HYPERLEDGER

BLOCKCHAIN TECHNOLOGIES FOR BUSINESS

Hyperledger Korea User Group

https://www.virtualbox.org/wiki/Downloads

https://github.com/robertchoi/Hyperledger20/tree/master/190921_%EB%A7%88%ED%8F%AC%EC%84%B8%EB%AF%B8%EB%82%98

HashiCorp

Vagrant

Development Environments Made Easy

GET STARTED | DOWNLOAD 2.2.5 | FIND BOXES

https://www.vagrantup.com/

D:₩box>vagrant box add --provider virtualbox bento/ubuntu-18.04

```
==> box: Loading metadata for box 'bento/ubuntu-18.04'
    box: URL: https://vagrantcloud.com/bento/ubuntu-18.04
==> box: Adding box 'bento/ubuntu-18.04' (v201906.18.0) for provider: virtualbox
    box: Downloading: https://vagrantcloud.com/bento/boxes/ubuntu-
18.04/versions/201906.18.0/providers/virtualbox.box
    box: Download redirected to host: vagrantcloud-files-production.s3.amazonaws.com
    box: Progress: 4% (Rate: 445k/s, Estimated time remaining: 0:15:15))
```

D:₩box>vagrant box list

```
bento/ubuntu-18.04 (virtualbox, 201906.18.0)
```

https://raw.githubusercontent.com/hlkug/meetup/master/000000/vagrant/hyperledger_fabric/1.4.x/Vagrantfile

D:₩box₩hf14>vagrant up

D:₩box₩hf14>vagrant status
Current machine states:

node1-1 running (virtualbox)

The VM is running. To stop this VM, you can run `vagrant halt` to
shut it down forcefully, or you can run `vagrant suspend` to simply
suspend the virtual machine. In either case, to restart it again,
simply run `vagrant up`.

D:₩box₩hf14>vagrant ssh node1-1
Welcome to Ubuntu 18.04.2 LTS (GNU/Linux 4.15.0-51-generic x86_64)

```
vagrant@node1-1:~$ ls
fabric-samples
vagrant@node1-1:~$ exit
logout
Connection to 127.0.0.1 closed.
```

D:₩box₩hf14>vagrant halt node1-1

D:₩box₩hf14>vagrant up node1-1

D:₩box₩hf14>vagrant destroy node1-1

https://raw.githubusercontent.com/hlkug/meetup/master/000000/vagrant/hyperledger_fabric/2.0.x/Vagrantfile

D:₩box₩hf20>vagrant up

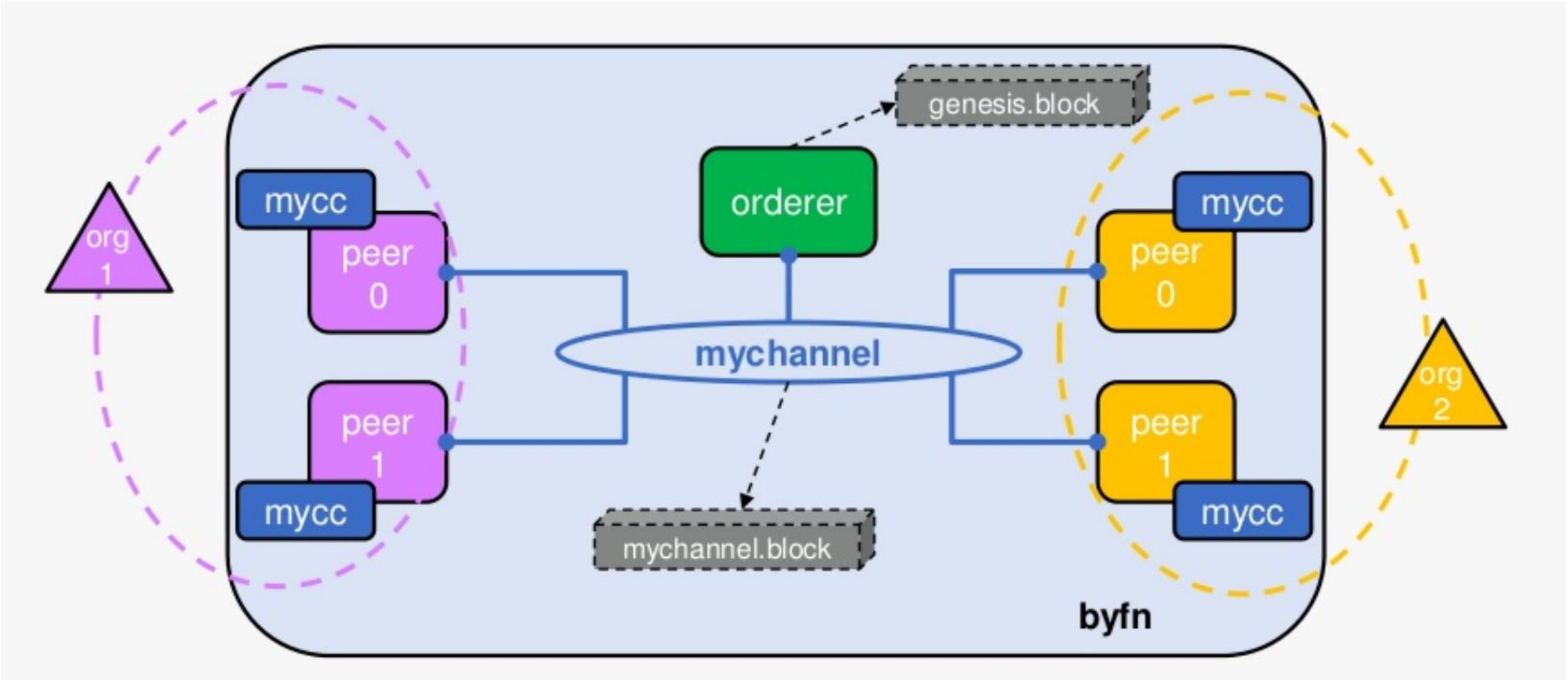
D:₩box₩hf20>vagrant status
Current machine states:

node1-1 running (virtualbox)

The VM is running. To stop this VM, you can run `vagrant halt` to
shut it down forcefully, or you can run `vagrant suspend` to simply
suspend the virtual machine. In either case, to restart it again,
simply run `vagrant up`.

D:₩box₩hf20>vagrant ssh node2-1
Welcome to Ubuntu 18.04.2 LTS (GNU/Linux 4.15.0-51-generic x86_64)

./byfn.sh generate



./byfn.sh down

Public vs Private

	퍼블릭 블록체인	컨소시엄(프라이빗) 블록체인
관리 주체	모든 거래 참여자	컨소시엄에 속한 참여자
데이터 접근	누구나 접근 가능	허가 받은 사용자만 접근 가능
합의 알고리즘	PoW, PoS 등	PBFT 등
보상/수수료	O	X
구현 사례	Bitcoin, Ethereum	Hyperledger Fabric, R3 Corda

Hyperledger Fabric의 특징

- **Linux Foundation**에 의해 설립된 오픈 소스 프로젝트
- 초기 **IBM**이 제공한 코드를 기반으로 현재 **30**여 조직에서 개발 참여 중
- 모듈화 및 구성이 가능한 아키텍처
- 범용 프로그래밍 언어로 작성된 **Smart Contract(Chaincode)**를 지원하는 최초의 분산 원장 플랫폼
  - Java, Go, Node.js
- 허가형 블록체인**(Permissioned Blockchain)**
- 플러그 가능 컨센서스 프로토콜을 지원
- 암호 화폐 불필요
- 개인 정보 보호 및 기밀성 유지

Hyperledger Fabric 구성 요소

- 채널(Channel)
- 조직(Organization)
- 피어(Peer)
- 오더러(Orderer)
- 원장(Ledger)
- 체인코드(Chaincode)

FabToken

- Hyperledger Fabric v2.0

- Token Management System
- Unspent Transaction Output (UTXO) 모델

- 합의, 검증을 위해 Orderer, Peer 사용
- 토큰 생성, 관리를 위해 체인코드를 사용하지 않음.(Endorsement Policy X)
- s송/수신자 식별 – MSP

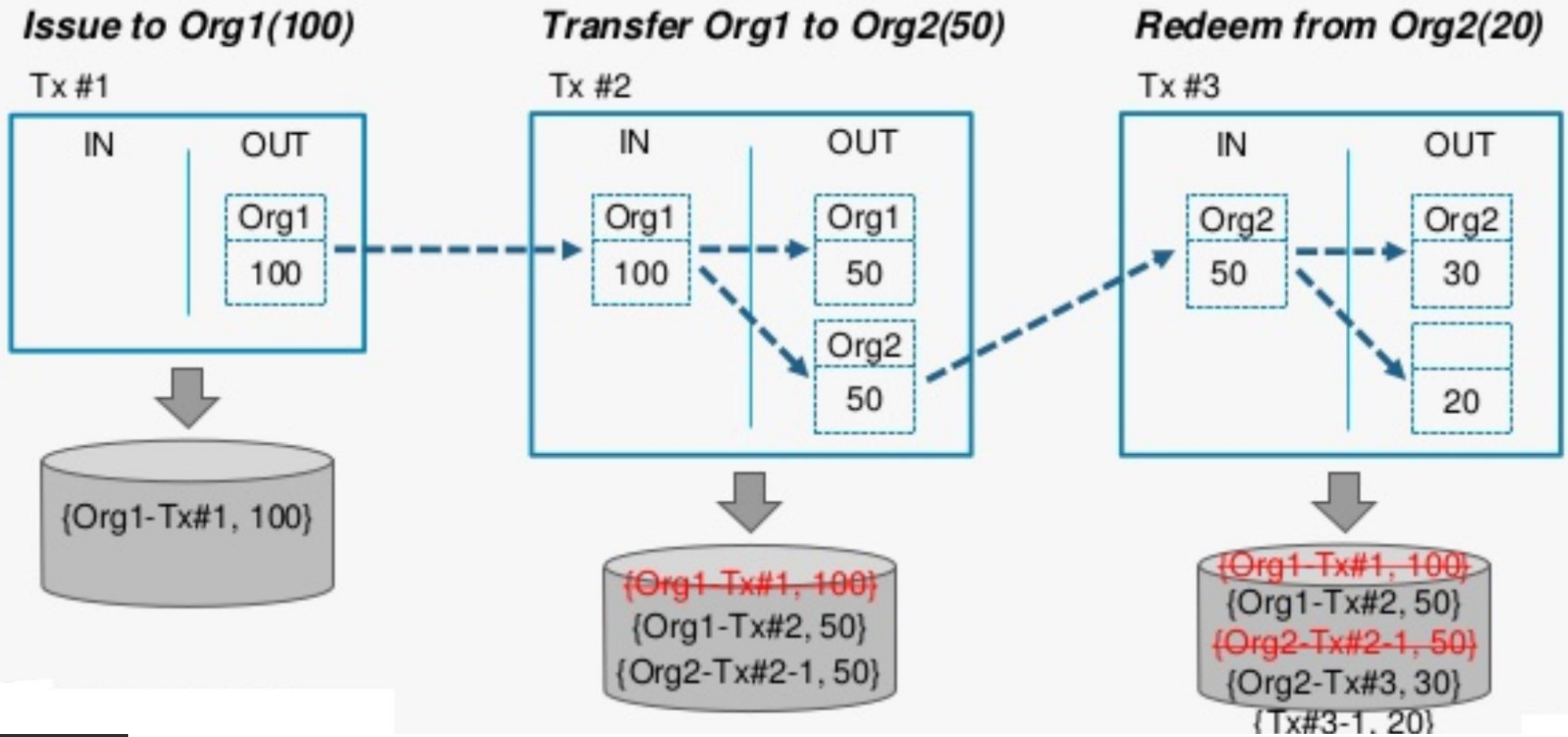
- Token Lifecycle: Issue, Transfer, Redeem, List

Hyperledger Fabric – UTXO

- 패브릭에서는 상태(State)는 Key-Value 형태로 저장
  Key : Namespace + TokenPrefix + Owner + TransactionId + Index
  Value: Quantity

- Unspent Transaction(Output)은 Ledger(State DB)에 저장되고
  Spent Transaction(Input)은 Ledger(State DB)에서 삭제됨.

Hyperledger Fabric – UTXO Transaction



Token Transaction Flow