

Annex I. List of DLT Experiments and Research in Payments and Settlements

Large-value Payment Systems

- Project Jasper (Phase 1) (Canada)
- Project Jasper (Phase 2) (Canada)
- Project Khokha (South Africa)
- Project Stella (Phase 1) (Euro Area/Japan)
- Project Ubin (Phase 1) (Singapore)
- Project Ubin (Phase 2) (Singapore)
- Project Inthanon (Phase 1) (Thailand)
- Project Salt (Brazil)

Securities Settlement Systems

- Project Blockbuster (Germany)
- Project by Depository Trust and Clearing Corporation (United States)
- Project ASX replacement of CHESS (Australia)
- Project Jasper (Phase 3) (Canada)
- Project Stella (Phase 2) (Euro Area/Japan)
- Project Ubin (Phase 3) (Singapore)
- Project Inthanon (Phase 2) (Thailand)

Cross-Border Payment Arrangements

- CLSNet foreign exchange netting service (United States)
- SWIFT DLT research (Belgium)
- Utility Settlement Coin (Switzerland)
- JPM Coin (United States)
- Project Jasper (Phase 4)—Project Ubin (Phase 4) (Canada, Singapore)
- Cross-border interbank settlements (Canada, United Kingdom, Singapore)
- Project Stella (Phase 3) (Euro Area/Japan)
- Project Inthanon (Phase 3)—LionRock (Thailand, Hong Kong)

Annex II. Distributed Ledger Technology Protocols

- **Bitcoin** DLT protocol was defined in 2008 (Nakamoto 2008). It was the first token-based DLT protocol. It is based on a so-called “proof-of-work” protocol used by “miners.” Anonymous or pseudonymous miners compete to solve an encryption task for adding a new block to the public block-chained transaction database. Double spending is controlled by accepting only the first instance of the next transaction generated by a bitcoin node—that is, it considers that all transactions sent by a node are sequentially numbered. Because the miners in the network are unknown, it is impossible to control to what extent they collaborate, which increases the risk for so-called 51 percent abuse of mining power (Ali and Barrdear 2014). In the Bitcoin protocol, the transaction database is public. Because users’ Bitcoin account addresses are pseudonymous, it is possible to identify all transactions belonging to a person once the pseudonym is revealed, for example, in connection with a transfer request.
- **Digital Asset Platform** is developed by the US company Digital Asset (Digital Asset 2016). It contains the Digital Asset Modeling Language for the management of contracts and contract transactions using a private contract store and a global sync log.
- **Elements** is a blockchain platform developed from Bitcoin that is provided by the private company Blockstream. It supports transaction confidentiality and PVP- and DVP-type cross-ledger transfers.
- **Ethereum** is an open-source DLT protocol for smart contracts, which is today maintained by the non-profit organization Enterprise Ethereum Alliance.
- **Hyperledger Fabric** is an open-source protocol from Linux Foundation’s Hyperledger Initiative that is based on smart contracts. Validation nodes validate transactions. The validating nodes are assigned validation tasks, and the other validating nodes can audit the results of other validating nodes. The validation process is thereby efficient, but users need to trust the validator nodes. All nodes, user and validation nodes, need to be recognized by a DLT network membership service. Privacy is ensured toward other nodes, but the membership service will know the identity of all other nodes.
- **Quorum** is an Ethereum-based enterprise-focused DLT environment for smart contracts with improvements in the following areas: “network and peer permissions management, enhanced transaction and contract privacy, voting-based consensus mechanisms, and better performance,” as reported by the Blockchain Council. J.P. Morgan facilitated the creation of Quorum.
- **R3/Corda** is an open-source protocol developed especially for the financial industry by the R3 consortium established by major international financial institutions (Brown 2018; Hearn 2016). It can run both transaction accounts and smart contracts. Unlike other DLT solutions, it has only bilateral transaction histories and therefore no common transaction database. Transactions are validated by the sending and receiving nodes and specialized notary nodes. The task of the notary node is to hinder double spending. Validation is a rapid process. Participants need to trust the notary node(s). The notary node will see all transactions and its processing speed and accuracy will affect the network. Any security problems within the notary node can jeopardize the whole network. Because of its structure, it will require different kinds of backup solutions for sufficient resiliency compared with other DLT networks.
- **Sequence** is protocol provided by Chain (a private US company) for managing account balances based on tokens in a ledger-as-a-service environment.
- **Zilliqa** is a DLT protocol employed by the Anquan Capital (public company in Singapore) blockchain platform, and it is closely related to the Elastico DLT protocol. Both use “sharding” to share mining activities among subgroups of miners, which facilitate parallel processing. This feature increases the scalability of this protocol considerably to be close to linear with increased volumes.

References

- Ali, Robleh, John Barrdear, Roger Clews, and James Southgate. 2014. “The Economics of Digital Currencies.” *Bank of England Quarterly Bulletin* 54 (3): 276–86.
- Bank of Canada and Monetary Authority of Singapore (BOC and MAS). 2019. “Jasper-Ubin Design Paper: Enabling Cross-Border High Value Transfer Using Distributed Ledger Technologies.” Accenture, Dublin.
- Bank of Canada, Bank of England, and Monetary Authority of Singapore (BOC, BOE, and MAS). 2018. “Cross-Border Interbank Payments and Settlements: Emerging Opportunities for Digital Transformation.” KPMG Services Pte. Ltd.
- Brown, Richard Gendal. 2018. “The Corda Platform: An Introduction.” May 2018 (accessed March 2, 2019). <https://www.corda.net/content/corda-platform-whitepaper.pdf>.
- Committee on Payment and Settlement Systems (CPSS). 1996. “Settlement Risk in Foreign Exchange Transactions.” Bank for International Settlements, Basel.
- Committee on Payment and Market Infrastructures (CPMI). 2017. “Distributed Ledger Technology in Payment, Clearing, and Settlement.” Bank for International Settlements, Basel.
- Committee on Payment and Market Infrastructures. 2019. “Wholesale Digital Tokens.” Bank for International Settlements, Basel.
- Digital Asset Holdings LLC. 2016. “The Digital Asset Platform: Non-technical White Paper.” December 2016 (accessed on February 9, 2019).
- Galati, Gabriele. 2002. “Settlement Risk in Foreign Exchange Markets and CLS Bank.” *BIS Quarterly Review* (December).
- Hearn, Mike. 2016. “Corda: A Distributed Ledger.” November 29, 2016 (accessed on March 2, 2019).
- International Monetary Fund (IMF). 2018. “Belgium Financial System Stability Assessment.” Country Report No. 18/67, Washington, DC.
- International Monetary Fund (IMF). 2019a. “Australia Financial Sector Assessment Program: Technical Note—Supervision, Oversight, and Resolution Planning of Financial Market Infrastructures.” IMF Country Report No. 19/52, Washington, DC.
- International Monetary Fund (IMF). 2019b. “Fintech: The Experience So Far.” IMF Policy Paper, June, Washington, DC.
- International Monetary Fund (IMF). 2019c. “Singapore Financial Sector Assessment Program: Detailed Assessment of Observance—CPSS-IOSCO Principles for Financial Market Infrastructures.” IMF Country Report No. 19/255, Washington, DC.
- International Monetary Fund (IMF). 2019d. “Switzerland Financial Sector Assessment Program: Technical Note—Supervision and Oversight of Financial Market Infrastructures.” IMF Country Report No. 19/190, Washington, DC.
- International Monetary Fund (IMF). 2020. “Canada Financial Sector Assessment Program: Technical Note—Oversight of Financial Market Infrastructures and Fintech Development.” IMF Country Report No. 20/22, Washington, DC.
- Leinonen, Harry, and Kimmo Soramäki. 1999. “Optimizing Liquidity Usage and Settlement Speed in Payment Systems.” Bank of Finland Discussion Papers 16/1999, Helsinki.
- Nakamoto, Satoshi. 2008. “Bitcoin: A Peer-to-Peer Electronic Cash System.” (Accessed February 4, 2019).
- Society for Worldwide Interbank Financial Telecommunication (SWIFT). 2016. “SWIFT on Distributed Ledger Technologies: Delivering an Industry Standard Platform through Community Collaboration.” SWIFT SCRL, La Hulpe, Belgium.

DISTRIBUTED LEDGER TECHNOLOGY EXPERIMENTS IN PAYMENTS AND SETTLEMENTS

PART 1

Distributed Ledger Technology

PART 2

Experiments and Research

PART 3

Risk Management Issues

PART 4

Financial Market Standards

PART 5

Potential Impact on the
International Monetary System



PUBLICATIONS

Distributed Ledger Technology Experiments
in Payments and Settlements

NOTE/20/01

ISBN-13: 978-1-51353-633-0



9 781513 536330