Running Smart Contracts and DApps featuring HyperLedger Fabric

TECHNOLOGY ENABLED LEARNING SOLUTIONS ®

Module Objectives:

- Hyperledger Fabric product architecture, including the EVM/Solidity components.
- Deconstructing a Distributed Application (DApp).
- Announcement of the Fabric-EVM-Lab
- Why use the EVM for HyperLedger Fabric applications
- EVM for HyperLedger Fabric applications
- Distributed Application (DApp) demonstration
- Next Steps.

EVM Hyperledger Fabric

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- Access Code: **MS-dApp-HLF**

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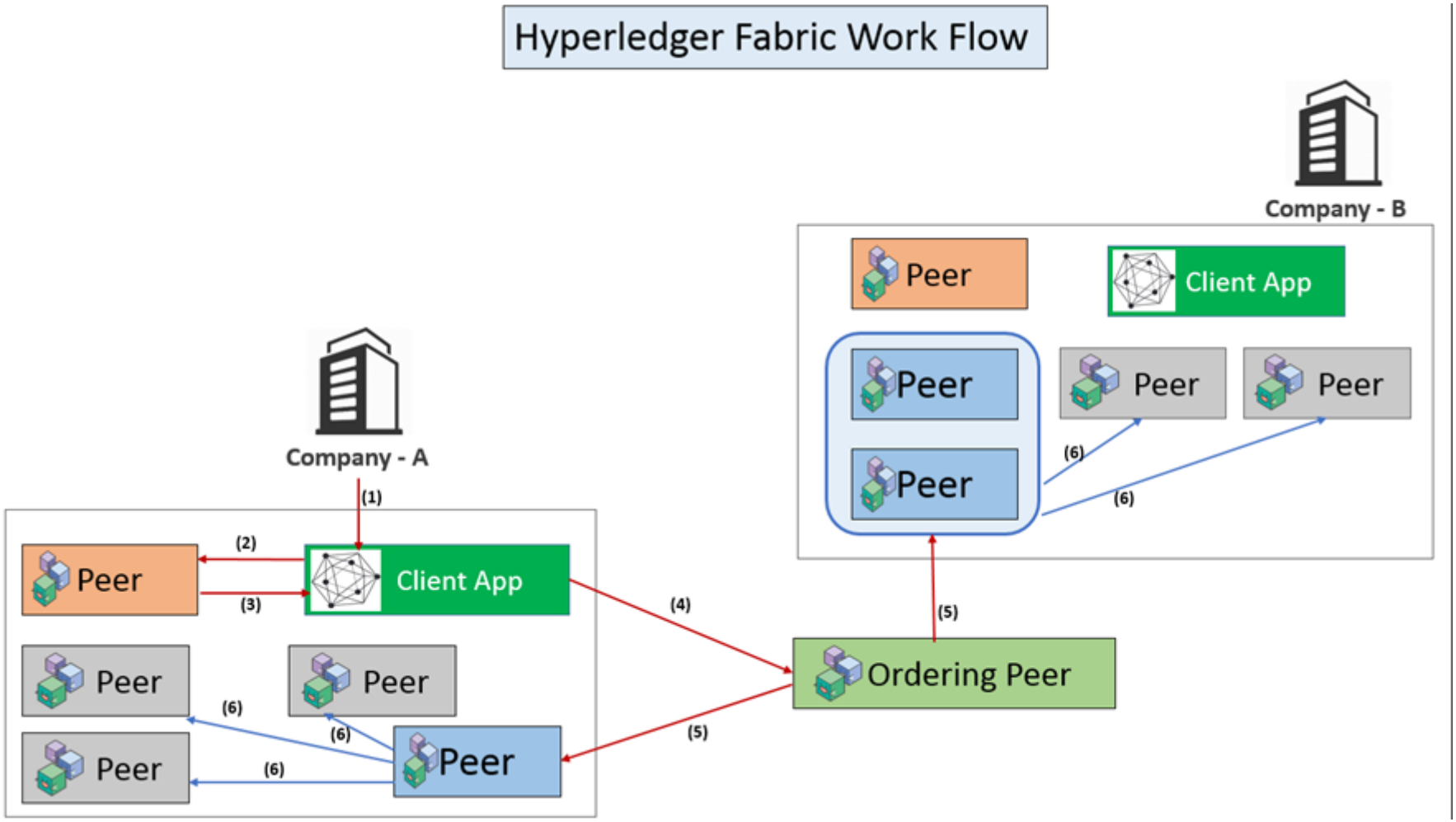
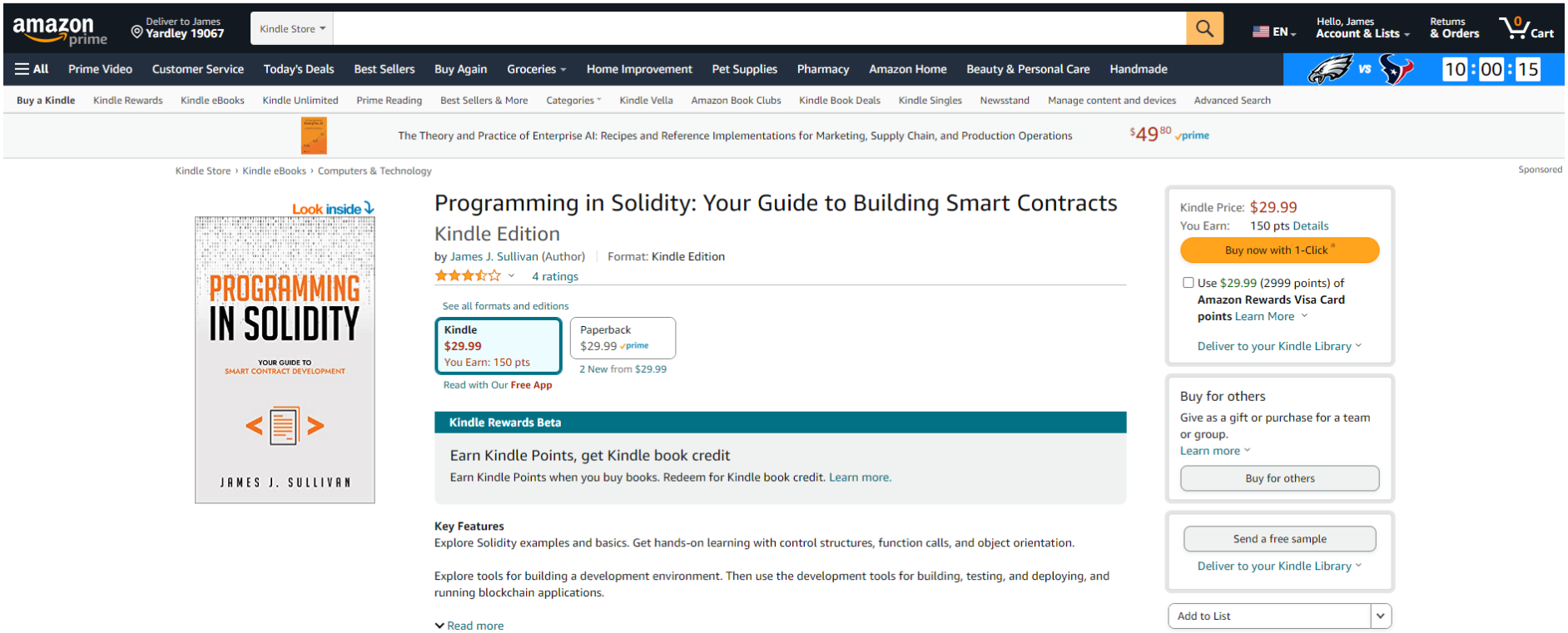
or
https://qrco.de/be3Do4

Hyperledger Fabric Architecture



EVM Hyperledger Fabric Architecture

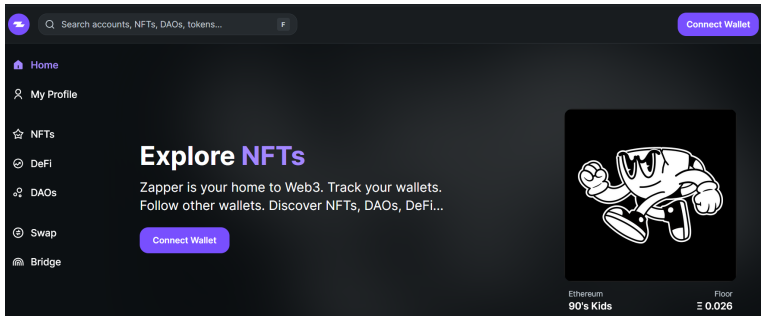
- Developer Solidity Smart Contracts Book

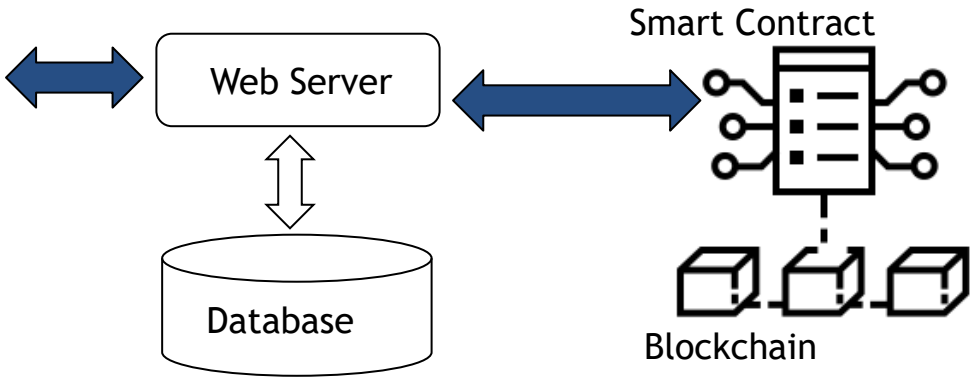


EVM Hyperledger Fabric Architecture

Distributed Applications

- A DApp has its backend code running on a decentralized peer-to-peer network. Contrast this with an **app** (central application) where the backend code is running on centralized servers.
- Identical to an app, a DApp can have web or mobile user interfaces written in many supported languages to make calls to its backend.
- In most cases a Smart Contract is part of a DApp's backend. Furthermore, attachment data can be stored in distributed repositories such as IPFS.

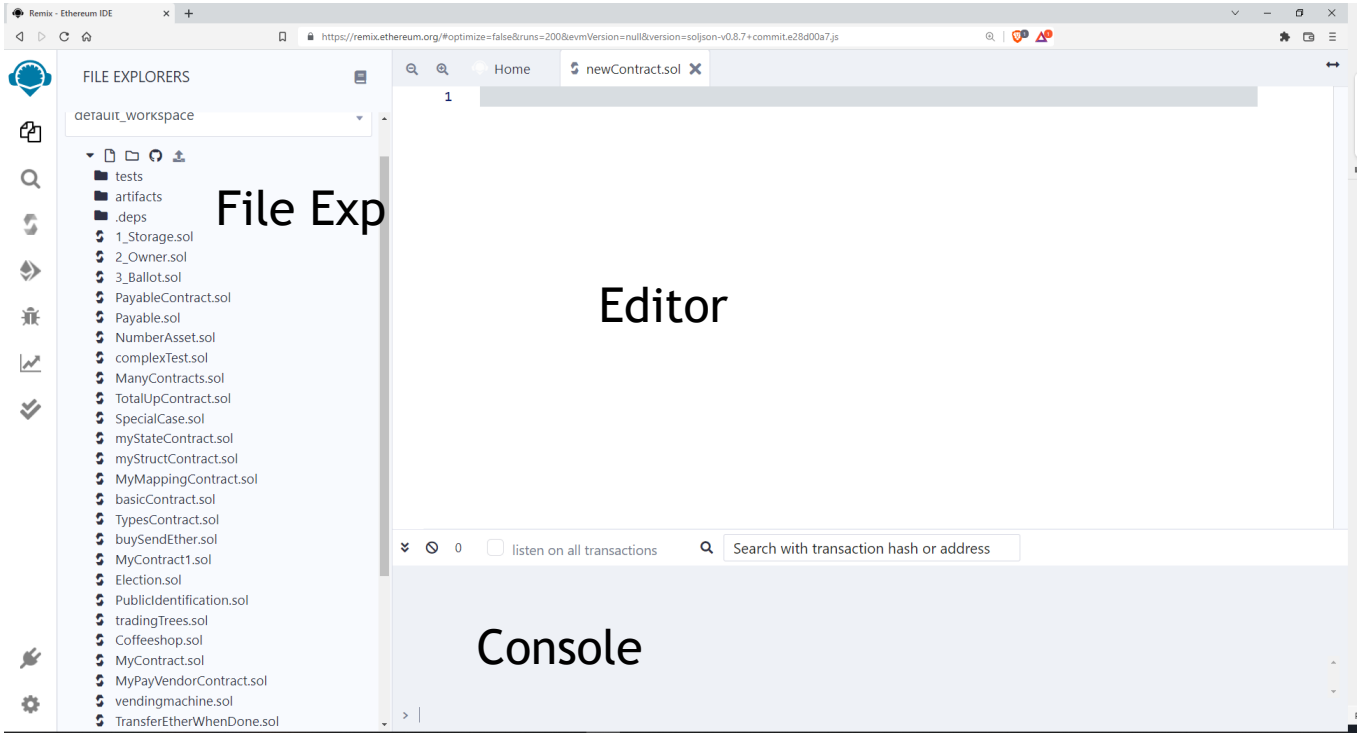




EVM Hyperledger Fabric

- Deconstruct a Distributed Application.

- Remix Development Environment: https://remix.ethereum.org
- Brower Based IDE
- Editor
- Console
- Module Selector



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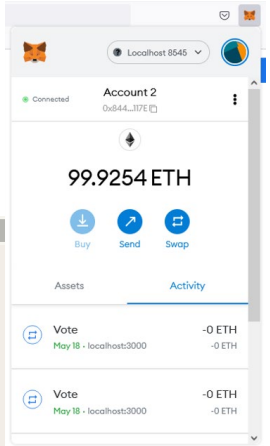
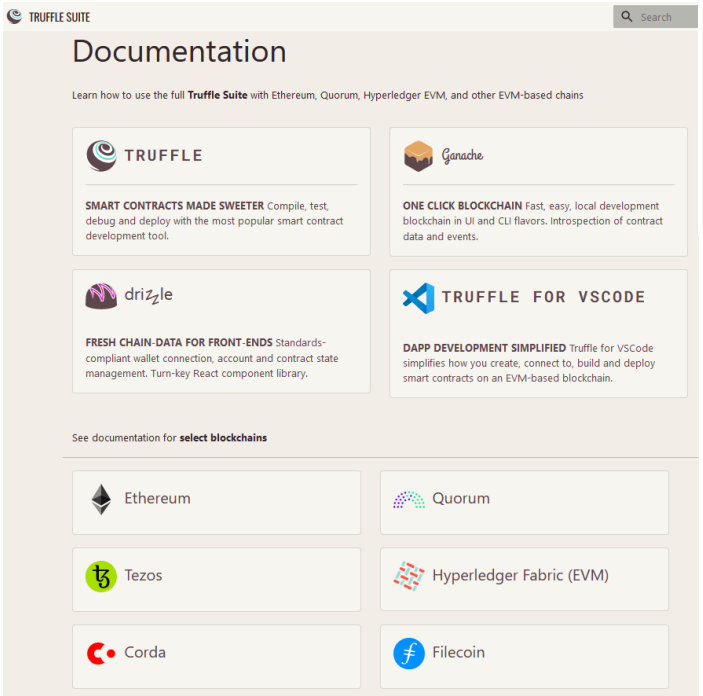
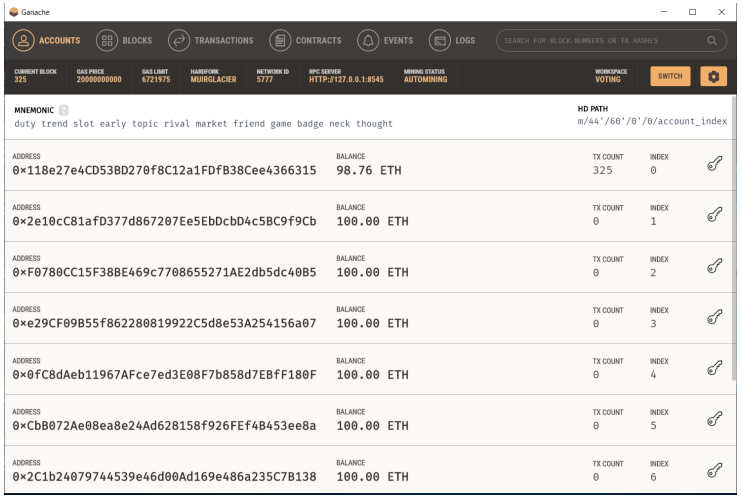






EVM Hyperledger Fabric

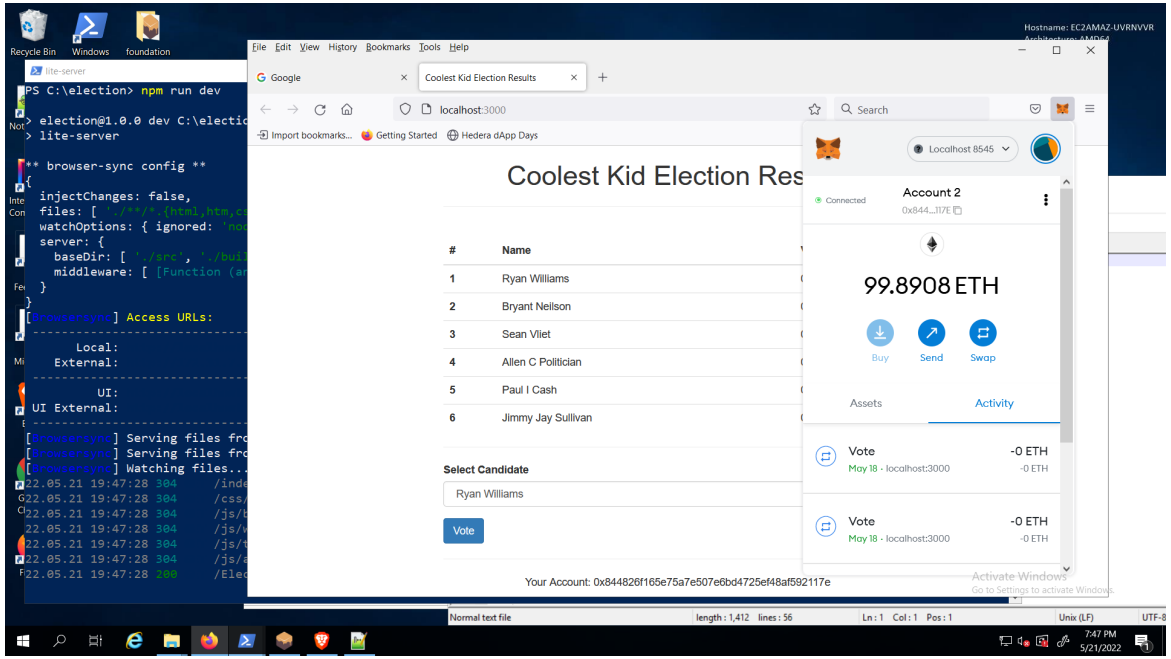
- Deconstruct a Distributed Application.

```
App = {
  web3Provider: null,
  contracts: {},
  account: '0x0',
  hasVoted: false,

  init: function() {
    return App.initWeb3();
  },

  initWeb3: function() {
    // TODO: refactor conditional
    if (typeof web3 !== 'undefined') {
      // If a web3 instance is already provided by Meta Mask.
      App.web3Provider = web3.currentProvider;
      web3 = new Web3(web3.currentProvider);
    } else {
      // Specify default instance if no web3 instance provided
      App.web3Provider = new Web3.providers.HttpProvider('http://localhost:8545');
      web3 = new Web3(App.web3Provider);
    }
    return App.initContract();
  },

  initContract: function() {
    $.getJSON("Election.json", function(election) {
      // Instantiate a new truffle contract from the artifact
      App.contracts.Election = TruffleContract(election);
      // Connect provider to interact with contract
      App.contracts.Election.setProvider(App.web3Provider);

      App.listenForEvents();

      return App.render();
    });
  },

  // Listen for events emitted from the contract
  listenForEvents: function() {
    App.contracts.Election.deployed().then(function(instance) {
      // Restart Chrome if you are unable to receive this event
      // This is a known issue with Metamask
      // https://github.com/MetaMask/metamask-extension/issues/2393
      instance.votedEvent({}, {
        fromBlock: 0,
        toBlock: 'latest'
      }).watch(function(error, event) {
        console.log("event triggered", event)
        // Reload when a new vote is recorded
        App.render();
      });
```

EVM Hyperledger Fabric Architecture

- Deconstruct a Distributed Application.

- DApp Developer Environments
- The Ethereum Community provides rich tools for user application development.
- The DApp is running as a Blockchain Web Application.
- Tool Examples:
  - Truffle
  - Metamask
  - Web3.js



- https://github.com/theblockchainacademy/electiondapp

EVM on Hyperledger Fabric

https://github.com/theblockchainacademy/electiondapp

Announcement !

- The on360.io team, powered by the Blockchain Academy, is the new maintainers of the Fabric EVM Lab (Fabric-EVM-Library)
- We look forward to working with the Fabric EVM Lab community.

on360

THE BLOCKCHAIN ACADEMY

Hey it's the Fabric EVM Lab !

EVM Hyperledger Fabric Architecture

- Why use the Ethereum Virtual Machine (EVM) on Hyperledger Fabric
- Reuse, Commonality, Community, Resources, more …

SIMBA

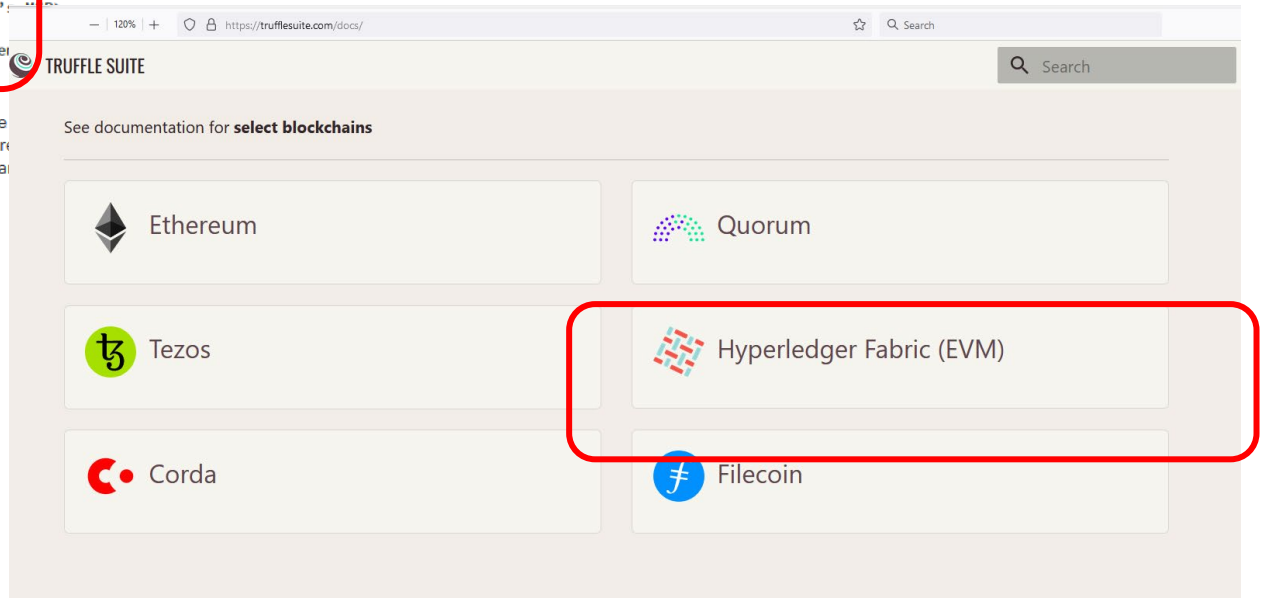
CONFIGURE THE CORE PEER

Next, we need to configure the peer CLI to operate on the core peer for your organization. To do this, select a peer that you want to act as the core peer (this is an arbitrary selection), then define the following environment variables:

(NOTE: This is just an example!! You'll need to set your peer accordingly.)

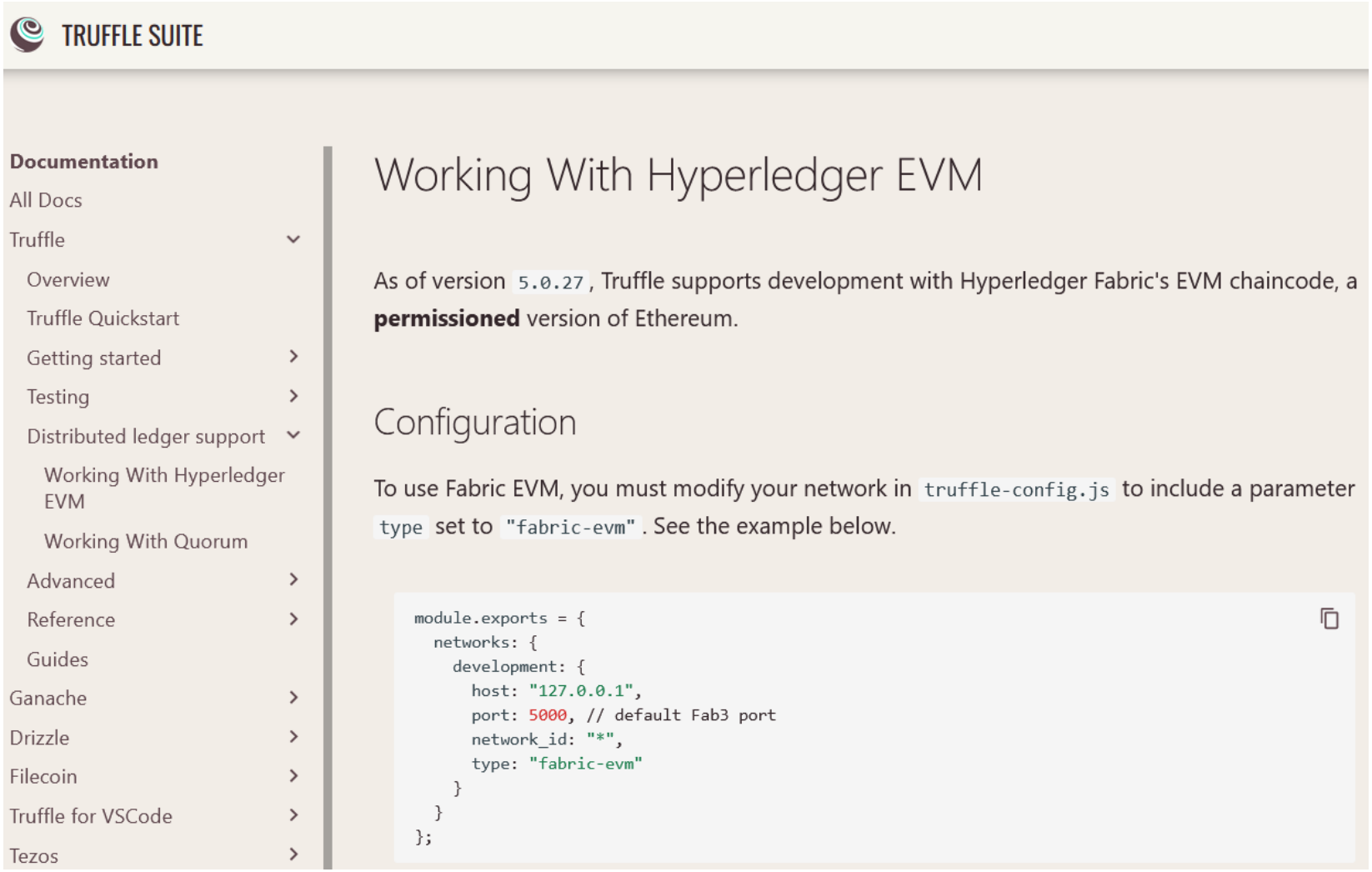
```bash
export FABRIC_CFG_PATH=<path to directory containing the core.yaml configuration>
export CORE_PEER_TLS_ENABLED=<true | false>
export CORE_PEER_LOCALMSPID=<your org's MSP ID>
export CORE_PEER_TLS_ROOTCERT_FILE=<path to core peer's TLS CA cert>
export CORE_PEER_MSPCONFIGPATH=<path to core peer admin user's
export CORE_PEER_ADDRESS=<peer address>
export ORDERER_CA=<path to orderer's /msp/tlscacerts/tlsca.pe
```

(HINT: If you are using the sample-network, then you will need to create
organizations will have its own core peer. My suggestion would be to cr
switch between environments. This way you can run the peer cli comma
again to target the other peer.)



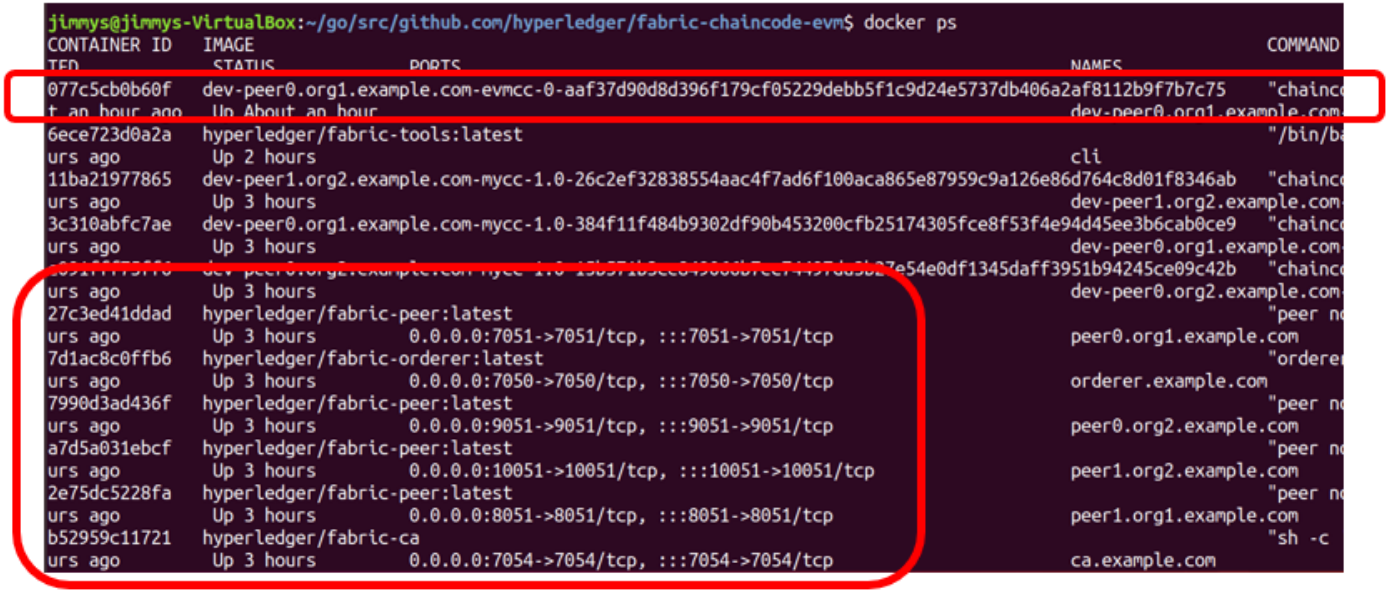
EVM Hyperledger Fabric Architecture

- Truffle Configuration for Hyperledger Fabric.



EVM Hyperledger Fabric Architecture

- Installing the Ethereum Virtual Machine (EVM)
- Part I: Deploy the EVM Smart Contract to Hyperledger Fabric
- Part II: Use NodeJS and Web3 and run the Smart Contract with Node and Web3.



EVM Hyperledger Fabric Architecture

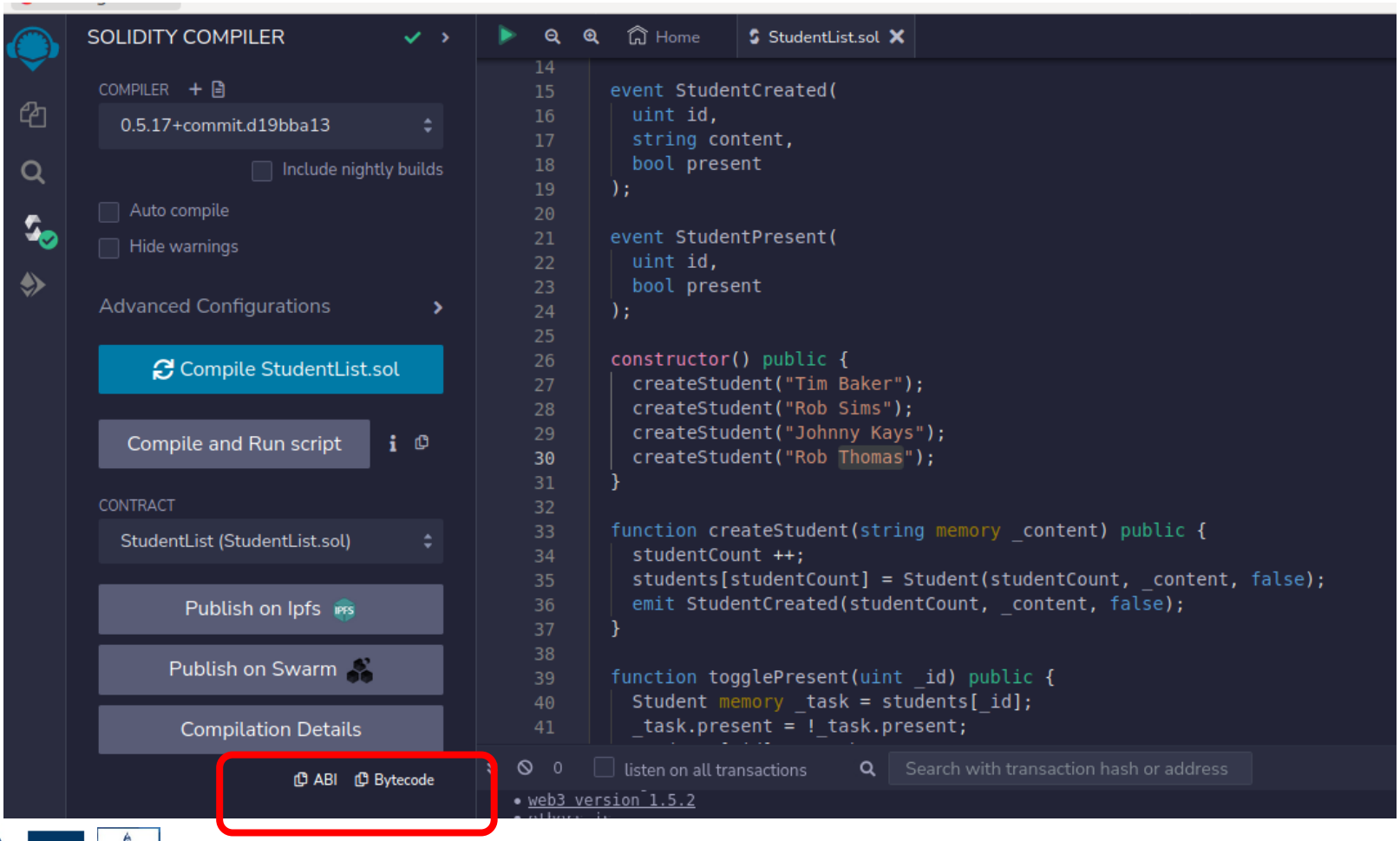
- Installing the Ethereum Virtual Machine (EVM)

- Part II: Deploy the EVM Smart Contract to Hyperledger Fabric

```
File  Edit  View  Search  Terminal  Help
root@d626eb9602f5:/opt/gopath/src/github.com/hyperledger/fabric/peer# peer chaincode instantiate -n evmcc -v 0 -C mychannel -c '{"Args":[]}' -o o
rderer.example.com:7050 --tls --cafile /opt/gopath/src/github.com/hyperledger/fabric/peer/crypto/ordererOrganizations/example.com/orderers/ordere
r.example.com/msp/tlscacerts/tlsca.example.com-cert.pem
2022-10-28 13:03:56.124 UTC [chaincodeCmd] checkChaincodeCmdParams -> INFO 001 Using default escc
2022-10-28 13:03:56.124 UTC [chaincodeCmd] checkChaincodeCmdParams -> INFO 002 Using default vscc
root@d626eb9602f5:/opt/gopath/src/github.com/hyperledger/fabric/peer#
```

EVM Hyperledger Fabric Architecture

- Remix for Hyperledger Fabric.
- Remix can connect to Hyperledger Fabric



EVM Hyperledger Fabric Architecture

- Installing the Ethereum Virtual Machine (EVM)

- Part III: Install NodeJS and Web3 and run the Smart Contract with Node and Web3.
- A look at EVM other Tools supported for Hyperledger.

```
File  Edit  View  Search  Terminal  Help
root@d626eb9602f5:/opt/gopath/src/github.com/hyperledger/fabric/peer# peer chaincode invoke -n evmcc -C mychannel -c '{"Args":["5a6a377ed8d4aa527
1f3cba63149497c375f666f","60fe47b1000000000000000000000000000000000000000000000000000000000000000a"]}' -o orderer.example.com:7050 --tls --cafile
 /opt/gopath/src/github.com/hyperledger/fabric/peer/crypto/ordererOrganizations/example.com/orderers/orderer.example.com/msp/tlscacerts/tlsca.exa
mple.com-cert.pem
2022-10-28 13:31:40.393 UTC [chaincodeCmd] chaincodeInvokeOrQuery -> INFO 001 Chaincode invoke successful. result: status:200
root@d626eb9602f5:/opt/gopath/src/github.com/hyperledger/fabric/peer#
```

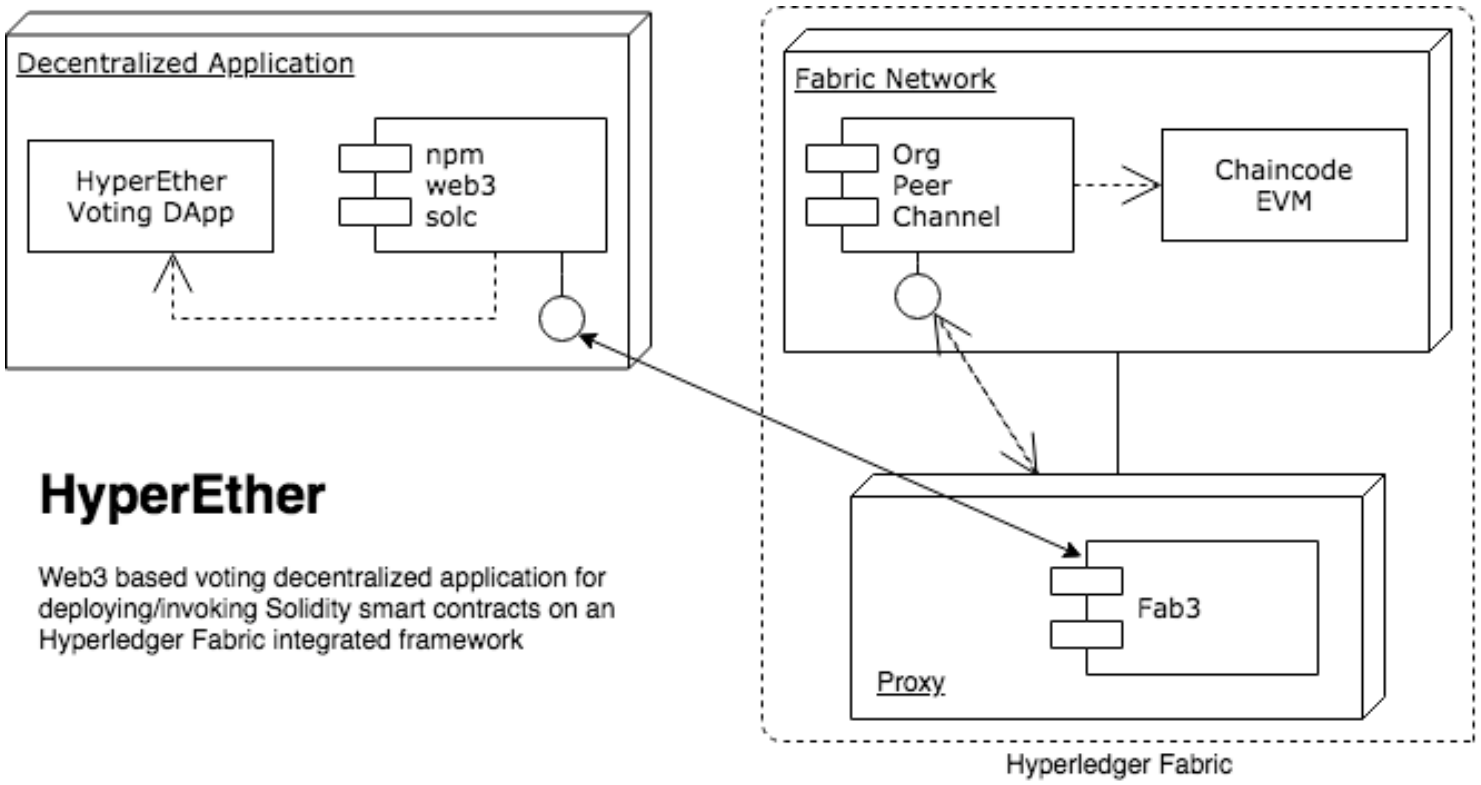
```
File  Edit  View  Search  Terminal  Help
root@d626eb9602f5:/opt/gopath/src/github.com/hyperledger/fabric/peer# peer chaincode query -n evmcc -C mychannel -c '{"Args":["5a6a377ed8d4aa5271
f3cba63149497c375f666f","6d4ce63c"]}' --hex
000000000000000000000000000000000000000000000000000000000000000a
root@d626eb9602f5:/opt/gopath/src/github.com/hyperledger/fabric/peer#
```

```
File  Edit  View  Search  Terminal  Help
> myContract.set(10)
```

```
File  Edit  View  Search  Terminal  Help
> myContract.get()
BigNumber { s: 1, e: 1, c: [ 10 ] }
> myContract.get().toNumber()
10
>
```

EVM Hyperledger Fabric Architecture

- DApp



Fabric-EVM-Library

EVM Hyperledger Fabric

- Next Steps

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- Thank You, for your time.
- Thanks to the Linux Foundation

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