Interbank Payments and FinTech

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Presentation Overview

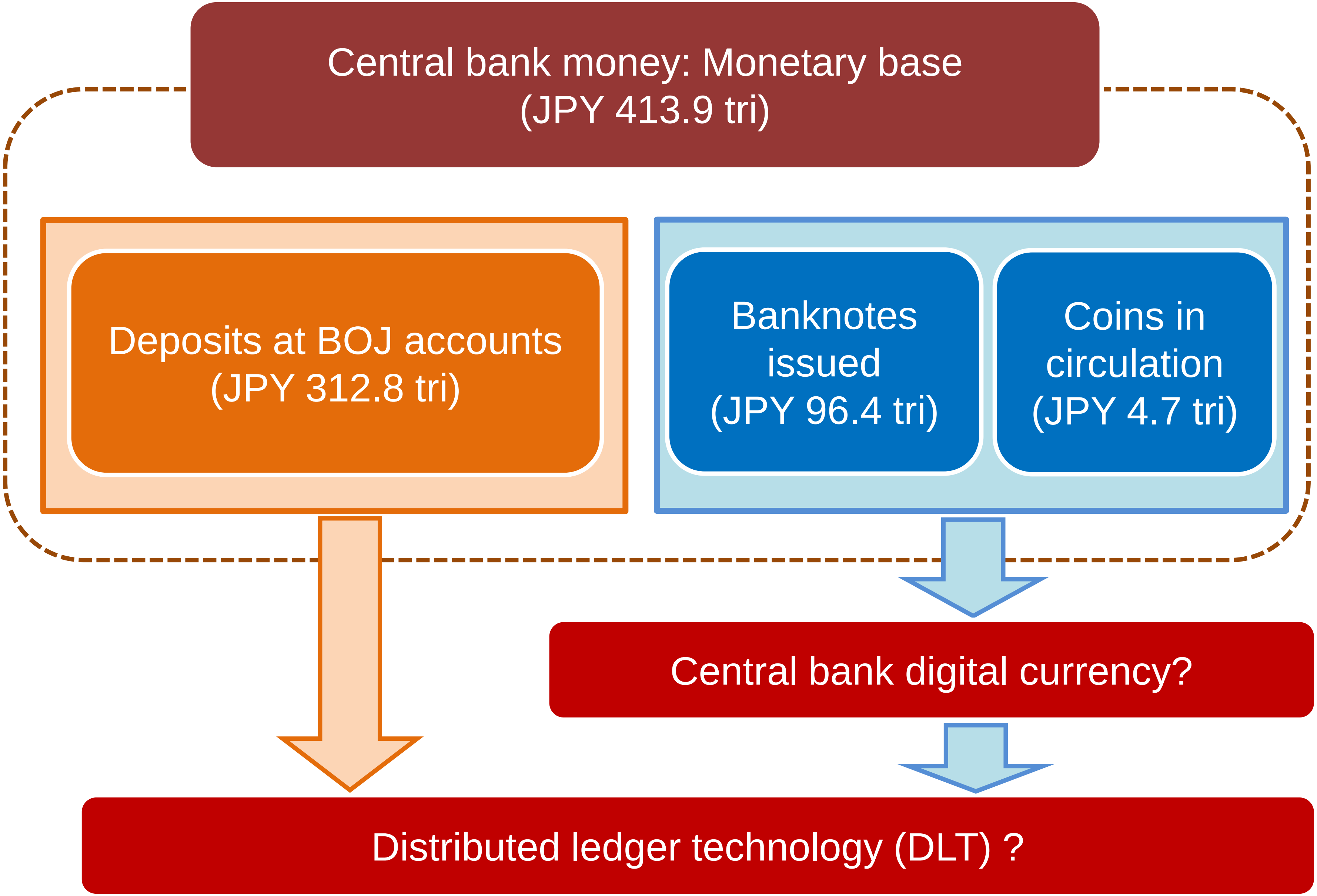
1. What FinTech means for central banking

2. Application of DLT to interbank payments

3. Issues for further work

* The views expressed in this presentation are those of the authors and do not necessarily represent those of the Bank of Japan.

1. What FinTech means for central banking



* Figures are averages for October 2016.

1. What FinTech means for central banking

Possible application of distributed ledger technology

		Central bank digital currency
Euro area	ECB: Published staff research paper on application of DLT in securities post-trading (April 2016)	
UK	BOE: Conducted a PoC with the private sector on the transfer of ownership of a fictional asset (June 2016)	University College London: Published a paper on central bank digital currency (RSCoin) (February 2016)
Canada	BOC: Launched a project with the private sector to explore the possibility of issuing, transferring and settling central bank issued assets on DLT (June 2016)	
Russia	BOR: Developed prototype of a networking tool for market participants using DLT (October 2016)	
China		PBOC: Announced plans to consider issuing digital currency in the long term (January 2016)
Sweden		Riksbank: Announced intention to investigate the possible issuance of e-krona as a complement to cash (November 2016)

2. Application of DLT to interbank payments: Overview of staff study

- Objective: To deepen our understanding of the basic characteristics of the distributed ledger technology (DLT) by experimenting with a fictional DLT-based interbank payment system

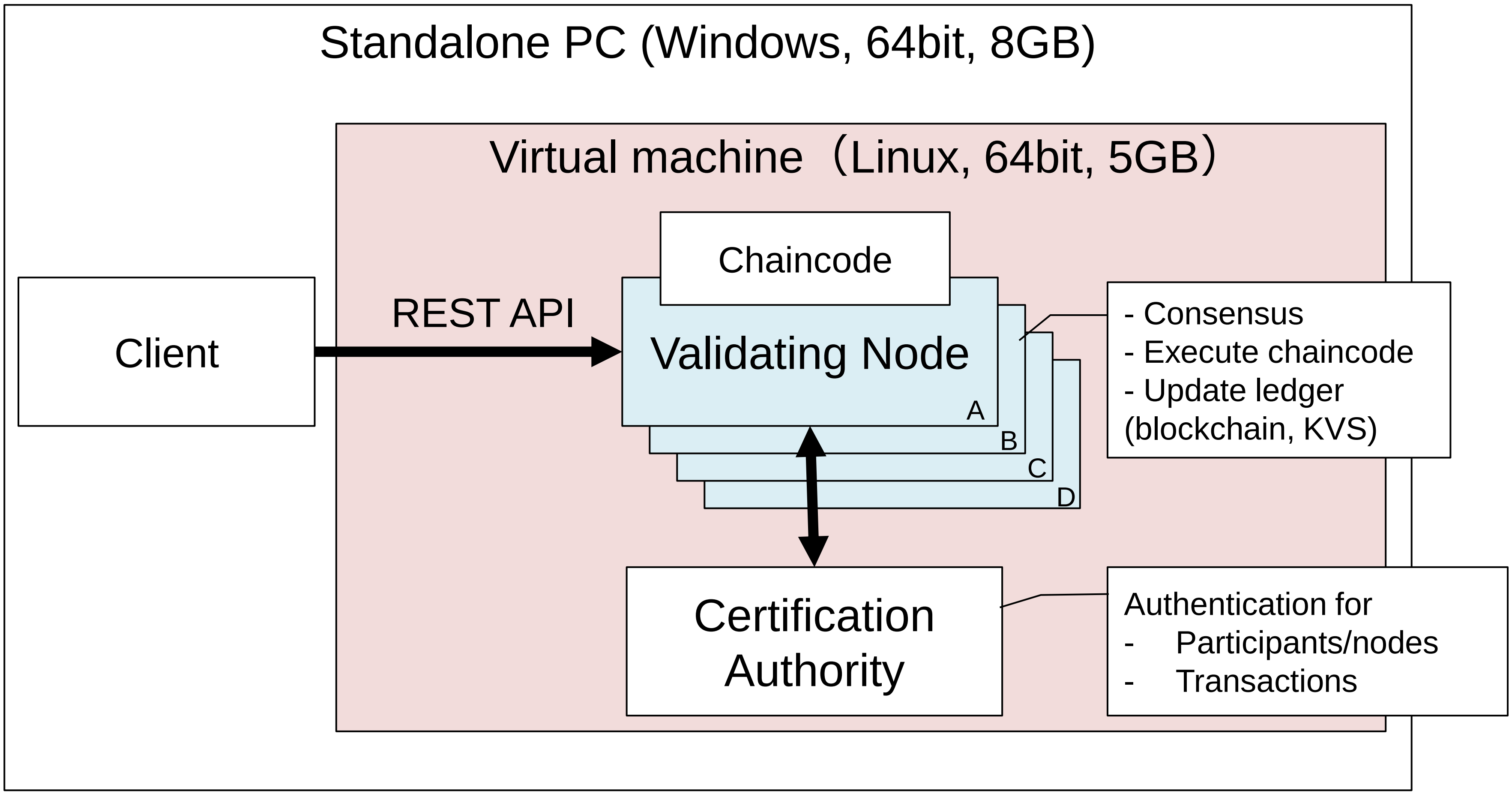
- Points of evaluation
  - Performance: how the number of nodes and the amount of traffic affect performance
  - Smart contract (Chaincode): whether complex operational flows can be realized on a DLT arrangement

- DLT platform used: Hyperledger fabric

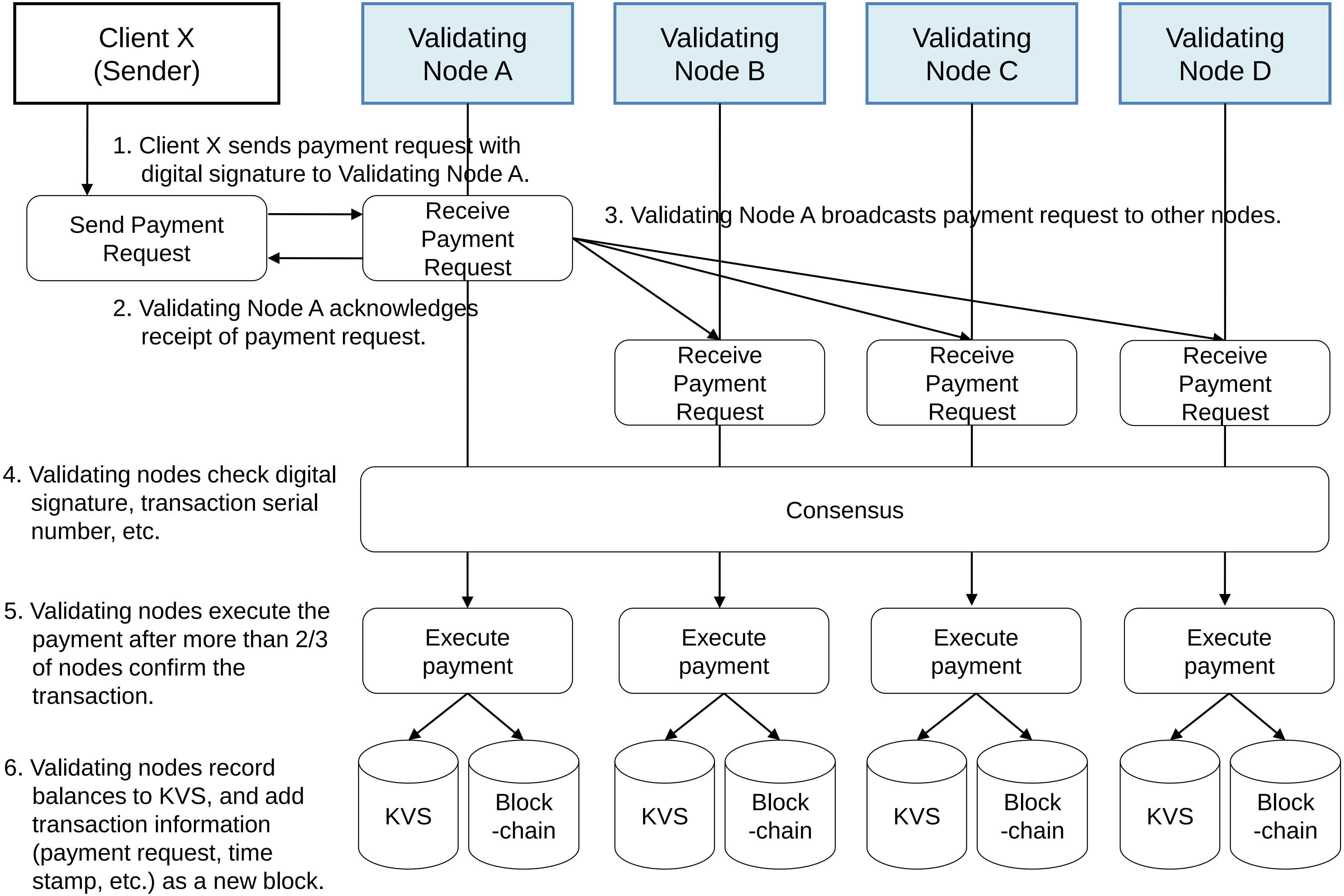
* We are grateful for the valuable inputs provided by IBM Japan, NTT Data, and Hitachi in conducting the study.

2. Application of DLT to interbank payments: Test environment

- Environment: virtual machine on a standalone PC
- Number of validating nodes: 4-16 nodes
- Consensus algorithm: PBFT (Practical Byzantine Fault Tolerance)

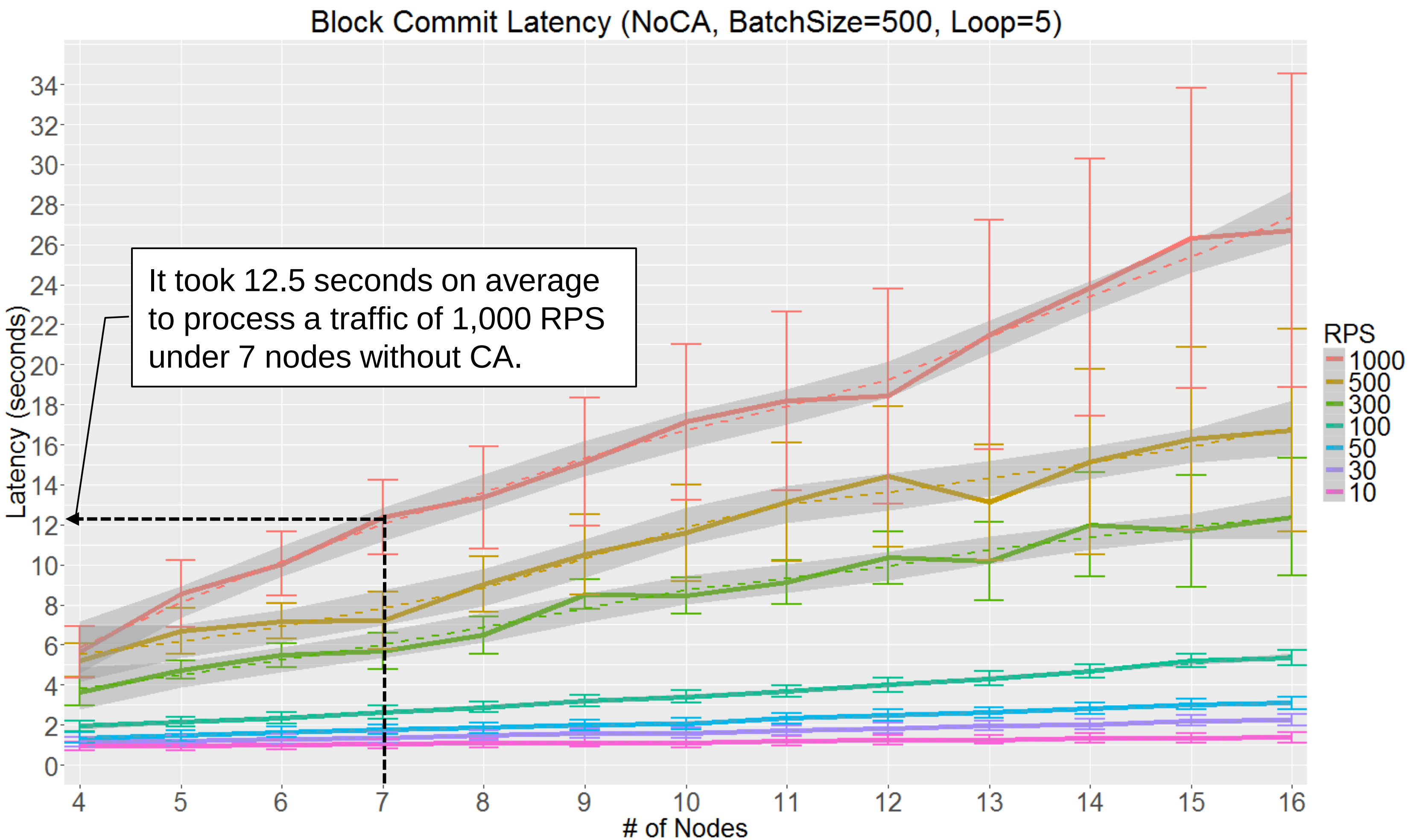


2. Application of DLT to interbank payments : Process flow



2. Application of DLT to interbank payments: Performance

- Lower performance (longer latency between payment request and ledger update) as the number of nodes increases.
- Increased delay in latency with increase in payment traffic (RPS, number of requests per second).

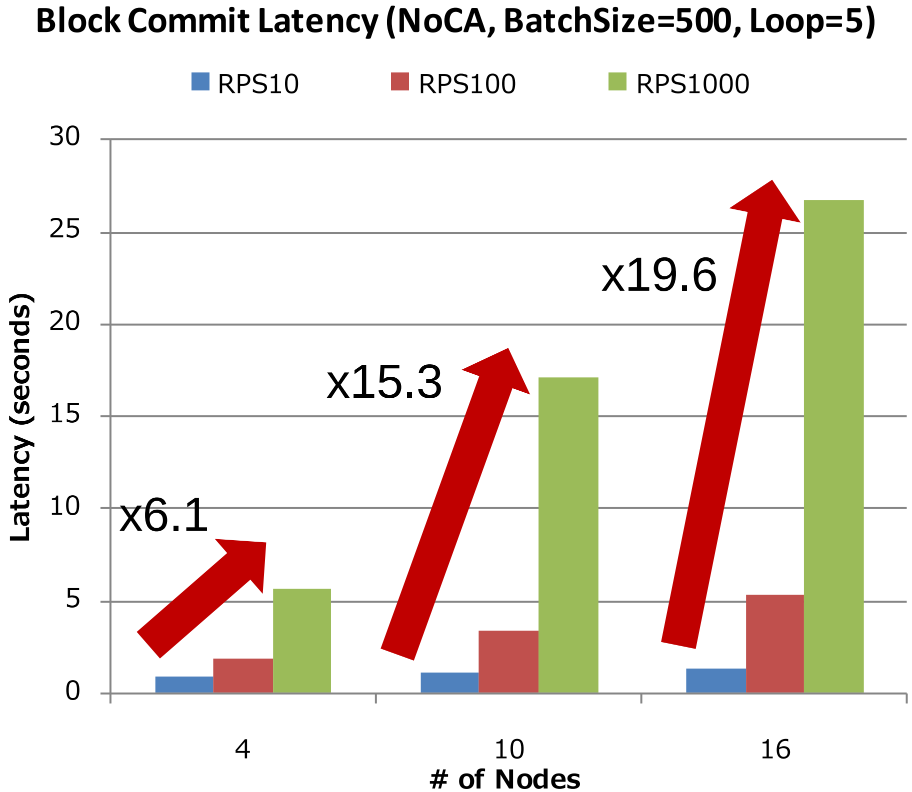


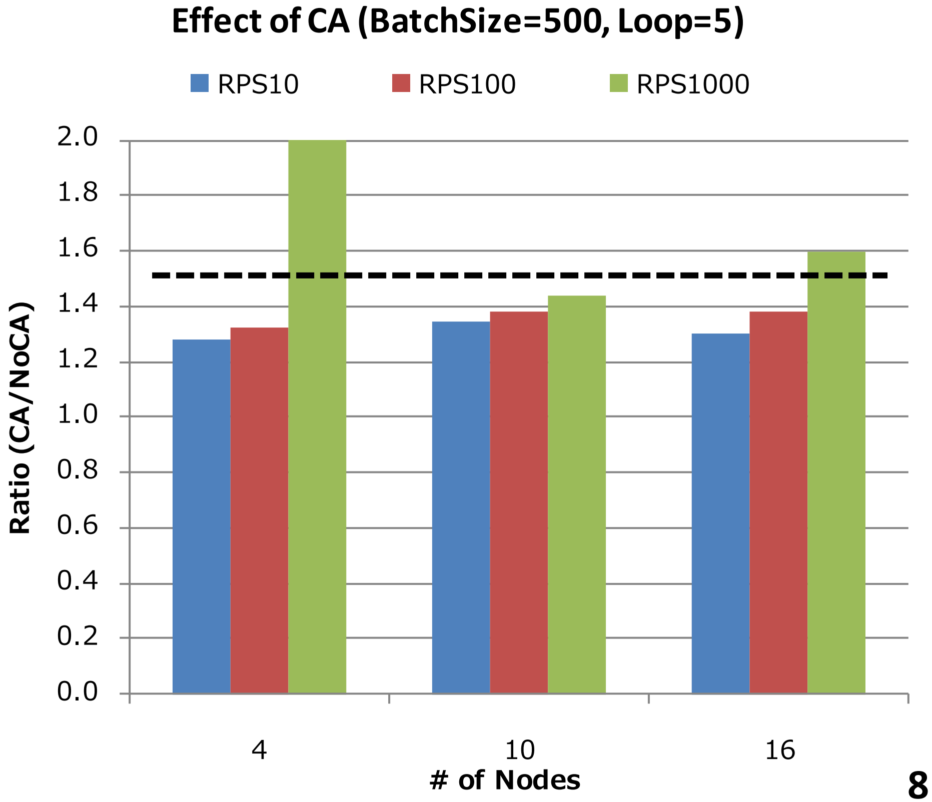
2. Application of DLT to interbank payments: Performance

- The extent of delay in latency caused by payment traffic increased with increase in the number of nodes.

* Lower performance may be due to limitations in the test environment (e.g., CPU).

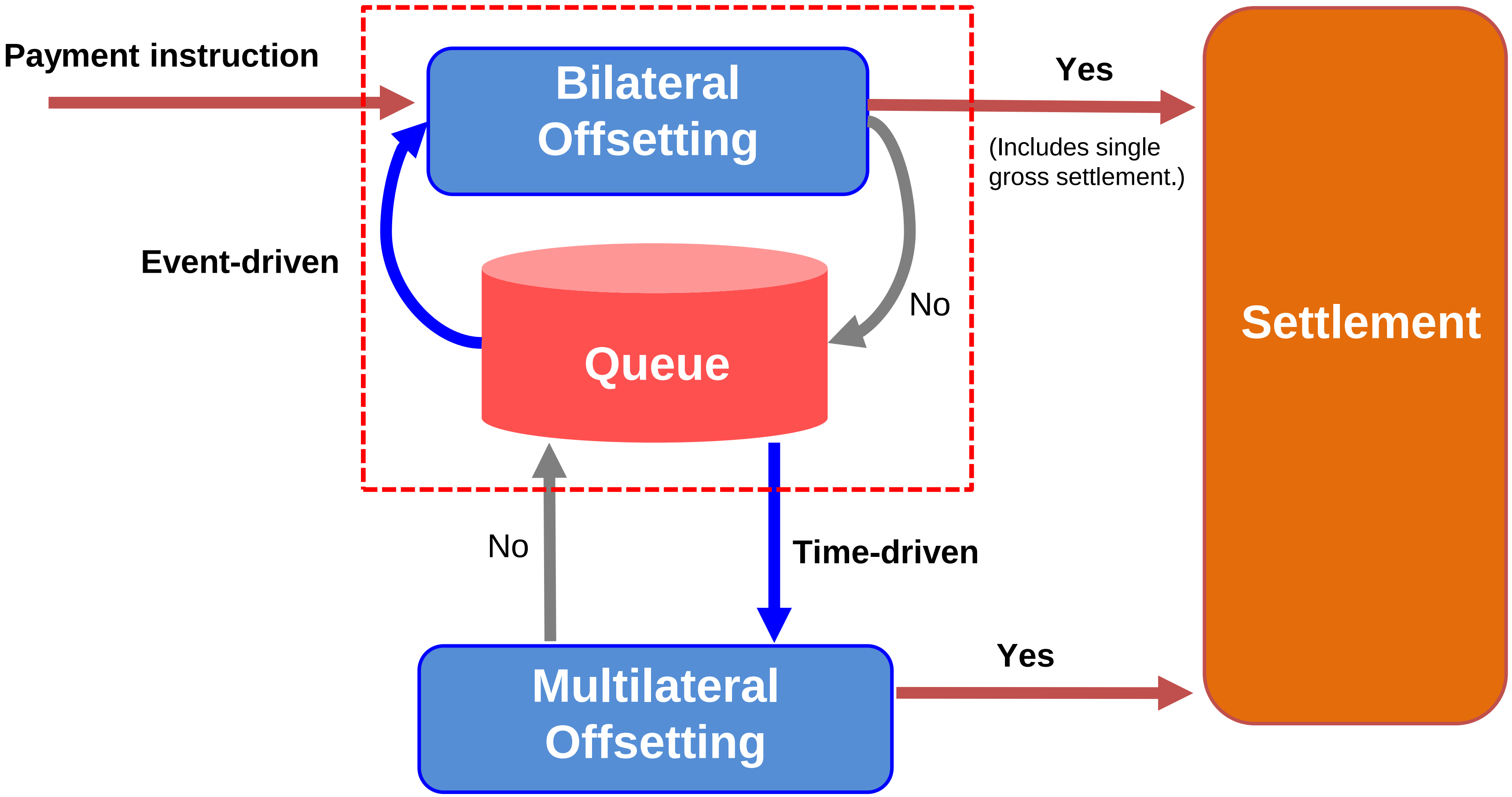
- Certificate Authority (CA), which issues Transaction Certificates for each transaction, could become a performance bottleneck; however, no significant impact was observed in this study.





2. Application of DLT to interbank payments: Liquidity-saving features

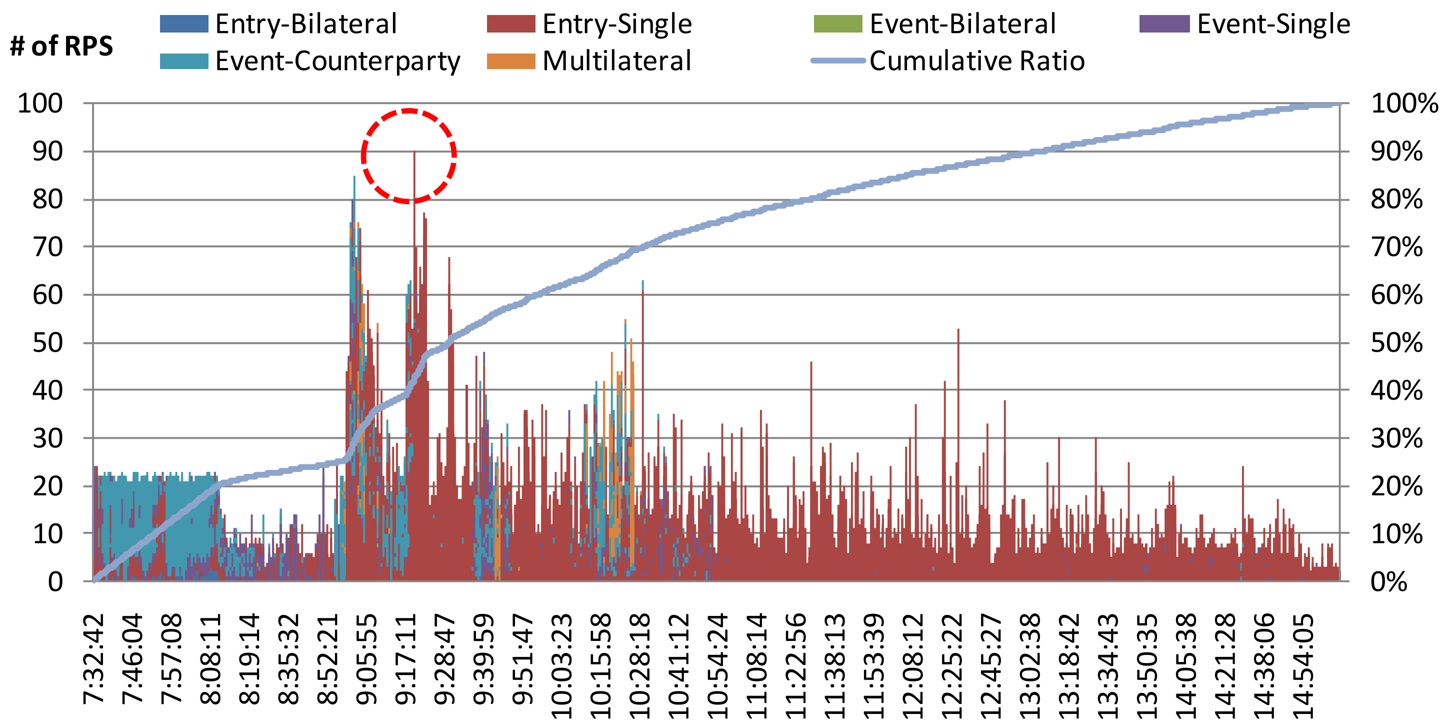
- Using “smart contracts” (chaincode), (i) centralized queuing and (ii) bilateral offsetting were programmed.



2. Application of DLT to interbank payments: Transaction data

- Liquidity-saving features, using actual transaction data for a high-volume day (March 31, 2016 <end-FY2015>), were tested.
- Traffic reached its peak at around 9:00 with approximately 100 RPS and decreases thereafter. For this study, data for the period of 9:15-9:30 were used (approximately 12,000 transactions).

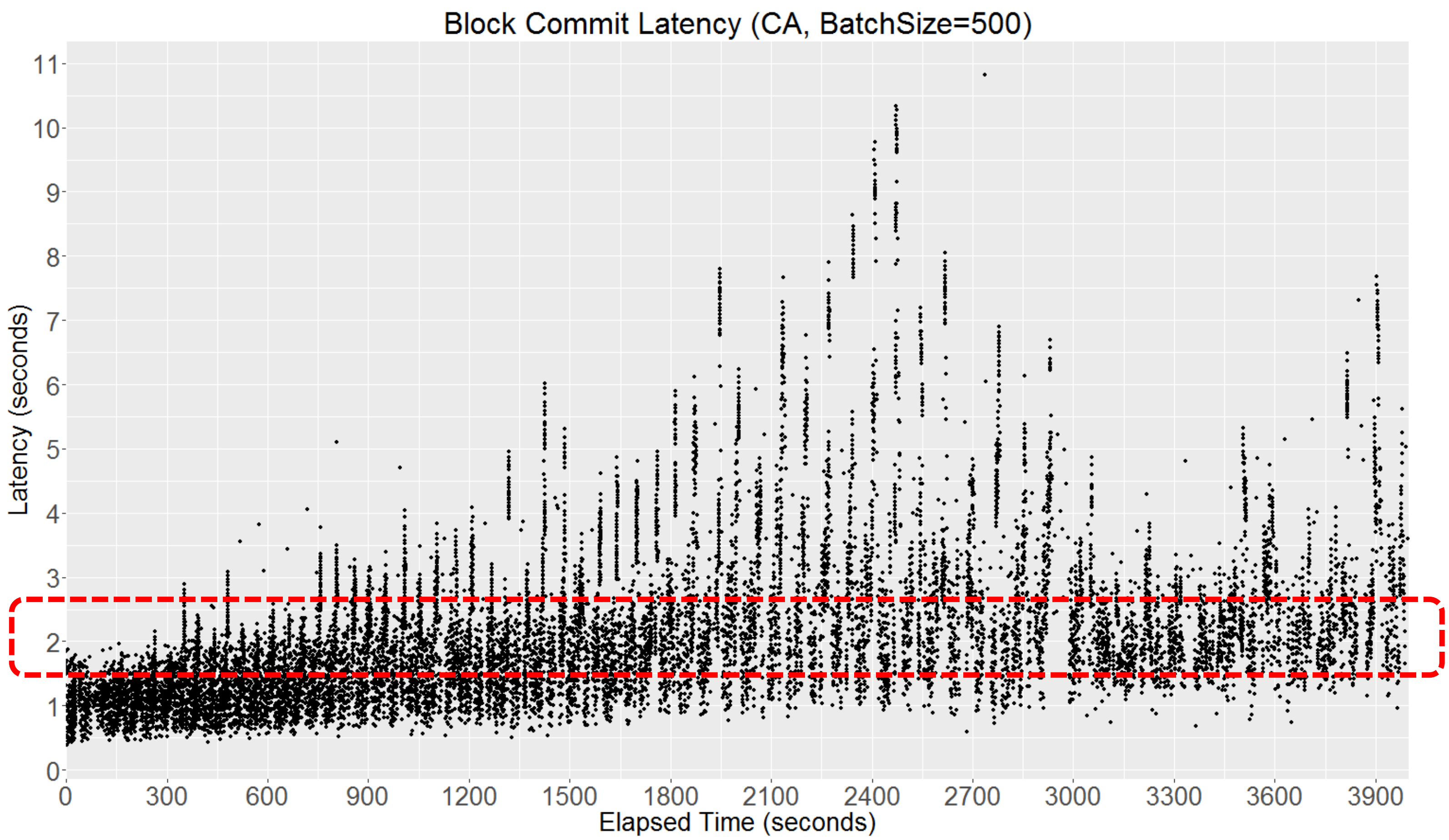
Request Per Second via Queuing-offsetting Accounts on March 31, 2016



Source: Bank of Japan.

2. Application of DLT to interbank payments：Preliminary results

- Due to limitations in the test environment (insufficient CPU power), it took more than 60 minutes to send the requests for the period of 9:15-9:30, with average latency of 2.1 seconds and maximum latency of 10.8 seconds.



3. Issues for further work

Tentative results

- Increase in the number of validating nodes and transaction volume results in longer latency between payment request and ledger update.
- Complex business flows such as queuing and offsetting functionalities can be implemented in a DLT arrangement by using smart contracts.

Issues for further work

- Evaluate other aspects of DLT including availability (e.g., whether the arrangement can continue to function in the event under which one or more validating nodes are not properly functioning)
- Take into account ongoing improvements in DLT (e.g., next-generation consensus algorithm planned for Hyperledger fabric)
- Evaluate potential application of DLT platforms other than fabric
- Enhance test environment in order to obtain a more accurate view on factors affecting performance

Role of Central Banks