



Bhartiya Vidya Bhavan's  
Sardar Patel Institute of Technology, Mumbai-400058  
Department of Electronics and Telecommunication Engineering  
**OEIT1:Blockchain Technology and Applications**

**Lab-8A: Hyperledger Fabric Application- Setup HF and Supply Chain Management (SCM)**

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**Class: TE COMPS B**

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**Objective:** Building a Supply Chain Management application using Hyperledger Fabric

**Outcomes:** After completing this lab, students will be able to:

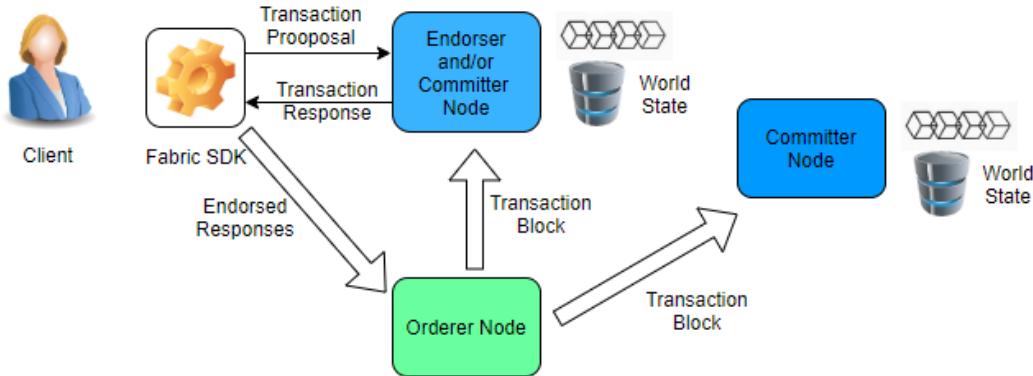
- [1] Implement a dApp using Hyperledger fabric
- [2] Demonstrate the basic concepts of Hyperledger fabric and how they work.
- [3] Demonstrate the importance of Certifying authority.

**System Requirements:**

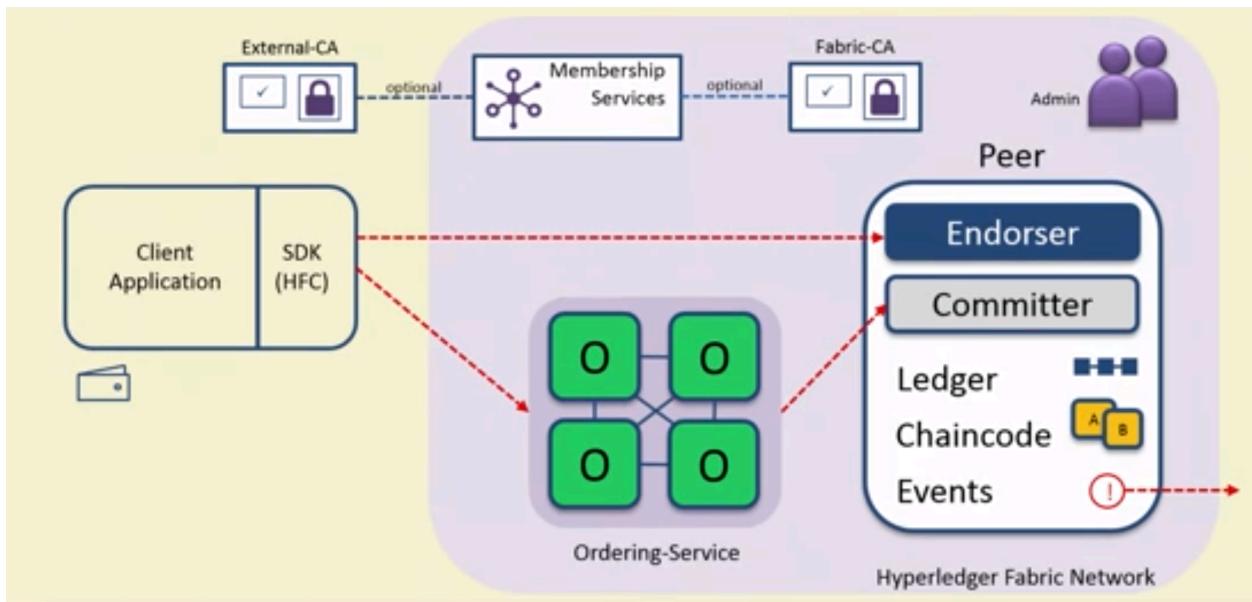
PC (C2D, 8GB RAM, 100GB HDD space and NIC),Ubuntu Linux 14.04/20.04 Internet connectivity,Python Cryptography and Pycrypto,Nodejs, Truffle,Ganache-cli, solidity,REST API

## Theory:

Hyperledger Fabric is a permissioned blockchain framework, with a modular architecture (plug-and-play). It leverages container technology to host smart contract (Chaincode) which contains application logic.



Hyperledger Fabric Basic Transaction Flow



## Hyperledger Fabric capabilities

Hyperledger has a full-stack, enterprise-grade business solution to deliver secure and scalable value with added security, confidentiality, and performance. Hyperledger Fabric delivers the following functionalities and core capabilities:

**Identity management:** To turn a permissioned network, Hyperledger Fabric provides a membership identity service that maintains user IDs and then authenticates each one of them in the network. One user ID can invoke a chain code application but can be blocked to turn up a new chain code.

**Efficient processing:** Hyperledger assigns a role for each node based on transaction ordering and commitment. The overall performance improves as the concurrent execution increases and improves the time to deliver each order.

**Privacy and confidentiality:** Private channels restrict the messaging paths to provide transaction privacy and confidentiality for specific network members. All data, including member information, transactions, and channel details, remains invisible and inaccessible to other network members.

**Chaincode functionality:** This regards chaincode applications and is the business logic of Hyperledger Fabric. Chaincode ensures that all transactions that transfer ownership are subject to its rules and requirements. The operating parameters of the channel are usually defined by the system chaincode, whereas the validation system chaincode defines the requirements for endorsing and validating transactions.

Stage-0: Use official document of Hyperledger fabric:

Setup Hyperledger Fabric using Docker and Docker-compose

[https://hyperledger-fabric.readthedocs.io/en/release-2.0/getting\\_started.html](https://hyperledger-fabric.readthedocs.io/en/release-2.0/getting_started.html)

Stage-1: Tuna Application Development

**Procedure:**

Cloning the education.git repository of Hyperledger from github.

```
$mkdir lab8a
```

```
$cd lab8a
```

```
$git clone https://github.com/hyperledger/education.git
```

Installing docker.io

```
$sudo apt install docker.io
```

Installing docker:

```
$sudo snap install docker
```

Going into the tuna-app folder:

```
$cd education/LFS171x/fabric-material/tuna-app
```

Changing permissions for docker.sock since connection gets denied

```
$sudo chmod 666 /var/run/docker.sock
```

```
./startFabric.sh
```

```

itlab@itlab-OptiPlex-3000: $ mkdir lab8a
itlab@itlab-OptiPlex-3000: $ cd lab8a
itlab@itlab-OptiPlex-3000: /lab8a $ curl -sSL https://raw.githubusercontent.com/hyperledger/fabric/main/scripts/install-fabric.sh && chmod +x install-fabric.sh
itlab@itlab-OptiPlex-3000: /lab8a $ ls
install-fabric.sh
itlab@itlab-OptiPlex-3000: /lab8a $ cd fabric-samples/test-network
bash: cd: fabric-samples/test-network: No such file or directory
itlab@itlab-OptiPlex-3000: /lab8a $ ./install-fabric.sh d s b
Clone hyperledger/fabric-samples repo
==> Cloning hyperledger/fabric-samples repo
Cloning into 'fabric-samples'...
remote: Enumerating objects: 13272, done.
remote: Counting objects: 100% (155/155), done.
remote: Compressing objects: 100% (108/108), done.
remote: Total 13272 (delta 37), reused 114 (delta 27), pack-reused 13117
Receiving objects: 100% (13272/13272), 22.84 MiB | 3.92 MiB/s, done.
Resolving deltas: 100% (7279/7279), done.
Fabric-samples v2.5.7 does not exist, defaulting to main. fabric-samples main branch is intended to work with recent versions of fabric.

Pull Hyperledger Fabric binaries
==> Downloading version 2.5.7 platform specific fabric binaries
==> Downloading: https://github.com/hyperledger/fabric/releases/download/v2.5.7/hyperledger-fabric-linux-amd64-2.5.7.tar.gz
==> Will unpack to: /home/itlab/lab8a/fabric-samples
  % Total    % Received   % Xferd  Average Speed   Time   Time     Current
          Dload  Upload Total Spent   Left Speed
0       0      0      0      0      0      0      0      0      0      0
100  109M  100  109M      0      0  2044K  0:00:54  0:00:54      384K
==> Done.
==> Downloading version 1.5.10 platform specific fabric-ca-client binary
==> Downloading: https://github.com/hyperledger/fabric-ca/releases/download/v1.5.10/hyperledger-fabric-ca-linux-amd64-1.5.10.tar.gz
==> Will unpack to: /home/itlab/lab8a/fabric-samples
  % Total    % Received   % Xferd  Average Speed   Time   Time     Current
          Dload  Upload Total Spent   Left Speed
0       0      0      0      0      0      0      0      0      0
100  28.6M  100  28.6M      0      0  3051K  0:00:09  0:00:09      4644K
==> Done.

Pull Hyperledger Fabric docker images
FABRIC_IMAGES: peer orderer ccenv tools baseos
==> Pulling Fabric Images
====> docker.io/hyperledger/fabric-peer:2.5.7

```

```

permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Post "http://%2Fvar%2Frun%2Fdocker.sock/v1.24/images/create?fromImage=hyperledger%2Ffabric-peer&tag=2.5.7": dial unix /var/run/docker.sock: connect: permission denied
permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Post "http://%2Fvar%2Frun%2Fdocker.sock/v1.24/images/docker.io/hyperledger/fabric-peer:2.5.7?tag=repo=hyperledger%2Ffabric-peer&tag=latest": dial unix /var/run/docker.sock: connect: permission denied
permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Post "http://%2Fvar%2Frun%2Fdocker.sock/v1.24/images/docker.io/hyperledger/fabric-peer:2.5.7?tag=repo=hyperledger%2Ffabric-peer&tag=2.5": dial unix /var/run/docker.sock: connect: permission denied
====> docker.io/hyperledger/fabric-orderer:2.5.7
permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Post "http://%2Fvar%2Frun%2Fdocker.sock/v1.24/images/create?fromImage=hyperledger%2Ffabric-orderer&tag=2.5.7": dial unix /var/run/docker.sock: connect: permission denied
permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Post "http://%2Fvar%2Frun%2Fdocker.sock/v1.24/images/docker.io/hyperledger/fabric-orderer:2.5.7?tag=repo=hyperledger%2Ffabric-orderer&tag=latest": dial unix /var/run/docker.sock: connect: permission denied
permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Post "http://%2Fvar%2Frun%2Fdocker.sock/v1.24/images/docker.io/hyperledger/fabric-orderer:2.5.7?tag=repo=hyperledger%2Ffabric-orderer&tag=2.5": dial unix /var/run/docker.sock: connect: permission denied
====> docker.io/hyperledger/fabric-ccenv:2.5.7
permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Post "http://%2Fvar%2Frun%2Fdocker.sock/v1.24/images/create?fromImage=hyperledger%2Ffabric-ccenv&tag=2.5.7": dial unix /var/run/docker.sock: connect: permission denied
permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Post "http://%2Fvar%2Frun%2Fdocker.sock/v1.24/images/docker.io/hyperledger/fabric-ccenv:2.5.7?tag=repo=hyperledger%2Ffabric-ccenv&tag=latest": dial unix /var/run/docker.sock: connect: permission denied
permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Post "http://%2Fvar%2Frun%2Fdocker.sock/v1.24/images/docker.io/hyperledger/fabric-ccenv:2.5.7?tag=repo=hyperledger%2Ffabric-ccenv&tag=2.5": dial unix /var/run/docker.sock: connect: permission denied
====> docker.io/hyperledger/fabric-tools:2.5.7
permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Post "http://%2Fvar%2Frun%2Fdocker.sock/v1.24/images/create?fromImage=hyperledger%2Ffabric-tools&tag=2.5.7": dial unix /var/run/docker.sock: connect: permission denied
permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Post "http://%2Fvar%2Frun%2Fdocker.sock/v1.24/images/docker.io/hyperledger/fabric-tools:2.5.7?tag=repo=hyperledger%2Ffabric-tools&tag=latest": dial unix /var/run/docker.sock: connect: permission denied
permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Post "http://%2Fvar%2Frun%2Fdocker.sock/v1.24/images/docker.io/hyperledger/fabric-tools:2.5.7?tag=repo=hyperledger%2Ffabric-tools&tag=2.5": dial unix /var/run/docker.sock: connect: permission denied
====> docker.io/hyperledger/fabric-baseos:2.5.7
permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Post "http://%2Fvar%2Frun%2Fdocker.sock/v1.24/images/create?fromImage=hyperledger%2Ffabric-baseos&tag=2.5.7": dial unix /var/run/docker.sock: connect: permission denied
permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Post "http://%2Fvar%2Frun%2Fdocker.sock/v1.24/images/docker.io/hyperledger/fabric-baseos:2.5.7?tag=repo=hyperledger%2Ffabric-baseos&tag=latest": dial unix /var/run/docker.sock: connect: permission denied
permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Post "http://%2Fvar%2Frun%2Fdocker.sock/v1.24/images/docker.io/hyperledger/fabric-baseos:2.5.7?tag=repo=hyperledger%2Ffabric-baseos&tag=2.5": dial unix /var/run/docker.sock: connect: permission denied
====> Pulling Fabric ca Image
====> docker.io/hyperledger/fabric-ca:1.5.10
permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Post "http://%2Fvar%2Frun%2Fdocker.sock/v1.24/images/create?fromImage=hyperledger%2Ffabric-ca&tag=1.5.10": dial unix /var/run/docker.sock: connect: permission denied
permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Post "http://%2Fvar%2Frun%2Fdocker.sock/v1.24/images/docker.io/hyperledger/fabric-ca:1.5.10?tag=repo=hyperledger%2Ffabric-ca&tag=latest": dial unix /var/run/docker.sock: connect: permission denied
permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Post "http://%2Fvar%2Frun%2Fdocker.sock/v1.24/images/docker.io/hyperledger/fabric-ca:1.5.10?tag=repo=hyperledger%2Ffabric-ca&tag=1.5": dial unix /var/run/docker.sock: connect: permission denied
====> List out hyperledger Images
permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Get "http://%2Fvar%2Frun%2Fdocker.sock/v1.24/images/json": dial unix /var/run/docker.sock: connect: permission denied

```

Starting hyperledger fabric, it also starts listening on channels created.

We have to use node v8.9.0

Run the following commands:

nvm install v8.9.0

nvm use v8.9.0

rm -rf node\_modules to delete existing modules

and then

npm install

Running node registerAdmin.js

Certificate gets created.

\$node registerAdmin.js

\$node registerUser.js

Running registerUser.js, this file registers user with CA.

\$node server.js

Running server.js

```
itlab@itlab-OptiPlex-3000:~/lab8a/education/LFS171x/fabric-material/tuna-app$ ./network.sh down
stopping network
Traceback (most recent call last):
  File "/usr/lib/python3/dist-packages/urllib3/connectionpool.py", line 700, in urlopen
    httplib_response = self._make_request(
  File "/usr/lib/python3/dist-packages/urllib3/connectionpool.py", line 395, in _make_request
    conn.request(method, url, **httplib_request_kw)
  File "/usr/lib/python3.10/http/client.py", line 1283, in request
    self._send_request(method, url, body, headers, encode_chunked)
  File "/usr/lib/python3.10/http/client.py", line 1329, in _send_request
    self.endheaders(body, encode_chunked=encode_chunked)
  File "/usr/lib/python3.10/http/client.py", line 1278, in endheaders
    self._send_output(message_body, encode_chunked=encode_chunked)
  File "/usr/lib/python3.10/http/client.py", line 1038, in _send_output
    self.send(msg)
  File "/usr/lib/python3.10/http/client.py", line 976, in send
    self.connect()
```

```
PermissionError: [Errno 13] Permission denied

During handling of the above exception, another exception occurred:

Traceback (most recent call last):
  File "/usr/lib/python3/dist-packages/requests/adapters.py", line 439, in send
    resp = conn.urlopen(
  File "/usr/lib/python3/dist-packages/urllib3/connectionpool.py", line 756, in urlopen
    retries = retries.increment(
  File "/usr/lib/python3/dist-packages/urllib3/util/retry.py", line 532, in increment
    raise six.reraise(type(error), error, _stacktrace)
  File "/usr/lib/python3/dist-packages/six.py", line 718, in reraise
    raise value.with_traceback(tb)
  File "/usr/lib/python3/dist-packages/urllib3/connectionpool.py", line 700, in urlopen
    httpplib_response = self._make_request(
  File "/usr/lib/python3/dist-packages/urllib3/connectionpool.py", line 395, in _make_request
    conn.request(method, url, **httpplib_request_kw)
  File "/usr/lib/python3.10/http/client.py", line 1283, in request
    self._send_request(method, url, body, headers, encode_chunked)
  File "/usr/lib/python3.10/http/client.py", line 1329, in _send_request
    self.endheaders(body, encode_chunked=encode_chunked)
  File "/usr/lib/python3.10/http/client.py", line 1278, in endheaders
    self._send_output(message_body, encode_chunked=encode_chunked)
  File "/usr/lib/python3.10/http/client.py", line 1038, in _send_output
    self.send(msg)
  File "/usr/lib/python3.10/http/client.py", line 976, in send
    self.connect()
  File "/usr/lib/python3/dist-packages/docker/transport/unixconn.py", line 30, in connect
    sock.connect(self_unix_socket)
urllib3.exceptions.ProtocolError: ('Connection aborted.', PermissionError(13, 'Permission denied'))
```

During handling of the above exception, another exception occurred:

```
Traceback (most recent call last):
  File "/usr/lib/python3/dist-packages/docker/api/client.py", line 214, in _retrieve_server_version
    return self.version(api_version=False)[“ApiVersion”]
  File "/usr/lib/python3/dist-packages/docker/api/daemon.py", line 181, in version
    return self._result(self._get(url), json=True)

  File "/usr/lib/python3/dist-packages/docker/api/client.py", line 237, in _get
    return self.get(url, **self._set_request_timeout(kwargs))
  File "/usr/lib/python3/dist-packages/requests/sessions.py", line 557, in get
    return self.request('GET', url, **kwargs)
  File "/usr/lib/python3/dist-packages/requests/sessions.py", line 544, in request
    resp = self.send(prepare, **send_kwargs)
  File "/usr/lib/python3/dist-packages/requests/sessions.py", line 657, in send
    r = adapter.send(request, **kwargs)
  File "/usr/lib/python3/dist-packages/requests/adapters.py", line 498, in send
    raise ConnectionError(err, request=request)
requests.exceptions.ConnectionError: ('Connection aborted.', PermissionError(13, 'Permission denied'))
```

During handling of the above exception, another exception occurred:

```
Traceback (most recent call last):
  File "/usr/bin/docker-compose", line 33, in <module>
    sys.exit(load_entry_point('docker-compose==1.29.2', 'console_scripts', 'docker-compose')())
  File "/usr/lib/python3/dist-packages/compose/cli/main.py", line 81, in main
    command_func()
  File "/usr/lib/python3/dist-packages/compose/cli/main.py", line 200, in perform_command
    project = project_from_options('.', options)
  File "/usr/lib/python3/dist-packages/compose/cli/command.py", line 60, in project_from_options
    return get_project()
  File "/usr/lib/python3/dist-packages/compose/cli/command.py", line 152, in get_project
    client = get_client()
  File "/usr/lib/python3/dist-packages/compose/cli/docker_client.py", line 41, in get_client
    client = docker_client(
  File "/usr/lib/python3/dist-packages/compose/cli/docker_client.py", line 170, in docker_client
    client = APIClient(use_ssh_client=not use_paramiko_ssh, **kwargs)
  File "/usr/lib/python3/dist-packages/docker/api/client.py", line 197, in __init__
    self._version = self._retrieve_server_version()
  File "/usr/lib/python3/dist-packages/docker/api/client.py", line 221, in _retrieve_server_version
    raise DockerException(
docker.errors.DockerException: Error while fetching server API version: ('Connection aborted.', PermissionError(13, 'Permission denied'))
permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Delete "http://%2Fvar%2Frun%2Fdocker.sock/v1.24/volumes/docker_orderer.example.com": dial unix /var/run/docker.sock: connect: permission denied
permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Delete "http://%2Fvar%2Frun%2Fdocker.sock/v1.24/volumes/docker_peer0.org1.example.com": dial unix /var/run/docker.sock: connect: permission denied
```

```

removing remaining containers
permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Get "http://%2Fvar%2Frun%2Fdocker.sock/v1.24/containers/json?all=1&filters=%7B%22label%22%3A%7B%22service%3Dhyperledger-fabric%22%3Atrue%7D%7D": dial unix /var/run/docker.sock: connection refused
permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Get "http://%2Fvar%2Frun%2Fdocker.sock/v1.24/containers/json?all=1&filters=%7B%22name%22%3A%7B%22dev-peer%2AN22%3Atrue%7D%7D": dial unix /var/run/docker.sock: connect: permission denied
permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Get "http://%2Fvar%2Frun%2Fdocker.sock/v1.24/containers/json?all=1&filters=%7B%22reference%22%3A%7B%22dev-peer%2AN22%3Atrue%7D%7D": dial unix /var/run/docker.sock: connect: permission denied
removing generated chaincode docker images
permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Get "http://%2Fvar%2Frun%2Fdocker.sock/v1.24/images/json?all=1&filters=%7B%22reference%22%3A%7B%22dev-peer%2AN22%3Atrue%7D%7D": dial unix /var/run/docker.sock: connect: permission denied
See 'docker run --help'.
docker: permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Post "http://%2Fvar%2Frun%2Fdocker.sock/v1.24/containers/create": dial unix /var/run/docker.sock: connect: permission denied.
See 'docker run --help'.
docker: permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Post "http://%2Fvar%2Frun%2Fdocker.sock/v1.24/containers/create": dial unix /var/run/docker.sock: connect: permission denied.
See 'docker run --help'.
docker: permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Post "http://%2Fvar%2Frun%2Fdocker.sock/v1.24/containers/create": dial unix /var/run/docker.sock: connect: permission denied.
See 'docker run --help'.
docker: permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Post "http://%2Fvar%2Frun%2Fdocker.sock/v1.24/containers/create": dial unix /var/run/docker.sock: connect: permission denied.
See 'docker run --help'.
docker: permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Post "http://%2Fvar%2Frun%2Fdocker.sock/v1.24/containers/create": dial unix /var/run/docker.sock: connect: permission denied.
See 'docker run --help'.
docker: permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Post "http://%2Fvar%2Frun%2Fdocker.sock/v1.24/containers/create": dial unix /var/run/docker.sock: connect: permission denied.
See 'docker run --help'.

```

```

ltlab@ltlab-OptiPlex-3000:~/lab8a/education/LFS171x/Fabric-material/tuna-app$ cd ..
ltlab@ltlab-OptiPlex-3000:~/lab8a/education/LFS171x/Fabric-material$ cd //
ltlab@ltlab-OptiPlex-3000:/$ ls
bin boot cdrom dev etc home lib lib32 lib64 libx32 lost+found media mnt opt proc root run sbin snap srv sys tmp usr var
ltlab@ltlab-OptiPlex-3000:/$ cd lab8a
bash: cd: lab8a: No such file or directory
====> Downloading: https://github.com/hyperledger/fabric/releases/download/v2.5.7/hyperledger-fabric-linux-amd64-2.5.7.tar.gz
====> Will unpack to: /home/kevin/lab8a/fabric-samples
    % Total    % Received % Xferd  Average Speed   Time   Time Current
          Dload  Upload Total Spent   Left Speed
0  0  0  0  0  0  0  0:--:-- --:--:--:--:--:-- 0
100 109M 100 109M  0  0 4723k    0 0:00:23 0:00:23 0:00:23 4829k
====> Done.
====> Downloading version 1.5.10 platform specific fabric-ca-client binary
====> Downloading: https://github.com/hyperledger/fabric-ca/releases/download/v1.5.10/hyperledger-fabric-ca-linux-amd64-1.5.10.tar.gz
====> Will unpack to: /home/kevin/lab8a/fabric-samples
    % Total    % Received % Xferd  Average Speed   Time   Time Current
          Dload  Upload Total Spent   Left Speed
0  0  0  0  0  0  0  0:--:-- --:--:--:--:--:-- 0
100 28.6M 100 28.6M  0  0 3978k    0 0:00:07 0:00:07 0:00:07 5864k
====> Done.

Pull Hyperledger Fabric docker images

FABRIC_IMAGES: peer orderer ccenv tools baseos
====> Pulling fabric Images
====> docker.io/hyperledger/fabric-peer:2.5.7
2.5.7: Pulling from hyperledger/fabric-peer
17d0380c2fff: Pull complete
411f949d2631: Pull complete
60477c51ae49: Pull complete
41fe030a0db76: Pull complete
4b3da0ef2f587: Pull complete
5bde8943d0ff: Pull complete
Digest: sha256:a3dad3b96a1593a150f11124e8a2bc4e13fe80e080733442a87735a0709a74e5
Status: Downloaded newer image for hyperledger/fabric-peer:2.5.7
docker.io/hyperledger/fabric-peer:2.5.7
====> docker.io/hyperledger/fabric-orderer:2.5.7

```

```
c599b25cda22: Pull complete
c3d079db3fa8: Pull complete
44b4e555bbda: Pull complete
145d0404f6b8: Pull complete
7e1ef4cce541: Pull complete
Digest: sha256:ie3933beae1d0d7e725f90c50f8d6acf89dc1b99291e2ba2571e722ecd04023a3
Status: Downloaded newer image for hyperledger/fabric-orderer:2.5.7
docker.io/hyperledger/fabric-orderer:2.5.7
=====> docker.io/hyperledger/fabric-ccenv:2.5.7
2.5.7: Pulling from hyperledger/fabric-ccenv
17d038dc2fff: Already exists
a0c4834172df: Pull complete
a84ab064a791: Pull complete
7e0868500310: Pull complete
0677902ea21a: Pull complete
3486671fc4b0: Pull complete
43d12d3f292e: Pull complete
Digest: sha256:eb01c0bbb5fb1067b6a28c878d4a8a2c32d7cad46e52f7d47068ace37a24d8fa
Status: Downloaded newer image for hyperledger/fabric-ccenv:2.5.7
docker.io/hyperledger/fabric-ccenv:2.5.7
=====> docker.io/hyperledger/fabric-tools:2.5.7
Error response from daemon: Head "https://registry-1.docker.io/v2/hyperledger/fabric-tools/manifests/2.5.7": Get "https://auth.docker.io/token?scope=repository%3Ahyperledger%2Ffabric-tools%3Apull&service=registry.docker.io": net/http: request canceled (Client.Timeout exceeded while awaiting headers)
Error response from daemon: No such image: hyperledger/fabric-tools:2.5.7
Error response from daemon: No such image: hyperledger/fabric-tools:2.5.7
=====> docker.io/hyperledger/fabric-baseos:2.5.7
2.5.7: Pulling from hyperledger/fabric-baseos
17d038dc2fff: Already exists
933df0dd4d6d: Pull complete
2d4dcce64c4: Pull complete
8e3f26925c19: Pull complete
Digest: sha256:d7841906740f4edb38730866fb887c20e886e034a975ebc80f1b4db73c3a199
Status: Downloaded newer image for hyperledger/fabric-baseos:2.5.7
docker.io/hyperledger/fabric-baseos:2.5.7
====> Pulling fabric ca Image
=====> docker.io/hyperledger/Fabric-ca:1.5.10
1.5.10: Pulling from hyperledger/fabric-ca
```

```
/home/itlab/lab8a/fabric-samples/test-network/../bin/cryptogen
```

====> docker.io/hyperledger/fabric-ca:1.5.10				
1.5.10: Pulling from hyperledger/fabric-ca				
17d0386c2fff: Already exists				
e34750fbc60d: Pull complete				
694866b29955: Pull complete				
be49257713f2: Pull complete				
Digest: sha250:09a67ec71cfdb2861475d37cfcc822f00545dc6852a43a6326e608b5926da1b5				
Status: Downloaded newer image for hyperledger/fabric-ca:1.5.10				
====> List out hyperledger images				
hyperledger/fabric-peer	2.5	4b70009a7773	10 hours ago	141MB
hyperledger/fabric-peer	2.5.7	4b70009a7773	10 hours ago	141MB
hyperledger/fabric-peer	latest	4b70009a7773	10 hours ago	141MB
hyperledger/fabric-orderer	2.5	3209e74fbdbb	10 hours ago	110MB
hyperledger/fabric-orderer	2.5.7	3209e74fbdbb	10 hours ago	110MB
hyperledger/fabric-orderer	latest	3209e74fbdbb	10 hours ago	110MB
hyperledger/fabric-ccenv	2.5	682214ab2caa	10 hours ago	629MB
hyperledger/fabric-ccenv	2.5.7	682214ab2caa	10 hours ago	629MB
hyperledger/fabric-ccenv	latest	682214ab2caa	10 hours ago	629MB
hyperledger/fabric-baseos	2.5	f8ac867caa68	10 hours ago	128MB
hyperledger/fabric-baseos	2.5.7	f8ac867caa68	10 hours ago	128MB
hyperledger/fabric-baseos	latest	f8ac867caa68	10 hours ago	128MB
hyperledger/fabric-ca	1.5	da516cafd70e	10 hours ago	206MB
hyperledger/fabric-ca	1.5.10	da516cafd70e	10 hours ago	206MB
hyperledger/fabric-ca	1.5.10	da516cafd70e	10 hours ago	206MB
hyperledger/fabric-ca	latest	da516cafd70e	10 hours ago	206MB
hyperledger/fabric-tools	2.5	de9e326e137d	8 weeks ago	544MB
hyperledger/fabric-tools	2.5.6	de9e326e137d	8 weeks ago	544MB
hyperledger/fabric-peer	latest	de9e326e137d	8 weeks ago	544MB
hyperledger/fabric-orderer	2.5.6	af191f403625	8 weeks ago	140MB
hyperledger/fabric-ccenv	2.5.6	0ae165f25b4c	8 weeks ago	110MB
hyperledger/fabric-baseos	2.5.6	58b926fe2ef5	8 weeks ago	627MB
hyperledger/fabric-ca	2.5.6	6b2489cc7d4e	8 weeks ago	126MB
hyperledger/fabric-ca	1.5.9	760a0473a384	8 weeks ago	205MB

```
itlab@itlab-OptiPlex-3000:~/lab8a/fabric-samples/test-network$ ./network.sh down
Using docker and docker-compose
Stopping network
Traceback (most recent call last):
  File "/usr/lib/python3/dist-packages/urllib3/connectionpool.py", line 700, in urlopen
    httplib_response = self._make_request(
  File "/usr/lib/python3/dist-packages/urllib3/connectionpool.py", line 395, in _make_request
    conn.request(method, url, **httplib_request_kw)
  File "/usr/lib/python3.10/http/client.py", line 1283, in request
    self._send_request(method, url, body, headers, encode_chunked)
  File "/usr/lib/python3.10/http/client.py", line 1329, in _send_request
    self.endheaders(body, encode_chunked=encode_chunked)
  File "/usr/lib/python3.10/http/client.py", line 1278, in endheaders
```

```

PermissionError: [Errno 13] Permission denied

During handling of the above exception, another exception occurred:

Traceback (most recent call last):
  File "/usr/lib/python3/dist-packages/requests/adapters.py", line 439, in send
    resp = conn.urlopen(
  File "/usr/lib/python3/dist-packages/urllib3/connectionpool.py", line 756, in urlopen
    retries = retries.increment(
  File "/usr/lib/python3/dist-packages/urllib3/util/retry.py", line 532, in increment
    raise six.reraise(type(error), error, _stacktrace)
  File "/usr/lib/python3/dist-packages/six.py", line 718, in reraise
    raise value.with_traceback(tb)
  File "/usr/lib/python3/dist-packages/urllib3/connectionpool.py", line 700, in urlopen
    httplib_response = self._make_request(
  File "/usr/lib/python3/dist-packages/urllib3/connectionpool.py", line 395, in _make_request
    conn.request(method, url, **httpplib_request_kw)
  File "/usr/lib/python3.10/http/client.py", line 1283, in request
    self._send_request(method, url, body, headers, encode_chunked)
  File "/usr/lib/python3.10/http/client.py", line 1329, in _send_request
    self.endheaders(body, encode_chunked=encode_chunked)
  File "/usr/lib/python3.10/http/client.py", line 1278, in endheaders
    self._send_output(message_body, encode_chunked=encode_chunked)
  File "/usr/lib/python3.10/http/client.py", line 1038, in _send_output
    self.send(msg)
  File "/usr/lib/python3.10/http/client.py", line 976, in send
    self.connect()
  File "/usr/lib/python3/dist-packages/docker/transport/unixconn.py", line 30, in connect
    sock.connect(self.unix_socket)
urllib3.exceptions.ProtocolError: ('Connection aborted.', PermissionError(13, 'Permission denied'))

During handling of the above exception, another exception occurred:

Traceback (most recent call last):
  File "/usr/lib/python3/dist-packages/docker/api/client.py", line 214, in _retrieve_server_version
    return self.version(api_version=False)[“ApiVersion”]
  File "/usr/lib/python3/dist-packages/docker/api/daemon.py", line 181, in version
    return self._result(self._get(url), json=True)

```

```

File "/usr/lib/python3/dist-packages/docker/api/client.py", line 237, in _get
    return self.get(url, **self._set_request_timeout(kwargs))
File "/usr/lib/python3/dist-packages/requests/sessions.py", line 557, in get
    return self.request('GET', url, **kwargs)
File "/usr/lib/python3/dist-packages/requests/sessions.py", line 544, in request
    resp = self.send(prep, **send_kwargs)
File "/usr/lib/python3/dist-packages/requests/sessions.py", line 657, in send
    r = adapter.send(request, **kwargs)
File "/usr/lib/python3/dist-packages/requests/adapters.py", line 498, in send
    raise ConnectionError(err, request=request)
requests.exceptions.ConnectionError: ('Connection aborted.', PermissionError(13, 'Permission denied'))

During handling of the above exception, another exception occurred:

Traceback (most recent call last):
  File "/usr/bin/docker-compose", line 33, in <module>
    sys.exit(load_entry_point('docker-compose==1.29.2', 'console_scripts', 'docker-compose')())
  File "/usr/lib/python3/dist-packages/compose/cli/main.py", line 81, in main
    command_func()
  File "/usr/lib/python3/dist-packages/compose/cli/main.py", line 200, in perform_command
    project = project_from_options('.', options)
  File "/usr/lib/python3/dist-packages/compose/cli/command.py", line 60, in project_from_options
    return get_project()
  File "/usr/lib/python3/dist-packages/compose/cli/command.py", line 152, in get_project
    client = get_client()
  File "/usr/lib/python3/dist-packages/compose/cli/docker_client.py", line 41, in get_client
    client = docker_client(
  File "/usr/lib/python3/dist-packages/compose/cli/docker_client.py", line 170, in docker_client
    client = APIClient(use_ssh_client=not use_paramiko_ssh, **kwargs)
  File "/usr/lib/python3/dist-packages/docker/api/client.py", line 197, in __init__
    self._version = self._retrieve_server_version()
  File "/usr/lib/python3/dist-packages/docker/api/client.py", line 221, in _retrieve_server_version
    raise DockerException(
docker.errors.DockerException: Error while fetching server API version: ('Connection aborted.', PermissionError(13, 'Permission denied'))
permission dented while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Delete "http://%2Fvar%2Frun%2Fdocker.sock/v1.24/volumes/docker_orderer.example.com": dial unix /var/run/docker.sock: connect: permission dented
permission dented while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Delete "http://%2Fvar%2Frun%2Fdocker.sock/v1.24/volumes/docker_peer0.org1.example.com": dial unix /var/run/docker.sock: connect: permission dented

```

## References:

[1] [https://hyperledger-fabric.readthedocs.io/en/release-2.0/getting\\_started.html](https://hyperledger-fabric.readthedocs.io/en/release-2.0/getting_started.html)

## [2] Supply Chain- Tuna Shipment Application

<https://github.com/hyperledger/education.git>

### [3] How To Install Node.js on Ubuntu 20.04

[How To Install Node.js on Ubuntu 20.04 | DigitalOcean](#)

```
itlab@itlab-OptiPlex-3000:~/lab8a/fabric-samples/test-network$ sudo ./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'
LOCAL_VERSION=v2.5.7
DOCKER_IMAGE_VERSION=v2.5.7
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
CONTAINER ID        IMAGE               COMMAND             CREATED            STATUS              PORTS
 NAMES
7b9a7c11a6b0        hyperledger/fabric-peer:latest   "peer node start"   1 second ago      Up Less than a second   0.0.0.0:7051->7051/tcp, 0.0.0.0:
9444->9444/tcp
peer0.org1.example.com
e2d61f2ff228        hyperledger/fabric-orderer:latest  "orderer"          1 second ago      Up Less than a second   0.0.0.0:7050->7050/tcp, 0.0.0.0:
7053->7053/tcp, 0.0.0.0:9443->9443/tcp
orderer.example.com
5f267bcc7c00        hyperledger/fabric-peer:latest   "peer node start"   1 second ago      Up Less than a second   0.0.0.0:9051->9051/tcp, 7051/tcp
, 0.0.0.0:9445->9445/tcp
peer0.org2.example.com
```

```

++ configtxlator proto_encode --input config_update_in_envelope.json --type common.Envelope --output Org1MSPanchors.tx
2024-04-16 09:31:29.802 IST 0001 INFO [channelCmd] InitCmdFactory -> Endorser and orderer connections initialized
2024-04-16 09:31:29.810 IST 0002 INFO [channelCmd] update -> Successfully submitted channel update
Anchor peer set for org 'Org1MSP' on channel 'mychannel'
Setting anchor peer for org2...
Using organization 2
Fetching channel config for channel mychannel
Using organization 2
Fetching the most recent configuration block for the channel
++ peer channel fetch config config_block.pb -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com -c mychannel --tls --cafile /home/kevin/lab8a/fabric-samples/test-network/organizations/ordererOrganizations/example.com/tlsca/tlsca.example.com-cert.pem
2024-04-16 09:31:29.852 IST 0001 INFO [channelCmd] InitCmdFactory -> Endorser and orderer connections initialized
2024-04-16 09:31:29.854 IST 0002 INFO [cli.common] readBlock -> Received block: 1
2024-04-16 09:31:29.854 IST 0003 INFO [channelCmd] fetch -> Retrieving last config block: 1
2024-04-16 09:31:29.854 IST 0004 INFO [cli.common] readBlock -> Received block: 1
Decoding config block to JSON and isolating config to Org2MSPconfig.json
++ configtxlator proto_decode --input config_block.pb --type common.Block --output config_block.json
++ jq '.data.data[0].payload.data.config' config_block.json
Generating anchor peer update transaction for org2 on channel mychannel
++ jq '.channel_group.groups.Application.groups.Org2MSP.values += {"AnchorPeers":{"mod_policy": "Admins","value":{"anchor_peers": [{"host": "peer0.org2.example.com","port": 9051}]}}, "version": "0"}' Org2MSPconfig.json
++ configtxlator proto_encode --input Org2MSPconfig.json --type common.Config --output original_config.pb
++ configtxlator proto_encode --input Org2MSPmodified_config.json --type common.Config --output modified_config.pb
++ configtxlator compute_update --channel_id mychannel --original original_config.pb --updated modified_config.pb --output config_update.pb
++ configtxlator proto_decode --input config_update.pb --type common.ConfigUpdate --output config_update.json
++ jq .
+++ cat config_update.json
++ echo '{"payload":{"header":{"channel_header":{"channel_id":"mychannel", "type":2}},"data":{"config_update":[{"channel_id": "mychannel", "isolated_data": {}, "read_set": {"groups": [{"Application": {"groups": {"Org2MSP": {"groups": {}, "mod_policy": "", "policies": [{"Admins": {"mod_policy": "", "policy": null, "version": "0"}, "Endorsement": {"mod_policy": "", "policy": null, "version": "0"}, "Readers": {"mod_policy": "", "policy": null, "version": "0"}, "Values": {"MSP": {"mod_policy": "", "value": null, "version": "0"}, "mod_policy": "", "policies": {}, "values": {}}, "version": "0"}, "mod_policy": "", "policies": {}, "values": {}}, "version": "0"}, "mod_policy": "", "policies": {}, "values": {}}, "version": "0"}, "write_set": {"groups": [{"Application": {"groups": {"Org2MSP": {"groups": {}, "mod_policy": "Admins", "policies": {"Admins": {"mod_policy": "", "policy": null, "version": "0"}, "Readers": {"mod_policy": "", "policy": null, "version": "0"}, "Values": {"MSP": {"mod_policy": "", "value": null, "version": "0"}, "mod_policy": "", "policies": {"Admins": {"mod_policy": "", "value": [{"host": "peer0.org2.example.com", "port": 9051}]}}, "version": "0"}, "mod_policy": "", "policies": {}, "values": {}}, "version": "0"}, "mod_policy": "", "policies": {}, "values": {}}, "version": "0"}]}]}]}}

```

```

itlab@itlab-OptiPlex-3000:~/lab8a/fabric-samples/test-network$ sudo ./network.sh deployCC -ccn basic -ccp ..//asset-transfer-basic/chaincode-go -ccl go
go: downloading github.com/pmezard/go-difflib v1.0.0
go: downloading gopkg.in/yaml.v3 v3.0.1
go: downloading gopkg.in/gobuffalo/envy v1.10.1
go: downloading gopkg.in/gobuffalo/packd v1.0.1
go: downloading gopkg.in/xelpuvv/gojsomreference v0.0.0-20180127040603-bd5ef7bd5415
go: downloading gopkg.in/go-openapi/jsonpointer v0.20.0
go: downloading gopkg.in/go-openapi/jsonpointer v0.19.5
go: downloading gopkg.in/xelpuvv/gojsompointer v0.0.0-20190905194746-82993c407fbf
go: downloading gopkg.in/roppepe/go-internal v1.8.1
go: downloading gopkg.in/joho/godotenv v1.4.0
go: downloading gopkg.in/yaml.v2 v2.4.0
go: downloading gopkg.in/mailru/easyjson v0.7.7
go: downloading gopkg.in/josharian/intern v1.0.0
go: downloading google.golang.org/genproto v0.0.0-20230110181048-76db0878b65f
go: downloading golang.org/x/net v0.7.0
go: downloading golang.org/x/sys v0.5.0
go: downloading golang.org/x/text v0.7.0
/home/kevin/lab8a/fabric-samples/test-network
Finished vendoring Go dependencies
+ '[' false = true ']'
+ peer lifecycle chaincode package basic.tar.gz --path ..//asset-transfer-basic/chaincode-go --lang golang --label basic_1.0.1
+ res=0
Chaincode is packaged
Installing chaincode on peer0.org1...
Using organization 1
+ peer lifecycle chaincode queryinstalled --output json
+ jq -r 'try (.installed_chaincodes[],.package_id)'
+ grep '^basic_1.0.1:650b7b4f5a8545d710651dc01edee8cf83518ef4b36a67a08be061ba14da653a$'
+ test 1 -ne 0
+ peer lifecycle chaincode install basic.tar.gz
+ res=0
2024-04-16 09:32:29.180 IST 0001 INFO [cli.lifecycle.chaincode] submitInstallProposal -> Installed remotely: response:<status:200 payload:"\nbasic_1.0.1:650b7b4f5a8545d710651dc01edee8cf83518ef4b36a67a08be061ba14da653a|022|013basic_1.0.1">
2024-04-16 09:32:29.180 IST 0002 INFO [cli.lifecycle.chaincode] submitInstallProposal -> Chaincode code package identifier: basic_1.0.1:650b7b4f5a8545d710651dc01edee8cf83518ef4b36a67a08be061ba14da653a
Chaincode is installed on peer0.org1

```

```

peer lifecycle chaincode approveformyorg -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com --tls --cafile /home/kevin/lab8a/fabric-samples/test-network/organizations/ordererOrganizations/example.com/tlsca/tlsca.example.com-cert.pem --channelID mychannel --name basic --version 1.0.1 --package-id basic_1.0.1:650b7b4f5a8545d710651dc01edee8cf83518ef4b36a67a08be61ba14d4653a --sequence 1
res=0
024-04-16 09:32:50.686 IST 0001 INFO [chaincodeCmd] ClientWait -> txid [489c6e2c9caa9755dbe6342ec27c36aa818291b2abda78a3984dd0eb9443807] committed with status (VALID) at localhost:9051
chaincode definition approved on peer0.org2 on channel 'mychannel'
sing organization 1
hecking the commit readiness of the chaincode definition on peer0.org1 on channel 'mychannel'...
ttempting to check the commit readiness of the chaincode definition on peer0.org1, Retry after 3 seconds.
peer lifecycle chaincode checkcommitreadiness --channelID mychannel --name basic --version 1.0.1 --sequence 1 --output json
res=0

"approvals": [
    "Org1MSP": true,
    "Org2MSP": true
}

hecking the commit readiness of the chaincode definition successful on peer0.org1 on channel 'mychannel'
sing organization 2
hecking the commit readiness of the chaincode definition on peer0.org2 on channel 'mychannel'...
ttempting to check the commit readiness of the chaincode definition on peer0.org2, Retry after 3 seconds.
peer lifecycle chaincode checkcommitreadiness --channelID mychannel --name basic --version 1.0.1 --sequence 1 --output json
res=0

"approvals": [
    "Org1MSP": true,
    "Org2MSP": true
}

hecking the commit readiness of the chaincode definition successful on peer0.org2 on channel 'mychannel'
sing organization 1
sing organization 2

```

```

itlab@itlab-OptiPlex-3000:~/lab8a/fabric-samples/test-network$ peer chaincode invoke -o localhost:7050 --ordererTLSHostnameOverride orderer.example.com --tls --cafile
Error: flag needs an argument: --cafile
Usage:
  peer chaincode invoke [flags]

Flags:
  -C, --channelID string            The channel on which this command should be executed
  --connectionProfile string        Connection profile that provides the necessary connection information for the network. Note: currently
only supported for providing peer connection information
  -c, --ctor string                Constructor message for the chaincode in JSON format (default "{}")
  -h, --help                        help for invoke
  -I, --isInit                      Is this invocation for init (useful for supporting legacy chaincodes in the new lifecycle)
  -n, --name string                 Name of the chaincode
  --peerAddresses stringArray       The addresses of the peers to connect to
  --tlsRootCertFiles stringArray    If TLS is enabled, the paths to the TLS root cert files of the peers to connect to. The order and number
of certs specified should match the --peerAddresses flag
  --waitForEvent                   Whether to wait for the event from each peer's deliver filtered service signifying that the 'invoke' transaction
has been committed successfully
  --waitForEventTimeout duration   Time to wait for the event from each peer's deliver filtered service signifying that the 'invoke' transaction
has been committed successfully (default 30s)

Global Flags:
  --cafile string                  Path to file containing PEM-encoded trusted certificate(s) for the ordering endpoint
  --certfile string                Path to file containing PEM-encoded X509 public key to use for mutual TLS communication with the orderer endpoint
  --clientauth                     Use mutual TLS when communicating with the orderer endpoint
  --connTimeout duration           Timeout for client to connect (default 3s)
  --keyfile string                 Path to file containing PEM-encoded private key to use for mutual TLS communication with the orderer endpoint
  -o, --orderer string             Ordering service endpoint
  --ordererTLSHostnameOverride string The hostname override to use when validating the TLS connection to the orderer
  --tls                           Use TLS when communicating with the orderer endpoint
  --tlsHandshakeTimeShift duration The amount of time to shift backwards for certificate expiration checks during TLS handshakes with the orderer endpoint

```

## Conclusion:

Therefore, our conclusion was that the experiment provided valuable hands-on experience in deploying Hyperledger Fabric using Docker and Docker-compose. This encompassed understanding its modular architecture and the utilization of containers for smart contract hosting. We also gained insights into permissioned networks, identity management for user authentication, privacy features like private channels, and the critical role of chaincode in enforcing transaction rules. Practical tasks such as registering identities, initializing the network, and building applications with Node.js contributed significantly to comprehending blockchain's potential applications in Supply Chain Management and enterprise solutions.

**References:**

1. Hyperledger Fabric. (n.d.). Getting Started with Hyperledger Fabric. Retrieved from [https://hyperledger-fabric.readthedocs.io/en/release-2.0/getting\\_started.html](https://hyperledger-fabric.readthedocs.io/en/release-2.0/getting_started.html)
2. Hyperledger. (n.d.). Tuna Shipment Application - Hyperledger Education. Retrieved from <https://github.com/hyperledger/education.git>
3. DigitalOcean. (n.d.). How To Install Node.js on Ubuntu 20.04. Retrieved from <https://www.digitalocean.com/community/tutorials/how-to-install-node-js-on-ubuntu-20-04>