ECB-UNRESTRICTED

EUROPEAN CENTRAL BANK
EUROSYSTEM

Thomas Lammer
Principal Expert Oversight Division

Directorate General
Market Infrastructure and Payments
European Central Bank

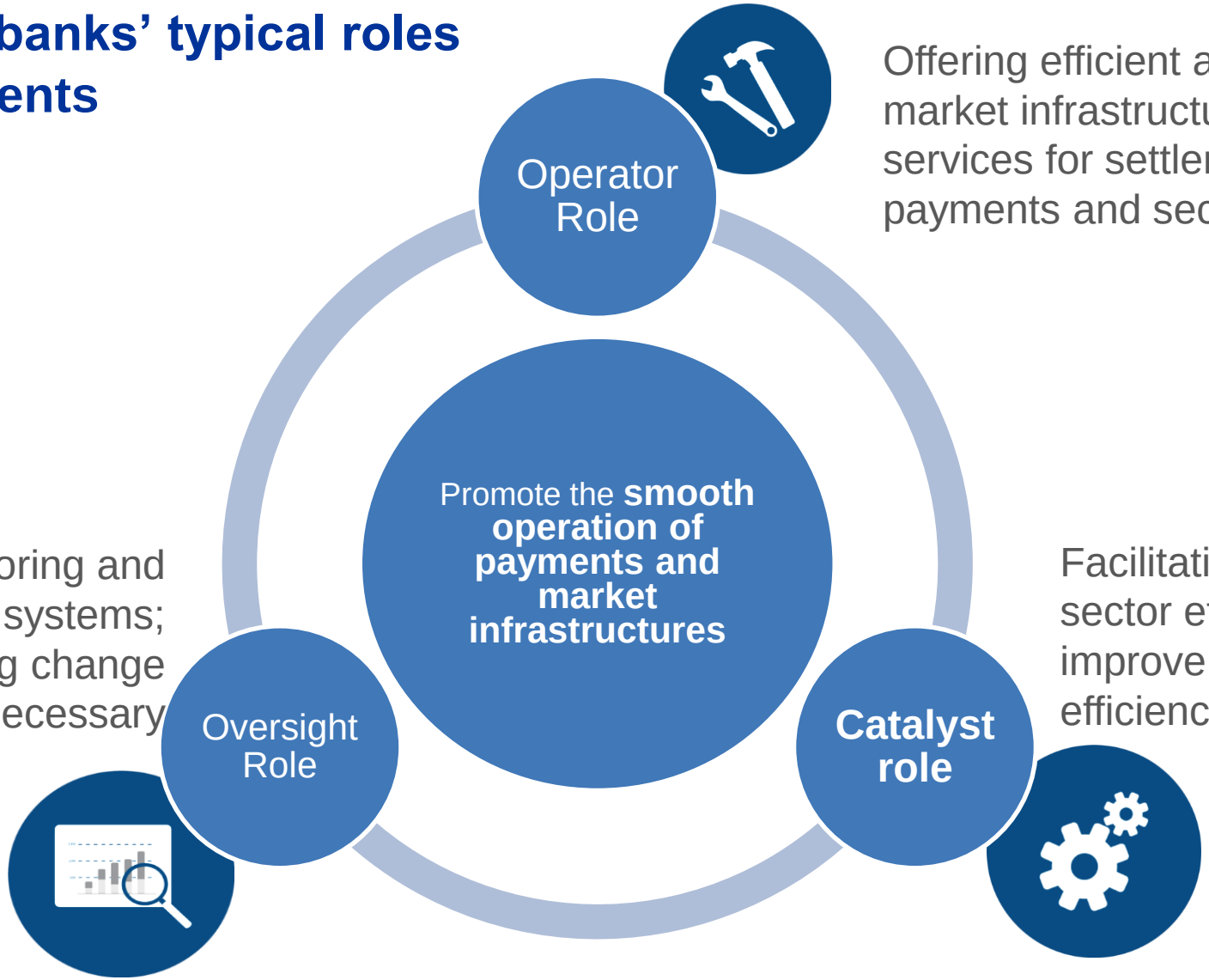
DLT use in payment infrastructures - a central bank/oversight perspective

FinSAC Conference on Fintech

Vienna, 23 March 2019

The views expressed are those of the speaker and do not necessarily reflect those of the ECB.

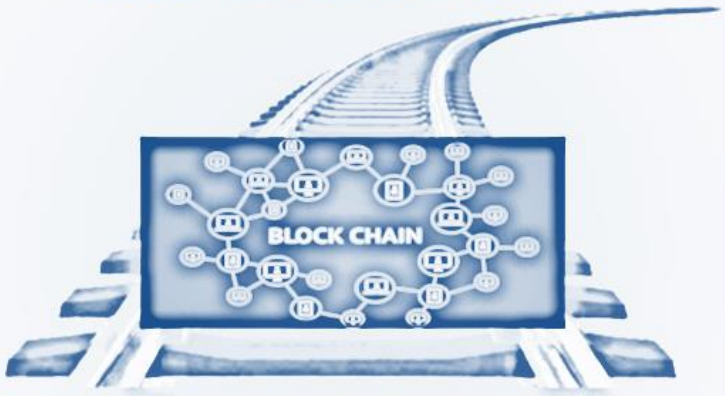
Central banks' typical roles in payments



www.ecb.europa.eu ©

Important to distinguish infrastructure from asset…

Infrastructure



Blockchain / Distributed Ledger Technologies

Asset

Payment tokens, digital/virtual currencies, crypto assets

www.ecb.europa.eu ©

…and the hype from reality

> […] blockchain is becoming the 5G of the payment industry. As more blockchain-based payment networks and fiat-backed digital currencies […] emerge, experts and analysts are predicting a sea change for the financial services industry.

COMPUTERWORLD
Mar 25, 2019

> Blockchain is not a disruptive technology […, it] is a foundational technology, like electricity and the internet, whose transformational impact takes much longer – decades rather than years.

THE WALL STREET JOURNAL
Jan 20, 2017

www.ecb.europa.eu ©

1 **Infrastructure layer: Eurosystem perspective**

2 **Asset layer: crypto assets, payment tokens**

3 **Explorations of standard setting bodies**

4 **Conclusions**

The Eurosystem and DLT innovation

Operational role

Eurosystem operates two of the world's largest market infrastructure services (TARGET2 and TARGET2-Securities) and recently launched TIPS

DLT cannot be the solution today but benefit of possible future use is being explored.

Catalyst role

Facilitation of market actors' work on standardisation and interoperability / counter risk of DLT silos and proprietary solutions

Coordinated efforts are necessary to harmonise new business processes at the industry level and with public authorities

Oversight role

Assess the need to adapt oversight approach in view of innovative developments

Assess possible impact of DLT adoption on overseen entities and their business models

www.ecb.europa.eu ©

ECB test lab

Experimental work with blockchain / DLT (to date: Hyperledger, Corda, Ethereum, elements)

Work within EU central bank community:

- **DLT learning tool** for EU central banks established in March 2018 (first version based on Hyperledger / cloud-based)
- World's first **DLT network** between a larger group of central banks
- **Hackathons** with the EU central bank community conducted to explore possible use cases

Launched in December 2016 to study the possible use of blockchain for market infrastructures.

2 reports published (09/2017, 03/2018):

- **Relative immaturity of the technology**, DLT is not a solution for large-scale payment services like BOJ-NET and TARGET2 at this stage of development
- From a conceptual and technical viewpoint – the **settlement of securities against cash can work in a DLT environment** - further analysis on safety and efficiency including legal aspects is warranted

www.ecb.europa.eu ©

DLT from an oversight perspective

- **Challenge of distributed ledger technology: oversight principles and FMI regulation predate DLT**
  - Centralised systems and centralised governance under a responsible operator are two premises on which regulation and oversight is conducted today
  - The use of new technologies might create new sources of risks that are not yet included in the scope of existing oversight principles.

- **Particular areas of attention:**
  - Legal basis: legal underpinning for services that avoid relying on a central party
  - Governance: allocation of responsibilities and decision making
  - Settlement finality: accommodation of consensus based settlement that is probabilistic
  - Operational risk: scalability, latency, cyber-resilience

www.ecb.europa.eu ©

1 **Infrastructure layer: Eurosystem perspective**

2 **Asset layer: crypto assets, payment tokens**

3 **Explorations of standard setting bodies**

4 **Conclusions**

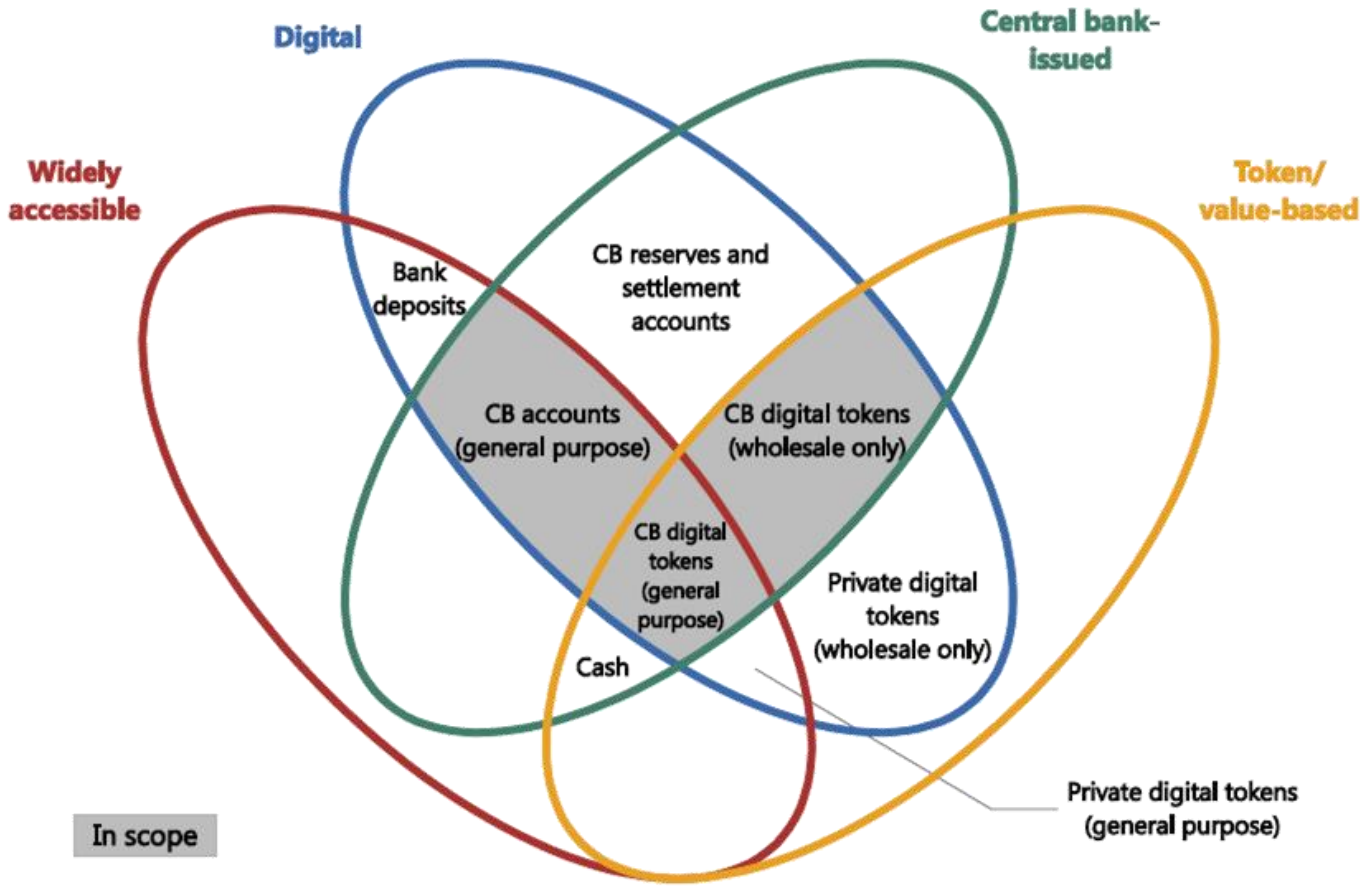
Virtual currencies / crypto assets / payment tokens

https://www.ecb.europa.eu/pub/pdf/other/virtualcurrencyschemes201210en.pdf
https://www.ecb.europa.eu/pub/pdf/other/virtualcurrencyschemesen.pdf
https://www.ecb.europa.eu/pub/pdf/scpops/ecb.op223~3ce14e986c.en.pdf?f2e9a2596a8f9c38c95f4735c05a0d47

Chart source: xe.com

www.ecb.europa.eu ©

Taxonomy of central bank digital currency



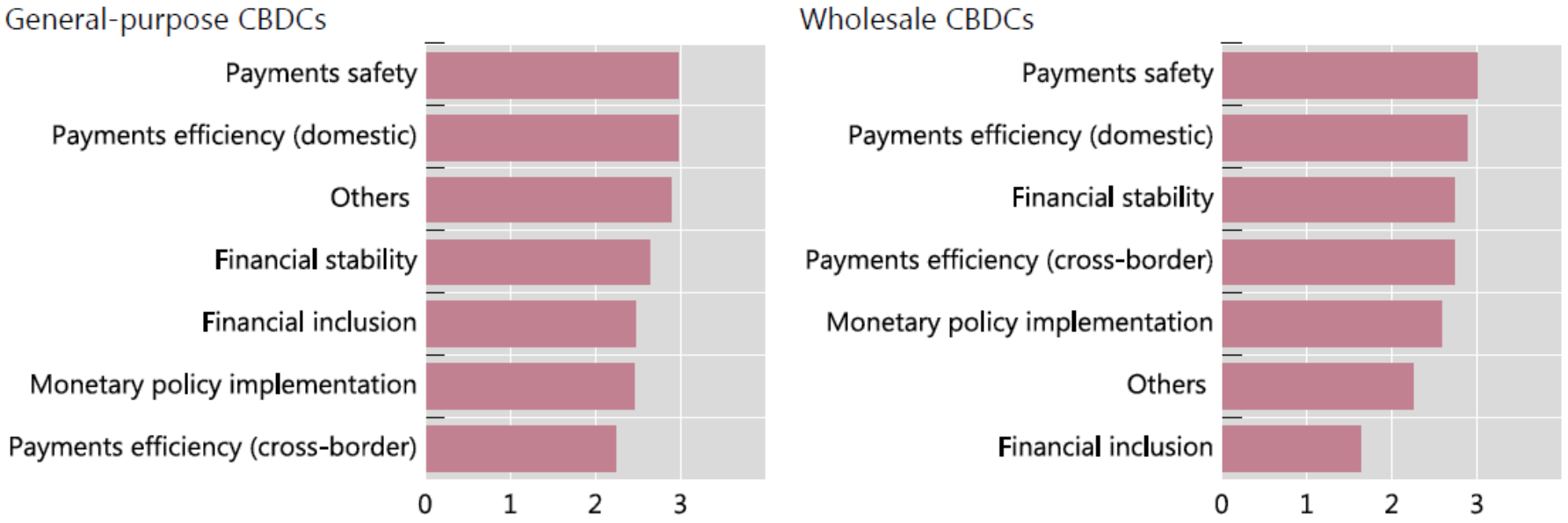
The Venn diagram illustrates the four key properties of money: *issuer* (central bank or not); *form* (digital or physical); *accessibility* (widely or restricted); and *technology* (account-based or token-based). CB = central bank. *Private digital tokens (general purpose)* include cryptocurrencies, such as Bitcoin. For examples of how other forms of money may fit in the diagram, please refer to the source.

Sources: CPMI-MC (2018); Bech and Garratt (2017).

Motivations for issuing a CBDC

Motivations for issuing a CBDC, ranked in order of importance

Score[1]

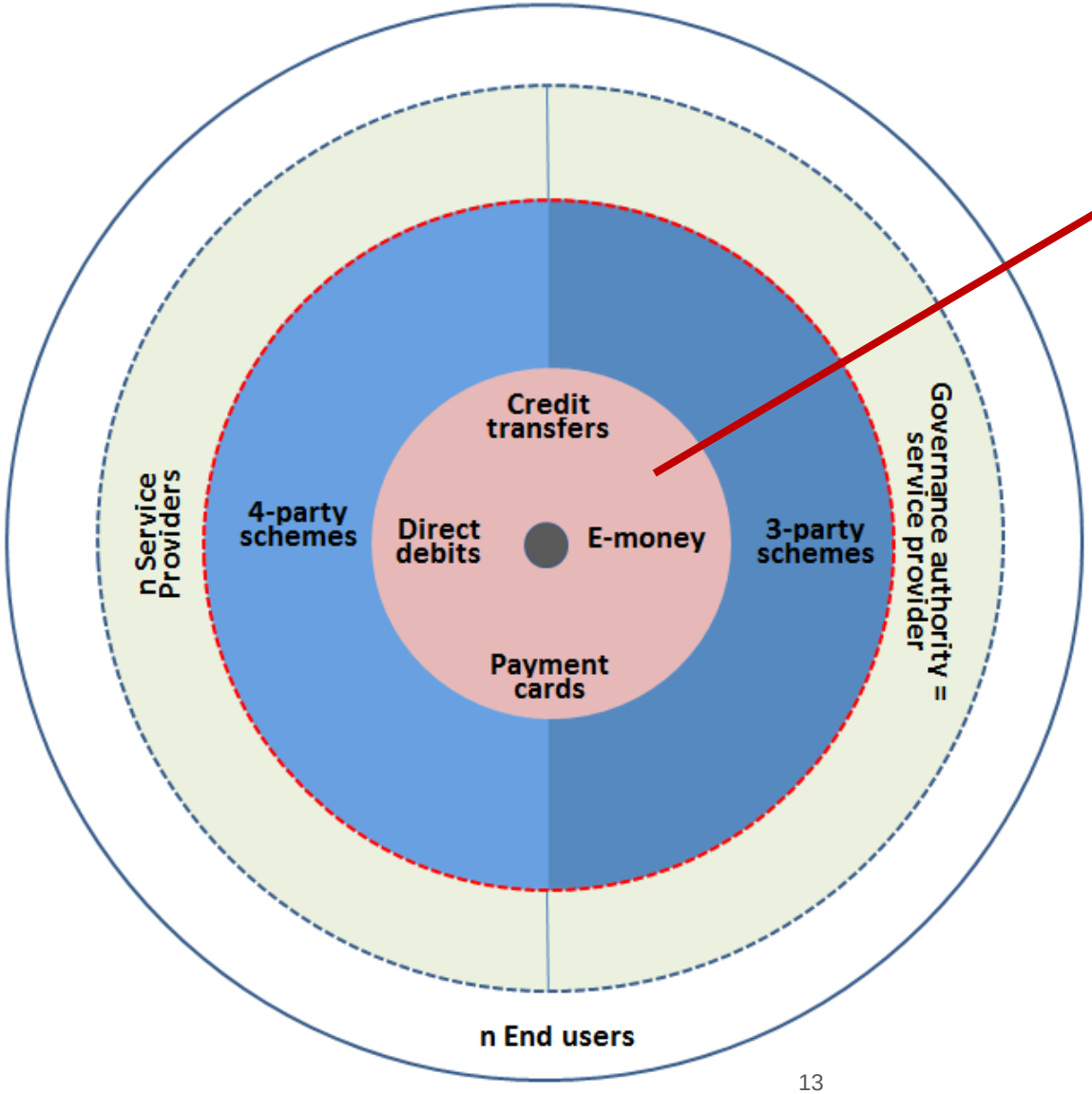


[1] The score is calculated as an average of the options: "Not so important" (1), "Somewhat important" (2), "Important" (3) and "Very important" (4).

Source: Central bank survey on CBDCs.

Source: BIS, 2019

Crypto assets/payment tokens from an oversight perspective



Overseers to assesses their oversight frameworks whether it [should] cater[s] for payment tokens

www.ecb.europa.eu ©

1 **Infrastructure layer: Eurosystem perspective**

2 **Asset layer: crypto assets, payment tokens**

3 **Explorations of standard setting bodies**

4 **Conclusions**

CPMI Working Group on Digital Innovations and Currencies

- Established in **February 2016** to assess the :
  - ***potential impact on the financial market infrastructure***
  - ***potential impact on central bank functions***

Development of an **analytical framework** (February 2017) to understand and analyse the implications of innovative technology for payments, clearing and settlement

CPMI-Markets Committee joint report on **central bank digital currencies** (March 2018)

Further work underway, including on ***wholesale digital currencies, legal aspects*** and ***cross-border issues***

www.ecb.europa.eu ©

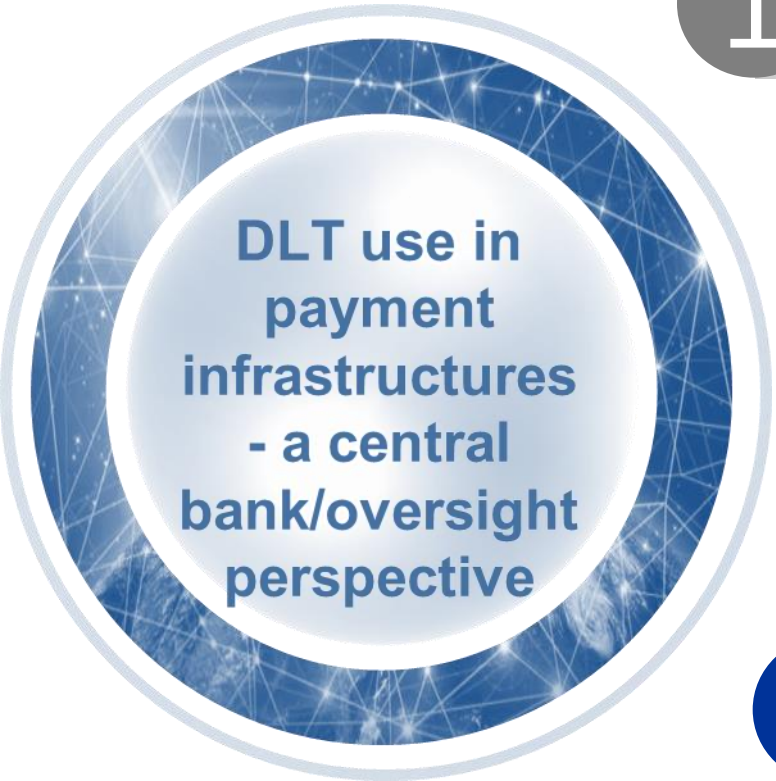
Analytical framework for DLT in payment, clearing & settlement

- Guidance on **understanding the arrangement (scope)**
  - Functionality and nature of the arrangement
  - Key factors for an effective implementation
- Potential implications for **efficiency, safety and the broader financial markets**

Efficiency	Safety
Speed of end-to-end settlement Costs of processing Reconciliation (speed, transparency) Credit and liquidity management Automated contract tools	Operational and security risk Settlement issues Legal risk Governance Data management and protection
Broader financial market implications	
Connectivity issues and standards development Financial market architecture (actors, markets, regulators) Broader financial market risks (micro- and macro-level)	

Source: BIS, 2017

www.ecb.europa.eu ©



1 **Infrastructure layer: Eurosystem perspective**

2 **Asset layer: crypto assets, payment tokens**

3 **Explorations of standard setting bodies**

4 **Conclusions**

Conclusions

1 MONITOR

The ECB monitors innovation to safeguard the payment system against fragmentation and new risks

2 UNDERSTAND

Central banks need to understand DLT and other technological innovations to assess its impact, being mindful of hype

3 EXPLORE

The ECB explores ways to take advantage of innovation in the fulfilment of its mandate, both via internal experimentation and by leveraging collaboration with market stakeholders and other public authorities

4 COOPERATE

Further need for cooperation and coordination of central banks and regulatory authorities (at the national and international level)

Conclusions

1 EVALUATE

need to evaluate the suitability of oversight standards as regards market developments

2 RETHINK

possible need to rethink certain concepts (settlement finality, DvP, liquidity risk management)

3 INNOVATE

e.g. “observer nodes” could enable direct monitoring of new arrangements and facilitate oversight activities, whilst possible creating moral hazard

4 BALANCE

avoid creating a competitive advantage for disrupters compared to traditional infrastructures by applying less stringent standards

Thomas Lammer
Principal Market
Infrastructure Expert

E: thomas.lammer@ecb.int

ANNEX

Report 1
Payments

Main findings

In-depth experiments on whether specific liquidity-saving mechanisms of RTGS could be run on DLT *(Hyperledger)*, published (09/2017):

performance

Current performance needs of RTGS system (ca. 10-70 requests/second) can be processed without difficulty

Liquidity-saving mechanisms (smart contract) not a major factor for latency (adding 0.01-0.02 seconds)

DLT performance is affected by distance between nodes

availability

DLT solutions were found to be resilient to the failure of individual network nodes

Validating nodes mostly recovered in less than 30 seconds

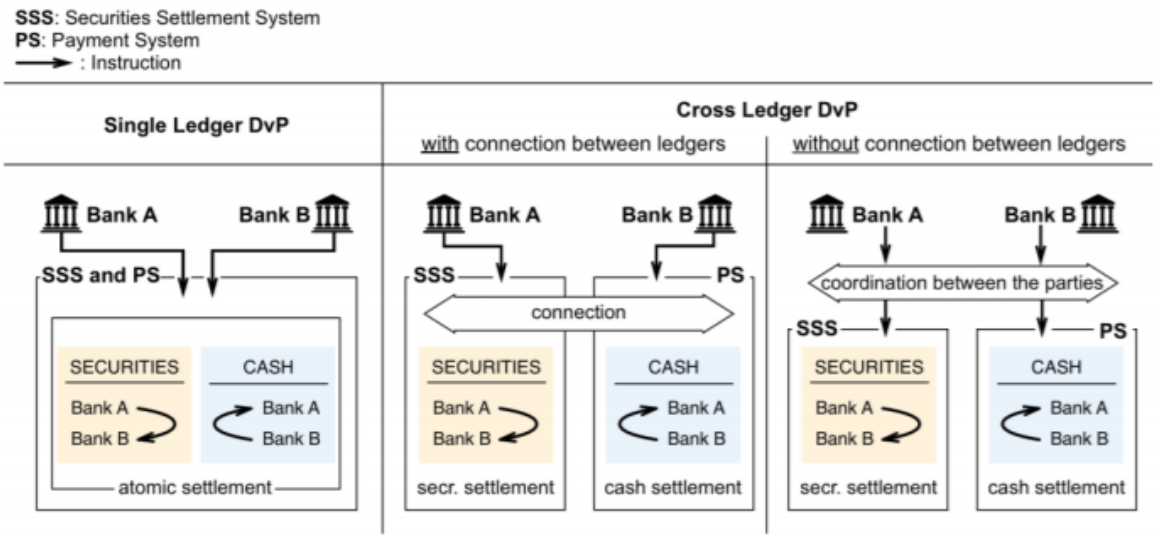
DLT solutions were found to be resilient to incorrectly formatted messages; latency remained between 0.5 and 1 second

www.ecb.europa.eu ©

Report 2
Securities

Main findings

Conceptual analysis and experiments on how Delivery-versus-Payment could be conceptually designed and operated on DLT (Hyperledger, Corda, elements), published (03/2018):

DLT offers a new approach for achieving DvP between ledgers, which does not require any connection between ledgers (cross-chain atomic swaps)

This new interoperability approach however entails complexities (e.g. higher liquidity needs) and possibly also additional risks