

Blockchain Node Performance Experiment

실험 개요

- Blockchain Network에서 Node의 개수에 따른 TPS(Transaction per Seconds)의 변화를 실험
- Ubuntu 16.04
- Hyperledger fabric 1.1 기반
- 10대의 서버를 사용
- 5 Orderer와 Kafka Consensus 사용
- Docker를 사용하여 하나의 Server에 4개의 Blockchain Node를 실행하여 총 32개의 Blockchain Node 실행
- 총 32개의 CLI와 NodeJS Gateway 실행

Blockchain Experiment Hardwares

Name	OS	용도	CPU	RAM	Group
Server01	Ubuntu 16.04	NodeJS Gateway(32) CLI(32)	Intel(R) Xeon(R) CPU E5620 2.40GHz X 8	12GB	Group01
Server02	Ubuntu 16.04	NodeJS Gateway CLI(32)	Intel(R) Xeon(R) CPU L5640 2.27GHz X 12	12GB	Group01
Server03	Ubuntu 16.04	Orderer(1), Kafka(1), Zookeeper(1) Blockchain Node(4)	Intel(R) Xeon(R) CPU E3-1230 V2 @ 3.30GHz X 8	8GB	Group02
Server04	Ubuntu 16.04	Orderer(1), Kafka(1) Blockchain Node(4)	Intel(R) Xeon(R) CPU E3-1230 V2 @ 3.30GHz X 8	8GB	Group02
Server05	Ubuntu 16.04	Orderer(1), Kafka(1) Blockchain Node(4)	Intel(R) Xeon(R) CPU E3-1230 V2 @ 3.30GHz X 8	8GB	Group03
Server06	Ubuntu 16.04	Orderer(1), Kafka(1) Blockchain Node(4)	Intel(R) Xeon(R) CPU E3-1230 V2 @ 3.30GHz X 8	8GB	Group03
Server07	Ubuntu 16.04	Orderer(1), Kafka(1) Blockchain Node(4)	Intel(R) Xeon(R) CPU X5650 @ 2.67GHz X 24	8GB	Group04
Server08	Ubuntu 16.04	Blockchain Node(4)	Intel(R) Xeon(R) CPU X5650 @ 2.67GHz X 24	8GB	Group04
Server09	Ubuntu 16.04	Blockchain Node(4)	Intel(R) Xeon(R) CPU E5-2430 v2 @ 2.50GHz X 12	16GB	Group05
Server10	Ubuntu 16.04	Blockchain Node(4)	Intel(R) Xeon(R) CPU E5-2430 v2 @ 2.50GHz X 12	16GB	Group05

각 Group는 지역적으로 분산되어 있음

Blockchain Servers

Server 01 ~ 02

CLI01	* * * * *	CLI16
CLI17	* * * * *	CLI32
Gateway 01	* * * * *	Gateway 16
Gateway 17	* * * * *	Gateway 32

Server 03

CA 01	Blockchain Node 001	Chain code 001
Orderer Node 001	Blockchain Node 002	Chain code 002
Zookeeper 01	Blockchain Node 003	Chain code 003
Kafka 01	Blockchain Node 004	Chain code 004

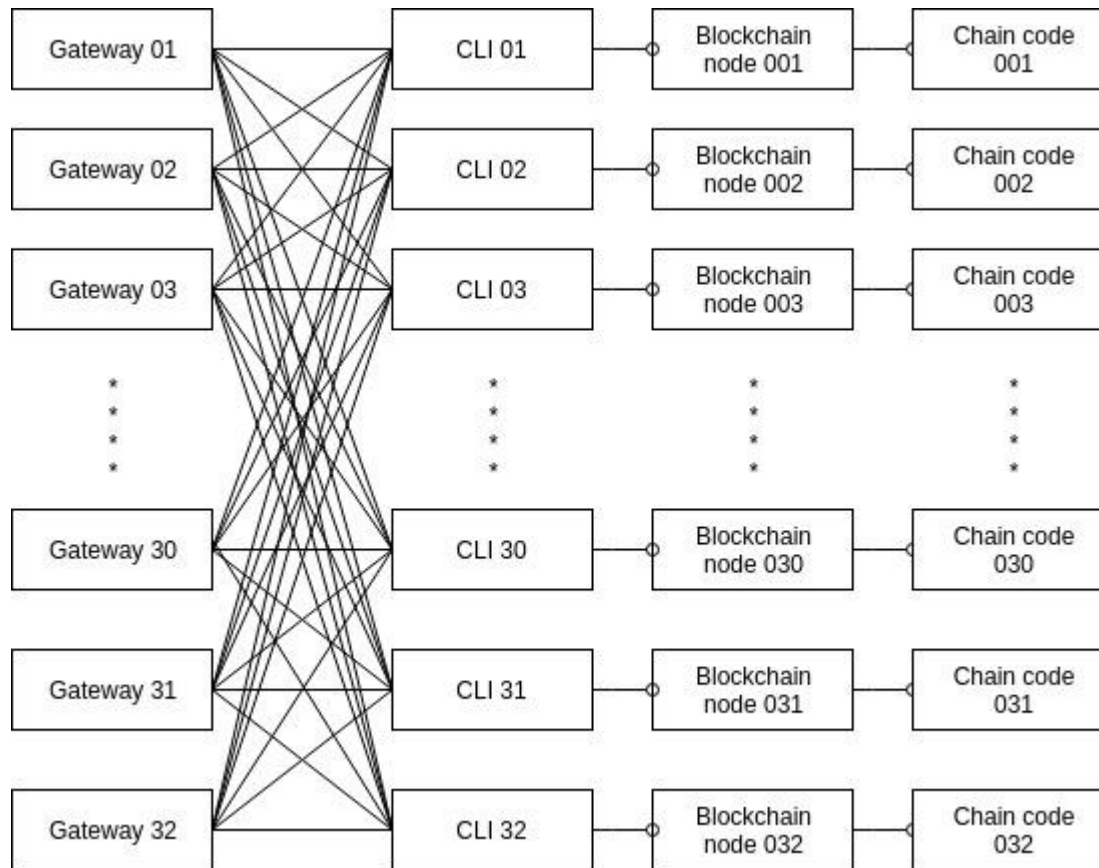
Server 04 ~ 07

Orderer Node 002 ~ 005	Blockchain Node 005~008	Chain code 005~008
Kafka 02 ~ 05	Blockchain Node 009~012	Chain code 009~012
	Blockchain Node 013~016	Chain code 013~016
	Blockchain Node 017~020	Chain code 017~020

Server 08 ~ 10

Blockchain Node 021~023	Chain code 021~023
Blockchain Node 024~026	Chain code 024~026
Blockchain Node 027~029	Chain code 027~029
Blockchain Node 030~032	Chain code 030~032

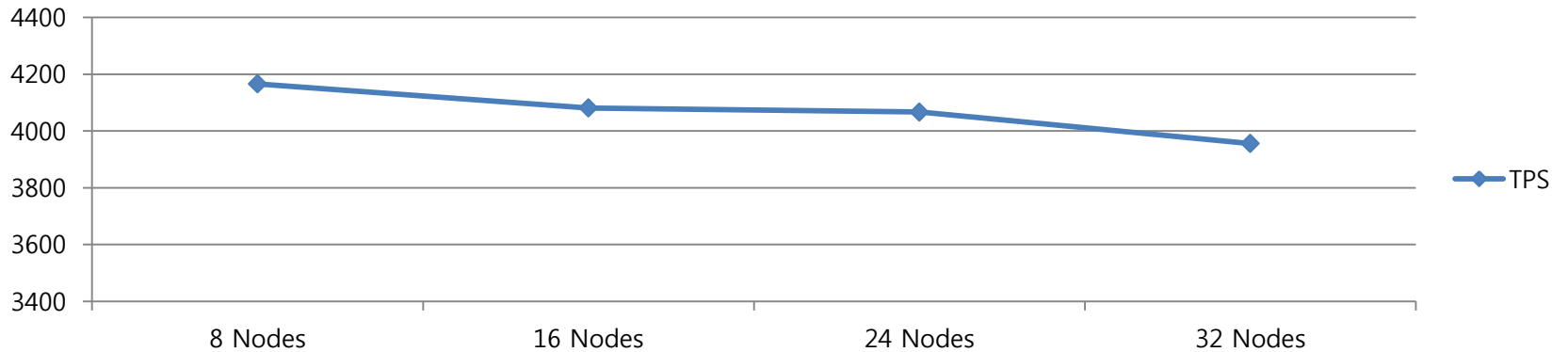
Blockchain Network



Experiment Result

	Transactions	30000	50000	70000	100000	Average
8 Nodes	Mili-seconds	7347	12232	16615	23374	
	TPS	4083	4088	4213	4278	4166
16 Nodes	Mili-seconds	7846	12364	16411	23860	
	TPS	3824	4044	4265	4191	4081
24 Nodes	Mili-seconds	7997	12215	16710	23618	
	TPS	3751	4093	4189	4234	4067
32 Nodes	Mili-seconds	7744	12712	17066	25553	
	TPS	3874	3933	4102	3913	3956

TPS



345,600,000/day (4,000 tps)