Introduction to Hyperledger

Prof. James Won-Ki Hong

Distributed Processing & Network Management Lab.
Dept. of Computer Science and Engineering
POSTECH

http://dpnm.postech.ac.kr
jwkhong@postech.ac.kr

Table of Contents

- Introduction to Hyperledger
- Hyperledger Frameworks
- Hyperledger Tools

Introduction to Hyperledger (1/2)

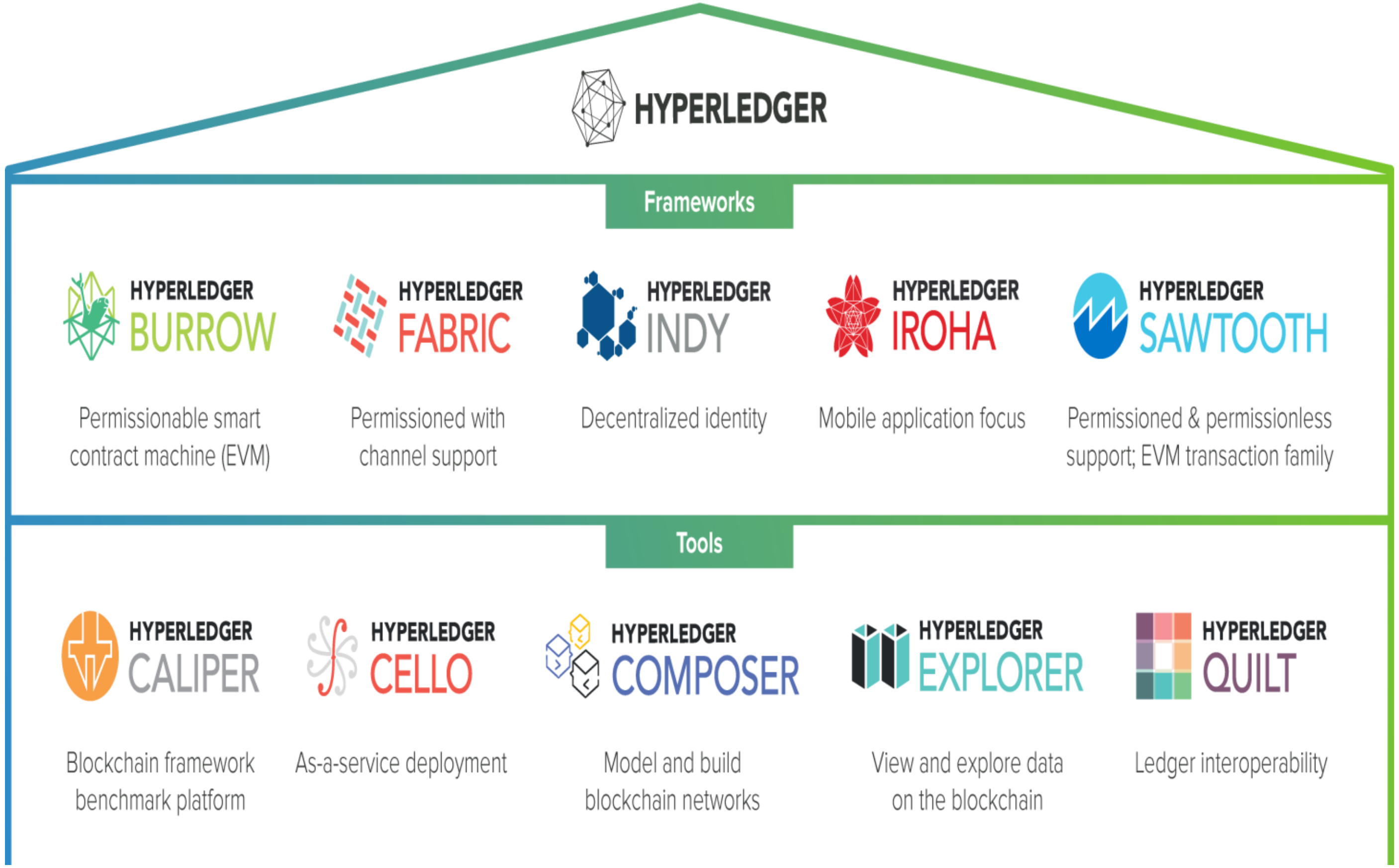
- **Hyperledger**
  - Blockchain open source project hosted by Linux foundation
  - Started in December 2015
  - Ultimate goal is to develop Blockchain techniques that can be applied a variety of industries, including finance, IoT, logistics, and manufacturing

- **Why Hyperledger?**
  - Supports private blockchain-based applications
  - Provides a universally applicable technology standard for many industries

Introduction to Hyperledger (2/2)

- **Hyperledger Project**
  1) Distributed Ledger Framework
  2) Smart Contract Engine
  3) Client library
  4) Graphic Interface
  5) Utility
  6) Sample Applications

- **Hyperledger Frameworks**
- **Hyperleger Tools**



Source: https://www.Hyperledger.org/

Hyperledger Framework (1/5)

Hyperledger Fabric

- Plug-and Play using modular architecture
- Permissioned Blockchain
- Chaincode = smart contract
- No internal cryptocurrency
- High performance
- Multi-blockchain

Hyperledger Framework (2/5)

Hyperledger SAWTOOTH

- Building, deploying, and running distributed ledgers.
- Separation between the core system and the application level
- Parallel Transaction Execution
- Ethereum Contract Compatibility with Seth (Sawtooth-Ethereum)
- Highly modular
- Sawtooth Dynaminc Consensus
  - New consensus algorithm: Proof of Elapsed Time (PoET)
- Supports both permissioned and permissionless blockchain networks

HYPERLEDGER SAWTOOTH

Hyperledger Framework (3/5)

Hyperledger IROHA

- Focus on mobile application development
- Written in C++
  - Provides a small set of fast commands and queries
- Variety of libraries for developers
- Prebuilt commands enable developers to test smart contracts faster
- Consensus algorithm: Byzantine Fault Tolerant (BFT)
- Only ledger that has a robust permission system

Hyperledger Framework (4/5)

Hyperledger INDY

- Certification-specific project
- Implement identity verification that does not depend on a specific country or organization
- Hyperledger INDY = Hyperledger Fabric + ID system
- Provide tools, libraries, and reusable components for creating and using independent digital identities
- Consensus algorithm: Redundant Byzantine Fault Tolerant (RBFT)

Hyperledger Framework (5/5)

- **Hyperledger BURROW**
  - Smart contract enforcement framework based on authorization approvals
  - Execute smart contract code following the Ethereum specification
  - Consensus algorithm: Tendermint
  - Application BlockChain Interface (ABCI)
  - Permissioned Ethereum Virtual Machine (EVM)

Hyperledger Tool (1/5)

Hyperledger COMPOSER

- First tool in Hyperledger project to build Blockchain business network
- Integrate existing systems with Blockchain applications
- Ensure that contracts run well between smart contract and distributed ledgers
- Support Hyperledger Fabric
- Quickly model current business network
  - Assets, participants, identities, transactions, events …

HYPERLEDGER
COMPOSER

Hyperledger Tool (2/5)

- **Hyperledger CELLO**
  - Blockchain-as-a-Service (BaaS)
  - Manage the life cycle of blockchain - reduce the effort for creating, managing and terminating blockchains
  - Provide multi-tenant chain service

Hyperledger Tool (3/5)

- **Hyperledger EXPLORER**
  - Open source browser
  - Monitor blocks, transactions, nodes and channels
  - View, invoke, deploy or query blocks, transactions and associated data, network information

HYPERLEDGER
EXPLORER

Hyperledger Tool (4/5)

- **Hyperledger QUILT**
  - Inter-Ledger Protocol (ILP)
  - Maximize interoperability between ledgers
  - Transfer value between existing distributed ledgers

Hyperledger Tool (5/5)

- **Hyperledger CALIPER**
  - Blockchain benchmark tool
  - Measure the performance of a specific Blockchain
  - TPS (Transaction Per Second), transaction latency, resource utilization, etc.
  - Supports Hyperledger Fabric, Hyperledger Sawthooth, Hyperledger Iroha, Hyperledger Composer

Summary

- Introduction to Hyperledger
- Hyperledger Frameworks
- Hyperledger Tools

References

- https://www.Hyperledger.org/
- https://youtu.be/Y177TCUc4g0
- https://medium.com/@yjw113080/%ED%95%98%EC%9D%B4%ED%8D%BC%EB%A0%88%EC%A0%80-Hyperledger-%EA%B0%9C%EC%9A%94-c8baafc33fc5
- https://www.slideshare.net/TIMEGATE07/ss-99335357
- https://www.Hyperledger.org/projects/iroha
- https://www.slideshare.net/CelineGeorge1/Hyperledger-iroha