Hyperledger

Xiaojie Zhu

March 13, 2018

1 Motivation

The existing blockchain implementation have fallen short of meeting the multitude of requirements inherent in the complex world of business transactions. In addition, scalability, confidential and private transactions, extensibility, and pluggability are the limitations of the existing blockchain. To propose a new blockchain and meet the requirement of industry-focused use cases and overcome the existing shortcomings.

2 Evaluation metrics

- Throughout. It measures the number of successful transactions per second. The configuration can be one or multiple clients or multiple threads per client to saturate the blockchain throughout.
- Latency. It measures the response time per transaction.
- Scalability. It measures when the changes in throughput and latency when increasing number of nodes and number of concurrent workloads.
- Fault tolerance. It measures how the throughput and latency change during node failure.
- Security metric. It is quantified by the number of blocks in the forks since the malicious behaviour cause forks with high possibility.

3 Evaluation Result

The configuration is set as follows. There are 8 servers and 8 concurrent clients over the period of 5 minutes. Each clients sends transactions to a server with a request rate from 8tx/s to 1024tx/s.

Hyperledger has up to 5.5x and 28x higher throughput than Ethereum and parity respectively while Parity has the lowers latency. By measuring the network utilization and CPU, it shows the hyperledger is communication bound whereas Ethereum is CPU bound.

For the scalability, Ethereum's throughput and latency degrade almost linearly beyond 8 servers while the Hyperleder stops working beyond 16 servers. The reason why Hyperleder stops working is that conflicting views occurred.

Unsurprsingly, the Ethereum outperforms other systems in fault tolerance and security. Hyperledger stops generating blocks after 4 servers' failure and takes longer time to recover from the attack.