HYPERLEDGER
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Accelerator: Achieving 10x Performance for Hyperledger Fabric and Cases

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Enterprise Blockchain – Why high performance?

Not all, but some blockchain business cases surely need high TPS processing!
Example – Maritime Logistics

"Port of Busan"
(6th largest port**)

20,000,000 TEU*/year

170,000 TEU departing from Port of Busan

*TEU: the standard unit of measurement, equivalent to a container of a length of 20 feet
** Ministry of Oceans and Fisheries, South Korea
Example – Maritime Logistics

If 1 transaction from 170,000 TEU every 15 seconds

11,300 TPS Throughput is required

This is only 3% of the total number of containers globally
Performance Checkpoint

Collect TRANSACTION-ENDORSED Msgs Into a valid endorsement that Satisfies Endorsement policy (chaintcodeID)

1. tx = \{<client ID, chaincode ID, tsPayload, timestamp, clientSig}\}

2. Simulate/Execute tx
   Sign TRANSACTION-ENDORSED

3. Verify endorsement, readset
   If OK apply writeset to state

4. orderers

Figure. Illustration of one possible transaction flow
Nexledger Accelerator: 2nd Layer Approach

"Minimum modification on the client, but NEVER on Hyperledger Fabric"
Design Overview

1. Aggregation of transactions, 2. Consensus for a batch, 3. Separation of the batch

Transaction Acceleration Flow

1. Aggregates transactions
   \[ \text{TX}_{\text{new}} = \{A=1, B=2, C=3\} \]

2. Send Proposal

3. Transaction split processing
   Peer 1
   - Accelerator’s Chaincode
   - Transaction Segregation
   - Ledger
     - A=1
     - B=2
     - C=3
   - Peer 2

4. Endorsement (e.g., 1 out N)

5. Broadcast

6. Deliver blob

7. Deliver Result
   e.g., result = success

Clients: A, B, C

TX₁ = \{A=1\}
TX₂ = \{B=2\}
TX₃ = \{C=3\}
Visualization
Performance Verification

- **Self-Verification**
  - using community de-facto project

- **Worldwide Verification**
  - with industry and academia

- **Field Verification**
  - with global startups

- ✔️ Hyperledger Caliper
- ✔️ Performance comparison with Fabric and Fabric with Accelerator
- ✔️ Technical paper (accepted, 2019 IEEE Globecom)
- ✔️ Digital ticketing use cases with True Tickets
Self-Verification – Hyperledger Caliper

Hyperledger Caliper

- Widely used for Hyperledger Fabric, Sawtooth, and other Hyperledger Project open source
- Measured outcomes for various elements

Only adaptor for Accelerator added

- No modification in the Benchmark and Interface & Core Layers
Worldwide Verification – IBM

Verification results were published in the co-authored whitepaper

- Simple scenario from Hyperledger Caliper dataset is used
- Writing is approximately 10 times faster!
Field Verification – True Tickets

Performance verification results with real business chaincode functions

Achieved TPS

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| Avg. Latency (sec)

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- Functions in real business chaincode are evaluated
- Average transaction latency as well as TPS is also improved!
Roadmap

- **Feb. 2019**: Whitepaper & Innovation Sandbox
- **Jun. 2019**: Open Accelerator source code to GitHub
- **Dec. 2019**: Statistics & Monitoring
- **Mar. 2020**: Self-adjusting congestion control (Adaptive)

To contribute to Accelerator project
https://github.com/nexledger/accelerator
Again – Why high performance is needed?

- **E-commerce**: Authentication requests, electrical trades from millions of users
- **Payment**: Simultaneous payment requests from clients as well as vendors
- **Logistics (IoT)**: Sporadic transactions from millions of IoT devices
- **Retail**: Delivery tracking, provenance and history check from users

A high speed transaction processing feature can extend blockchain use cases!
Takeaways & Thank you

Currently, processing bursty transactions in time is very hard due to performance bottleneck of the blockchain.

01 With Accelerator the bursty transactions can be processed with the minimum transaction latency

02 Use cases of blockchain can be easily extended with Accelerator

03 Accelerator can be easily deployed on any cloud platform

Find out more

- Whitepaper for Accelerator co-authored with IBM
  https://github.com/nexledger/accelerator

- To try Accelerator open source with your data
  https://github.com/nexledger/accelerator

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