libc-ares2 amd64 1.15.0-1ubuntu0.1 [38.2 kB]
Get:2 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 libnode64 amd64 10.19.0-dfsg-3ubuntu1 [5,765 kB]
Get:3 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 nodejs-doc all 10.19.0-dfsg-3ubuntu1 [942 kB]
Get:4 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 nodejs amd64 10.19.0-dfsg-3ubuntu1 [61.1 kB]
Fetched 6,807 kB in 35s (193 kB/s)
Selecting previously unselected package libc-ares2:amd64.
(Reading database ... 239850 files and directories currently installed.)
Preparing to unpack .../libc-ares2_1.15.0-1ubuntu0.1_amd64.deb ...
Unpacking libc-ares2:amd64 (1.15.0-1ubuntu0.1) ...
Selecting previously unselected package libnode64:amd64.
Preparing to unpack .../libnode64_10.19.0-dfsg-3ubuntu1_amd64.deb ...
Unpacking libnode64:amd64 (10.19.0-dfsg-3ubuntu1) ...
Selecting previously unselected package nodejs-doc.
Preparing to unpack .../nodejs-doc_10.19.0-dfsg-3ubuntu1_all.deb ...
Unpacking nodejs-doc (10.19.0-dfsg-3ubuntu1) ...
Selecting previously unselected package nodejs.
Preparing to unpack .../nodejs_10.19.0-dfsg-3ubuntu1_amd64.deb ...
Unpacking nodejs (10.19.0-dfsg-3ubuntu1) ...
Setting up libc-ares2:amd64 (1.15.0-1ubuntu0.1) ...
Setting up libnode64:amd64 (10.19.0-dfsg-3ubuntu1) ...
Setting up nodejs-doc (10.19.0-dfsg-3ubuntu1) ...
Setting up nodejs (10.19.0-dfsg-3ubuntu1) ...
```

After installing fabric-samples:



After running ./network.sh up:

```
param@ubuntu:~/Desktop/hyperledger/fabric-samples/test-network$ ./network.sh up
Using docker and docker-compose
Starting nodes with CLI timeout of '5' tries and CLI delay of '3' seconds and using database 'leveldb' with crypto from 'cryptogen'
LOCAL_VERSION=2.4.7
DOCKER_IMAGE_VERSION=2.4.7
/home/param/Desktop/hyperledger/fabric-samples/test-network/./bin/cryptogen
Generating certificates using cryptogen tool
Creating Org1 Identities
+ cryptogen generate --config=./organizations/cryptogen/crypto-config-org1.yaml --output=organizations
org1.example.com
+ res=0
Creating Org2 Identities
+ cryptogen generate --config=./organizations/cryptogen/crypto-config-org2.yaml --output=organizations
org2.example.com
+ res=0
Creating Orderer Org Identities
+ cryptogen generate --config=./organizations/cryptogen/crypto-config-orderer.yaml --output=organizations
+ res=0
Generating CCP files for Org1 and Org2
Creating network "fabric_test" with the default driver
Creating volume "compose_orderer.example.com" with default driver
Creating volume "compose_peer0.org1.example.com" with default driver
Creating volume "compose_peer0.org2.example.com" with default driver
Creating peer0.org2.example.com ... done
Creating peer0.org1.example.com ... done
Creating orderer.example.com ... done
Creating cli ... done
```


After running ./network.sh createChannel

```
param@ubuntu:~/Desktop/hyperledger/fabric-samples/test-network$ ./network.sh createChannel
Using docker and docker-compose
Creating channel 'mychannel'.
If network is not up, starting nodes with CLI timeout of '5' tries and CLI delay of '3' seconds and using database 'leveldb'
Network Running Already
Using docker and docker-compose
Generating channel genesis block 'mychannel.block'
/home/param/Desktop/hyperledger/fabric-samples/test-network/./bin/configtxgen
+ configtxgen -profile TwoOrgsApplicationGenesis -outputBlock ./channel-artifacts/mychannel.block -channelID mychannel
2022-11-20 08:42:31.855 PST 0001 INFO [common.tools.configtxgen] main -> Loading configuration
2022-11-20 08:42:31.893 PST 0002 INFO [common.tools.configtxgen.localconfig] completeInitialization -> orderer type: etcdraft
2022-11-20 08:42:31.894 PST 0003 INFO [common.tools.configtxgen.localconfig] completeInitialization -> Orderer.Etcdraft.Options unset, setting to tick_interval:"500ms" election_tick:10 heartbeat_tick:1 n
ax_inflight_blocks:5 snapshot_interval_size:16777216
2022-11-20 08:42:31.894 PST 0004 INFO [common.tools.configtxgen.localconfig] Load -> Loaded configuration: /home/param/Desktop/hyperledger/fabric-samples/test-network/configtx/configtx.yaml
2022-11-20 08:42:31.925 PST 0005 INFO [common.tools.configtxgen] doOutputBlock -> Generating genesis block
2022-11-20 08:42:31.926 PST 0006 INFO [common.tools.configtxgen] doOutputBlock -> Creating application channel genesis block
2022-11-20 08:42:31.926 PST 0007 INFO [common.tools.configtxgen] doOutputBlock -> Writing genesis block
+ res=0
Creating channel mychannel
Using organization 1
+ osnadmin channel join --channelID mychannel --config-block ./channel-artifacts/mychannel.block -o localhost:7053 --ca-file /home/param/Desktop/hyperledger/fabric-samples/test-network/organizations/order
erorganizations/example.com/tlsca/tlsca.example.com-cert.pem --client-cert /home/param/Desktop/hyperledger/fabric-samples/test-network/organizations/ordererOrganizations/example.com/orderers/orderer.exa
mple.com/tls/server.crt --client-key /home/param/Desktop/hyperledger/fabric-samples/test-network/organizations/ordererOrganizations/example.com/orderers/orderer.example.com/tls/server.key
+ res=0
Status: 201
{
  "name": "mychannel",
  "url": "/participation/v1/channels/mychannel",

```

Running ./network.sh deployCC -ccn basic -ccp ../asset-transfer-basic/chaincode-go -ccl go :

```
param@ubuntu:~/Desktop/hyperledger/fabric-samples/test-network$ ./network.sh deployCC -ccn basic -ccp ../asset-transfer-basic/chaincode-go -ccl go
Using docker and docker-compose
Deploying chaincode on channel 'mychannel'
Executing with the following
- CHANNEL_NAME: mychannel
- CC_NAME: basic
- CC_SRC_PATH: ../asset-transfer-basic/chaincode-go
- CC_SRC_LANGUAGE: go
- CC_VERSION: 1.0
- CC_SEQUENCE: 1
- CC_END_POLICY: NA
- CC_COLL_CONFIG: NA
- CC_INIT_FCN: NA
- DELAY: 3
- MAX_RETRY: 5
- VERBOSE: false
Vendoring Go dependencies at ../asset-transfer-basic/chaincode-go
~/Desktop/hyperledger/fabric-samples/asset-transfer-basic/chaincode-go ~/Desktop/hyperledger/fabric-samples/test-network
~/Desktop/hyperledger/fabric-samples/test-network
Finished vendoring go dependencies
+ peer lifecycle chaincode package basic.tar.gz --path ../asset-transfer-basic/chaincode-go --lang golang --label basic_1.0
+ res=0
++ peer lifecycle chaincode calculatepackageid basic.tar.gz
+ PACKAGE_ID=basic_1.0:866dd491693b4d360805bd1fee2bbdf315e13af755e396e746e753d75c874e6e
Chaincode is packaged
Installing chaincode on peer0.org1...
Using organization 1
+ grep '^basic_1.0:866dd491693b4d360805bd1fee2bbdf315e13af755e396e746e753d75c874e6e$'
+ jq -r 'try (.installed_chaincodes[].package_id)'
+ peer lifecycle chaincode queryinstalled --output json
+ test 0 -ne 0
basic_1.0:866dd491693b4d360805bd1fee2bbdf315e13af755e396e746e753d75c874e6e
Chaincode is installed on peer0.org1
Install chaincode on peer0.org2...
Using organization 2

```

Hence, our basic chaincode is deployed.

Initializing the ledger with assets:

```
param@ubuntu:~/Desktop/hyperledger/fabric-samples/test-network$ peer chaincode invoke -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com --tls --cafile "${PWD}/organizations/ordererOrganizations/example.com/orderers/orderer.example.com/msp/tlscacerts/tlsca.example.com-cert.pem" -C mychannel -n basic --peerAddresses localhost:7051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/org1.example.com/peers/peer0.org1.example.com/tls/ca.crt" --peerAddresses localhost:9051 --tlsRootCertFiles "${PWD}/organizations/peerOrganizations/org2.example.com/peers/peer0.org2.example.com/tls/ca.crt" -c '{"function": "InitLedger", "Args": []}'
2022-11-20 10:26:56.272 PST 0001 INFO [chaincodeCmd] chaincodeInvokeOrQuery -> Chaincode invoke successful. result: status:200
param@ubuntu:~/Desktop/hyperledger/fabric-samples/test-network$
```

List of assets in ledger :

```
param@ubuntu:~/Desktop/hyperledger/fabric-samples/test-network$ peer chaincode query -C mychannel -n basic -c '{"Args":["GetAllAssets"]}'
[{"AppraisedValue":300,"Color":"blue","ID":"asset1","Owner":"Tomoko","Size":5}, {"AppraisedValue":400,"Color":"red","ID":"asset2","Owner":"Brad","Size":5}, {"AppraisedValue":500,"Color":"green","ID":"asset3","Owner":"Jin Soo","Size":10}, {"AppraisedValue":600,"Color":"yellow","ID":"asset4","Owner":"Max","Size":10}, {"AppraisedValue":700,"Color":"black","ID":"asset5","Owner":"Adriana","Size":15}, {"AppraisedValue":800,"Color":"white","ID":"asset6","Owner":"Michel","Size":15}]
```

Reading a asset :

```
param@ubuntu:~/Desktop/hyperledger/fabric-samples/test-network$ peer chaincode query -C mychannel -n basic -c '{"Args":["ReadAsset","asset6"]}'
{"AppraisedValue":800,"Color":"white","ID":"asset6","Owner":"Christopher","Size":15}
param@ubuntu:~/Desktop/hyperledger/fabric-samples/test-network$
```

Running go application using certificate authority:

```
param@ubuntu:~/Desktop/hyperledger/fabric-samples/asset-transfer-basic/application-gateway-go$ go run .
2022/11/20 10:44:02 ===== application-golang starts =====
initLedger:
Submit Transaction: InitLedger, function creates the initial set of assets on the ledger
*** Transaction committed successfully
getAllAssets:
Evaluate Transaction: GetAllAssets, function returns all the current assets on the ledger
*** Result:[
{
  "AppraisedValue": 300,
  "Color": "blue",
  "ID": "asset1",
  "Owner": "Tomoko",
  "Size": 5
},
{
  "AppraisedValue": 400,
  "Color": "red",
  "ID": "asset2",
  "Owner": "Brad",
  "Size": 5
},
{
  "AppraisedValue": 500,
  "Color": "green",
  "ID": "asset3",
  "Owner": "Jin Soo",
  "Size": 10
},
{
  "AppraisedValue": 600,
  "Color": "yellow",
  "ID": "asset4",
  "Owner": "Max",
  "Size": 10
},
{
  "AppraisedValue": 700,
  "Color": "black",
  "ID": "asset5",
  "Owner": "Adriana",
  "Size": 15
},
{
  "AppraisedValue": 800,
  "Color": "white",
  "ID": "asset6",
  "Owner": "Michel",
  "Size": 15
}
]
```