Agenda item 1: General business cases for DLT

Background: members of the NTW-CG were invited to report on business cases in the payments, securities, and collateral management domains where DLT could make a difference compared to non-DLT settlement systems. In line with the purpose of the Eurosystem exploratory work, members were asked to preferably report on business cases relevant for wholesale payments and financial market transactions that are related to central bank money settlement.

With the NTW-CG's purpose of acting as a sounding board, such information sharing helps giving a better understanding of cases in which DLT specifically makes a difference, what the merits of DLT are and illustrating business cases that could be relevant for trials/experiments.
Inviting members to report on general business cases aims at information and idea sharing among members and with the interested public. The invitation does not constitute an endorsement by the Eurosystem.

3rd NTW-Contact Group meeting

07/09/2023

DvP Repo Trigger Chain Proposal

ECB NTW-CG Working Group

7 September 2023

Agenda

- HQLA^X Overview
- DvP Repo
- Impact of DLT
- Trigger Chain Solution
- Q&A
- Glossary

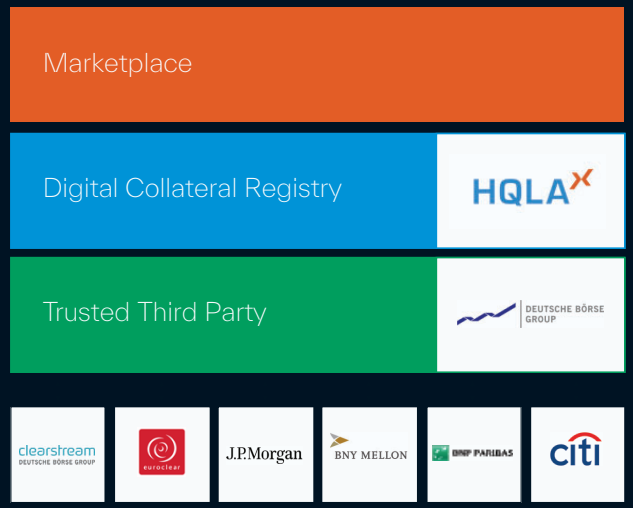
Who are HQLA^X

HQLA^X is an innovative financial technology firm that leverages Distributed Ledger Technology (DLT) to bring game-changing efficiencies to the securities finance and repo industry.

Our core clients are banks and asset managers active in the global securities finance and repo markets, and our unique platform enables market participants to execute frictionless, precise and real-time transfer of ownership of securities.

Guido Stroemer
Co-founder & CEO

Platform



- Trade execution
- Record of ownership of securities
- Holds securities at triparty agents and custodians on behalf of participants
- Triparty agents and custodians

DvP Repo

DEFINITION

- **Repo:** transaction in which one party sells an asset to another party at one price and commits to repurchase the same asset from the second party at a different price at a future date
- **Delivery versus payment (DvP):** the buyer's cash payment for securities must be made prior to or at the same time as the delivery of the security

PURPOSE

- Facilitates liquidity movements across the financial system between cash providers to cash borrowers
- Cash borrowers benefit from secured funding
- Cash providers benefit from secured investments

SIZE

- €19.7 trillion global market in which financial institutions deliver collateral vs. cash (Q4 2022)[1]

1. Source: Global Data Providers: Finadium, ISDA, S&P Global

Impact of DLT

CURRENT

Cash borrowers manage intraday liquidity needs using **overnight** repo as a minimum term

This results in increased funding costs, balance sheet, and required capital

WITH DLT

DLT allows for a new **intraday** repo market in the Eurozone, with access to liquidity at precise moments in time

BENEFITS

- New functionality in the market
- Reduced funding costs, balance sheet, and required capital from borrowing cash intraday to the nearest minute
- Reduced risk from synchronized DvP settlement in central bank money
- Incremental yield opportunity for intraday cash providers

HQLA^X & Deutsche Börse Proposed Use Case

PROPOSAL

Connect HQLA^X to the Bundesbank's Trigger Chain Solution

- HQLA^X to connect as an Asset Chain (eligible DLT platform)
- Clearstream International to act as Trusted Third Party (TTP) as they are in the HQLA^X model today
- Deutsche Börse to act as Transaction Coordinator (Interoperability Mechanism) and connect its platform to the Trigger Chain and HQLA^X platform

PROVEN SUCCESS

Proof of concepts conducted in DvP repo with HQLA^X and cash ledgers demonstrate successful interoperability

(1) J.P. Morgan / HQLA^X

HQLA^X, J.P. Morgan, Ownera and Wematch Demonstrate a Cross-Ledger Repo

October 06, 2022 05:00 AM Eastern Daylight Time

LUXEMBOURG--(BUSINESS WIRE)--HQLA^X, J.P. Morgan, Ownera and Wematch have successfully demonstrated the technical feasibility of executing a delivery-versus-payment (DvP) repo transaction across two different distributed ledger technology (DLT) platforms at HQLA^X and J.P. Morgan.

Interoperability across distributed ledger platforms is paramount for broad market adoption of DLT in the securities finance industry

Tweet this

The demonstration showed how rights to securities, recorded in digital collateral records (DCRs) on the HQLA^X ledger, and digital cash, recorded at J.P. Morgan, could be recorded and transferred using two different DLT platforms. The simulated transaction was negotiated in the Wematch trading front-end. Ownera connected Wematch and the two distributed ledgers using the open-source FINP2P routing protocol, ensuring the visibility of assets in Wematch, and coordinating the DvP settlement across the HQLA^X and J.P. Morgan platforms.

Guido Stroemer, Co-founder and CEO of HQLA^X, said, "Interoperability across distributed ledger platforms is paramount for broad market adoption of DLT in the securities finance industry. This test demonstrates not only the technical feasibility for interoperation across ledgers, but it also highlights the spirit of industry-wide collaboration."

Ami Ben-David, Co-founder and CEO of Ownera, said, "This project is an important milestone for the industry. Our role in it is to serve as a neutral layer, seamlessly interconnecting the various platforms using open-source interoperability specifications to facilitate market collaboration and liquidity."

Scott Lucas, Head of Markets DLT, J.P. Morgan said, "Collaboration and interoperability between platforms will be key to enhancing the liquidity of tokenized assets across the market. This is another step on that pathway."

Joseph Seroussi, CEO & Co-founder of Wematch.live, said, "After years of hard work and massive investments from banks and tech companies, blockchain is moving from the labs to the Street. The industry is ready to adopt this game-changing technology and unleash the efficiency of DLT in traditional finance. We thank our partners J.P. Morgan, HQLA^X and Ownera for including us in this project."

(2) Fnality Payment System / HQLA^X

HQLA^X and Fnality deliver cross-blockchain repo swap pilot

HQLA^X & Deutsche Börse Trigger Chain Solution

DELIVERY OF SECURITIES

1. Collateral Provider and Collateral Receiver agree on the exchange of Eligible Assets against EUR in the Asset Chain
2. Securities are allocated from the custodian network into accounts held with Trusted Third Party and linked to a Digital Collateral Record (DCR)
3. The DCR is then reserved pending the settlement of the payment

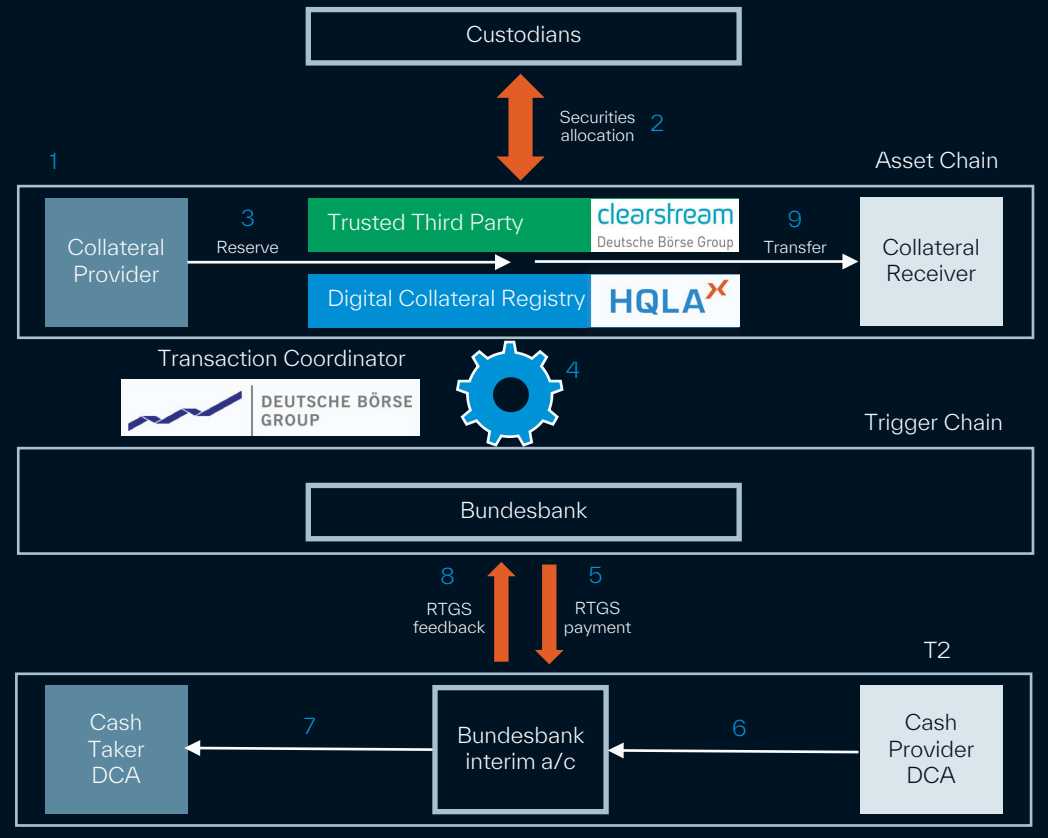
PAYMENT INSTRUCTION

4. Using the Transaction Coordinator (Interoperability Mechanism), a Payment Instruction will be created through a smart contract in the Trigger Chain
5. The Bundesbank converts the Payment Instruction in the Trigger Chain into ISO 20022 messages and submits them via ESMIG to T2 / RTGS
6. A direct debit is sent to the Network Service Provider in T2 in order to debit the cash provider's RTGS DCA and credit an interim account of the Bundesbank
7. A credit transfer is sent via the Network Service Provider to T2 in order to debit the interim account of the Bundesbank and credit the cash taker's RTGS DCA

OWNERSHIP TRANSFER

8. Information on the successful or failed settlement on the RTGS DCAs will be sent to the Trigger Chain
9. The status of the Payment Instruction is transferred to the Asset Chain where the assets are finally transferred

HIGH-LEVEL FLOW



Delivery vs Payment
Exchange of ownership
DCR on HQLA^X vs EUR in T2 / RTGS

HQLAˣ

Q&A

Glossary

- **Asset Chain:** eligible market DLT operator in which exchange of securities takes place
- **Trigger Chain:** DLT infrastructure which acts as technical bridge between T2 / RTGS and Asset Chain
- **Interoperability Mechanism:** facilitates information exchange between Asset Chain and Trigger Chain
- **Transaction Coordinator:** interoperability mechanism provided by Deutsche Börse to facilitate DvP process
- **ISO 20022:** standard for exchanging electronic messages across the financial system
- **Network Service Provider:** provides access to ESMIG
- **ESMIG (Eurosystem Single Market Infrastructure Gateway):** provides a single access point for external inbound and outbound communication to TARGET services, including T2
- **T2:** RTGS system of the Eurosystem in which payments are processed and settled in central bank money
- **RTGS (Real-Time Gross Settlement):** continuous (real-time) settlement of funds or securities transfers individually on an order-by-order basis with intraday finality (without netting)
- **DCA (Dedicated Cash Account):** participant's cash account in the RTGS system

onyx by J.P.Morgan

Digital Financing Overview

September 2023

DLT-based solutions have the potential to unlock ecosystem-wide efficiencies

Across capital markets and asset life-cycles, there are numerous pain-points shared among stakeholders

Pain points of traditional infrastructure	DLT-enabled solutions
Settlement / counterparty risk	Atomic settlement
Data siloes between parties	Increased transparency
Manual processes	Cost reduction via automation
Many intermediaries involved	Increased efficiency

Digital Financing on Onyx Digital Assets - Overview

Digital Financing is an application that provides access to secured financing through the exchange of cash for tokenized collateral. Settle repo transactions within minutes using smart contracts to position cash and tokenize collateral prior to trades - reducing settlement and counterparty risk.

Access to liquidity with real-time transaction settlement, reporting, and active intraday liquidity management

Atomic settlement through delivery-vs-payment enables the real-time simultaneous transfer of cash and collateral ownership

Programmable trade terms increase control and certainty of settlement and maturity timelines

Real-time transparency of trade lifecycle

Automated settlement and maturity of intraday repo trades thereby reduces settlement risk and timeline

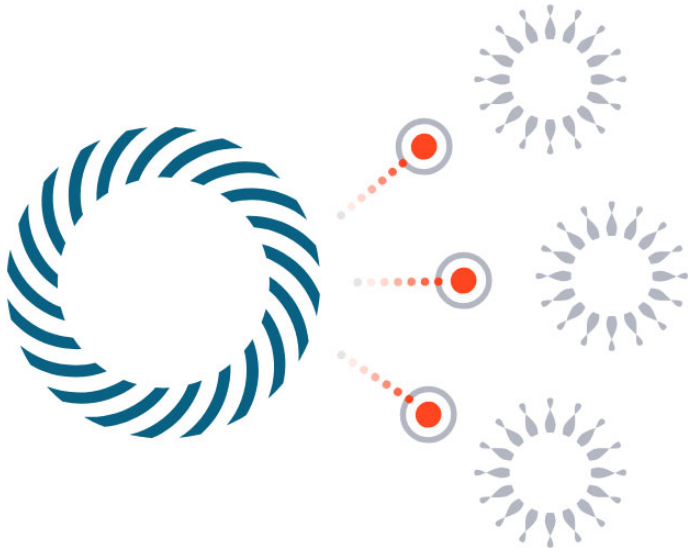
Interest accrues based on actual usage down to the minute

https://www.jpmorgan.com/onyx/digital-financing.htm

Digital Financing Benefits

Digital Financing can help **borrowers:**

- Efficiently manage cash needs by obtaining secured intraday liquidity with expanded operating hours
- Tailor financing arrangements to changing demands by adjusting the settlement and maturity windows



Digital Financing can help **lenders:**

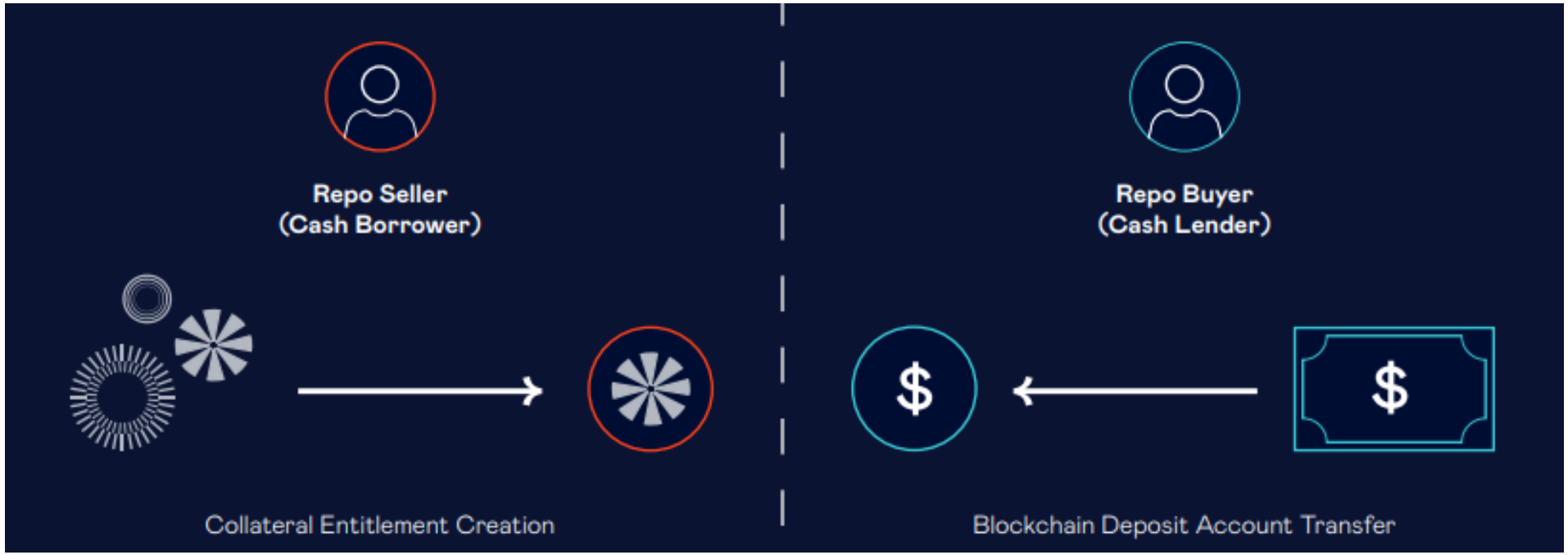
- Tap into a new channel of borrowers seeking secured financing arrangements
- Invest capital within flexible operating hours with the option to fine-tune transaction timing and track assets across custodians – all using a single platform

https://www.jpmorgan.com/onyx/digital-financing.htm

Digital Financing – Case Study

For details of a case study on how Digital Financing helped a Global Financial Institution and details of how it works please visit:

https://www.jpmorgan.com/onyx/documents/Onyx-Digital-Financing_case_study.pdf



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onyx by J.P.Morgan

What is the **objective/purpose** of the business case?

FNALITY

Fnality – Presentation to NTW-CG – DLT Use Cases

7 September 2023

Presenter:

Josh Sadler – Fnality International Director of Regulation

Fnality At-A-Glance

Company Overview

- Founded in May 2019 to create a network of decentralised Financial Market Infrastructures (dFMIs) to deliver the means of payment-on-chain in wholesale banking markets
- Backed by a consortium of global financial institutions: 14 banks, 2 Financial Market Infrastructure companies, 1 buy-side firm, across Fnality's initial target jurisdictions
- Headquartered in London

What We Do

We are developing peer-to-peer payment systems, underpinned by DLT, across key currency jurisdictions, beginning with USD, EUR, GBP.

Fnality Global Payments will enable instant settlement, cross-border and near 24/7, for wholesale payments, Payment vs Payment (PvP) and Delivery vs. Payment (DvP) transactions

Our solution will reduce credit, settlement and liquidity by enabling atomic settlement in a settlement asset backed 1-1 to fiat currency held directly in a Central Bank reserve account.

Founding Investors

BARCLAYS
BNY MELLON
CIBC
COMMERZBANK
ING
KBC
LLOYDS BANK
MIZUHO
MUFG
Nasdaq
Santander
SMBC
STATE STREET
UBS
euroclear
NOMURA
[undisclosed buy side investor]

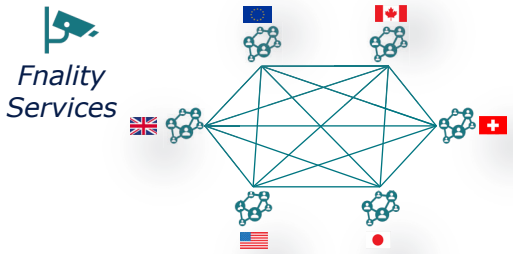
Fnality Ecosystem

Fnality Payment System

Fnality Payment System (e.g. £FnPS)

Enables near-instant peer-to-peer settlement in a digital cash asset

Fnality Global Payments

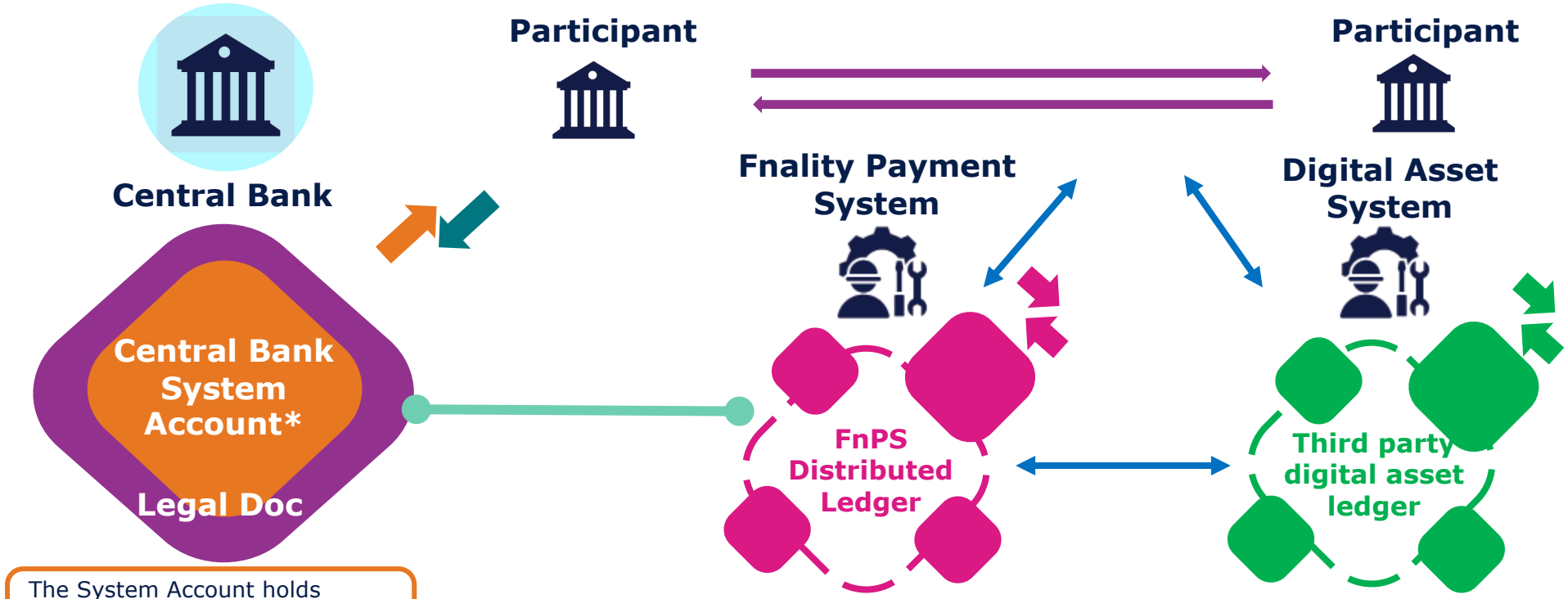


Interoperable network of FnPS, enabling near-instant cross-border settlement

Fnality and Other Settlement Systems

Interoperable with any legacy or DLT-based business application

How it works



The System Account holds participants' funds to use for payments.

The legal documentation ensures participants' legal entitlement to their share of funds.

Participants **pre-fund** by paying into the System Account from their own RTGS account

System Account balance vs. distributed ledger recording: **maintenance of 1:1 correspondence** at all times.

Distributed ledger records entitlement of each Participant, updated constantly as transactions occur between participants

The ledger updates but the overall System Account balance remains the same, unless participants defund back to their own RTGS account

Interoperability with third party digital asset ledger and atomic settlement ensures instant update of each ledger to record transfer of digital asset ownership and corresponding transfer of funds.

What are the issues the Fnality business case would address?

FNALITY

For traditional financial markets

For emerging De-Fi markets

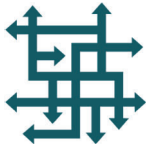
1 Disjointed and intermediated processes

- Slow and inefficient due to **intermediary layers**
- **$100bn of 'pure complexity costs'** estimated in post-trade[1]

2 Fragmented pools of liquidity

- **$10-30bn intraday liquidity requirements** for a large bank[2]

3 Complex and costly risk management



- **Credit** and **counterparty** risk (CCR), as well as **FX** risk

4 Payment leg for tokenised markets

- Future financial markets need **credible and trustworthy** methods of **payment on-chain**

5 Extraction of value from de-fi markets

- Future financial markets will also need a foundational, **regulated trust-layer** to bridge the current divide

1. Accenture, Banking on Blockchain
2. Oliver Wyman, Intraday Liquidity

What are the opportunities the Fnality use cases could create?

FNALITY

For traditional financial markets

For emerging De-Fi markets

1 Reduces reliance on intermediaries

- Reduces single points of failure through **peer-to-peer transfer of cash** and a **distributed, resilient system**

2 Enables single pool of liquidity

- **Interoperable** with legacy systems and other DLT
- **Single balance** for payment, PvP and DvP transactions

3 Lower risk

- Settlement finality in **central bank** funds
- Peer to peer with **T+0** settlement times, and **24/7 availability**

4 Enabling tokenised markets

- Settlement finality on-chain in a **central bank money backed** asset

5 A foundation for trad-fi /de-fi convergence

- An **institutional grade**, regulated trust layer, opening up a new world of **value-add services** for both trad-fi and de-fi markets

How would the core capabilities of Fnality's DLT Ecosystem overcome the issues?

FNALITY

Programmable Cash

- Smart contracts are deployable to enable additional business logic on-chain
- Empowers development of emerging financial markets

HQLA Characteristics

- Settlement asset represents funds held directly in a central bank account
- Minimises credit risk & maximises balance sheet management capability

Instant atomic settlement

- Legal settlement finality achieved in seconds - including on a cross border basis -due to robust legal and technical framework

24/7 Availability

- Fnality Payment Systems aim to operate 24/7 - payments could be made between participants outside of RTGS operating hours

Interoperability

- The Fnality Ecosystem is interoperable both with DLT platforms and legacy infrastructure
- Foundation for the convergence of traditional finance and decentralised finance applications

Benefits of DLT usage vs traditional infrastructure

Key objective for Fnality is to deliver unprecedented levels of payments infrastructure availability and operational resilience.

To achieve this, Fnality harnesses distributed ledger technology (DLT), which significantly enhances the resiliency for two reasons:

1) Simplification of the Settlement Model:

Introduction of a peer-to-peer settlement model: Simpler than the intermediated model and simplicity has the benefit of increasing resilience

2) Resilience

Resilience comes from having many alternative redundant services, operated by different stakeholders, implemented in diverse technologies, performing the tasks necessary for the system to function.

There are three primary reasons why decentralisation will ultimately result in greater resilience:

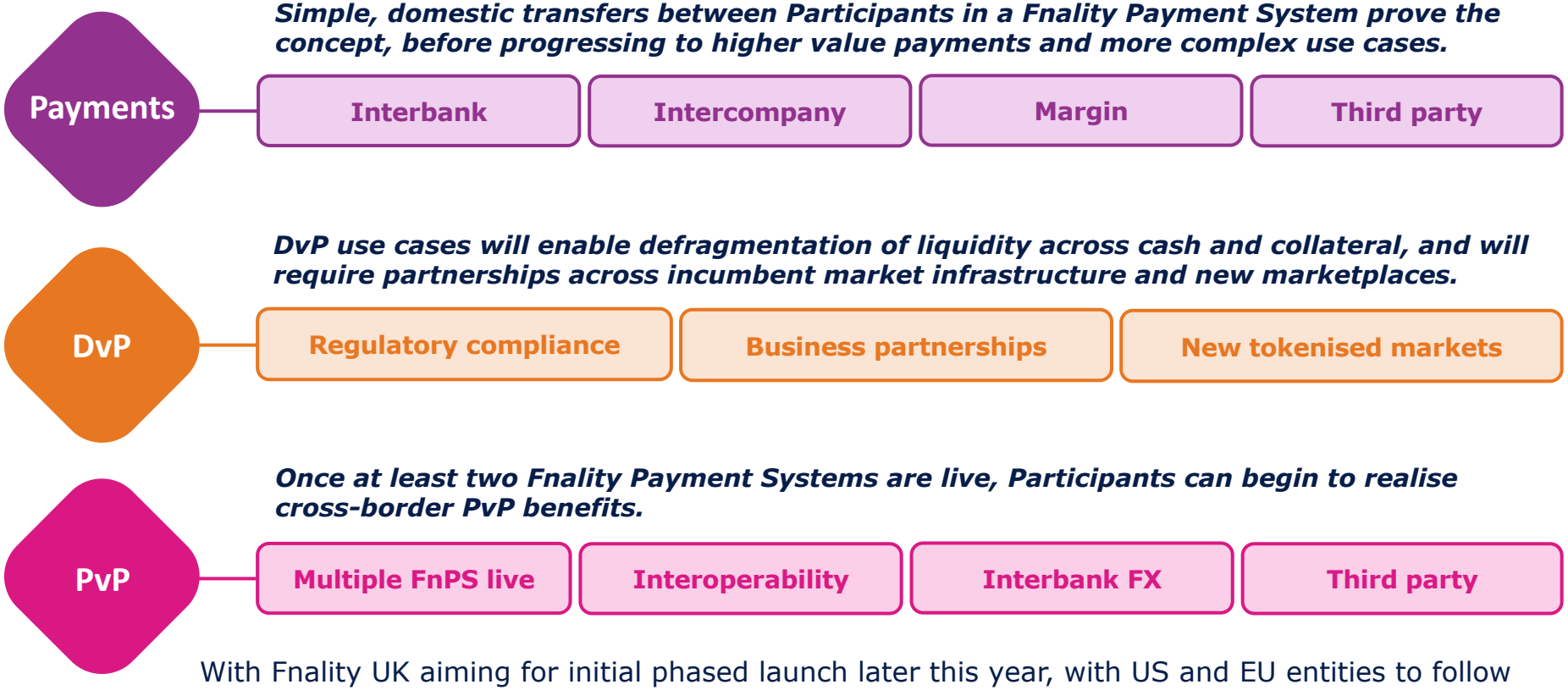
- Fault Tolerance: The distributed nature of DLT is intrinsically resistant to faults by having no single point of failure. Fault tolerance is further enhanced by the diversity of the nodes not only in terms of location, but also in other areas such as operating system, software implementation, and system operator.
- Attack Resistance: The Fnality Payments private DLT model* in contrast can continue normal operation even in the presence of malicious colluding nodes, provided that less than a third of validator nodes are compromised.
- Collusion Resistance: The DLT model of Fnality Payments involves the transparent and independent validation, execution, and storage of transactions by diverse peers on the network, hence the ledger is innately resistant to tampering and unauthorised transactions due to requiring a consensus of over two-thirds of validator nodes.

(*) FnPS is underpinned by a private permissioned blockchain network: Nodes may only be operated by permissioned, admitted FnPS participants (i.e. highly regulated financial institutions).

We have developed a strategic Use Case roadmap

Fnality Global Payments introduces a new form of distributed financial market infrastructure with the potential to fundamentally change how wholesale markets function.

Use cases are key in demonstrating how Fnality Payment Systems will be used post go live. The prioritisation of these use cases align to a natural sequence of complexity.



With Fnality UK aiming for initial phased launch later this year, with US and EU entities to follow (subject to regulatory approval), PvP and DvP in multiple currencies becomes possible.

Indicative list of potential Use Cases leveraging Fnality's core capabilities*

FNALITY

Payment vs Payment (PvP)

Intraday FX Swaps

A DLT platform for interbank intraday FX swaps, enabling bank treasurers to better manage their balance sheet.

- Enables intraday FX swaps
- Improved balance sheet management
- Optimises capital buffer assets

Treasury

Cash Management

Single currency payments (P)

Cross-Border Payments

DLT-based payments orchestration platform delivering benefits of DLT to corporates for cross-border payments.

- Predictable and transparent corporate payment processing
- Real-time visibility
- Reduces credit risk

Cash Management

Treasury

Margin Call Payments

Fnality-enabled new method to facilitate initial and variation margin payments for centrally cleared and bilateral activity

- Efficiency of collateral substitution
- Optimise liquidity usefulness
- Improve recoverability and resolution

Capital Markets

Cash Management/ Treasury

Delivery vs Payment (DvP)

Securities Settlement

An atomic DvP settlement model for tokenised securities settlement across interoperable systems

- T+0 DvP settlement
- Reduces settlement and replacement risk
- Supports adoption of tokenised markets

Securities Services

Capital Markets

Securities Issuance

A platform that digitises the issuance and administration of financial instruments, streamlining structuring, issuance, and settlement

- T+0 structuring, issuance, and settlement of financial instruments
- Interoperable DvP

Capital Markets

Securities Services

Intraday Repos

Enables market participants to transfer ownership of securities seamlessly across disparate collateral pools via near-instant DvP settlement

- Near-instant DvP settlement
- Reduces intraday liquidity requirements
- Reduction in fails

Treasury

Securities Services

** New use cases subject to relevant regulatory approval*

Why are these use cases relevant for the purpose of the Eurosystem exploratory work?

- Assuming market interest in the use cases outlined, the Eurosystem exploratory work could prove a valuable avenue to explore the practicalities of their adoption in the EU.

- In the context of a Eurosystem DLT trial/experiment, depending on timings Fnality could potentially interface between an EU central bank DLT solutions and third party digital asset provider for a trial/experiment, providing transaction processing and enhanced payment functionality (e.g. atomic settlement, smart contracts).

- Depending on the stage of development and international regulatory views, Fnality could potentially provide the £GBP leg (and ultimately the $USD leg) for a PvP trial / experiment in due course.

- We'd be happy to discuss interest from digital asset providers in collaboration on Eurosystem trials/experiments, as well as explore with EU central banks how Fnality's business case could interact with their DLT interoperability solutions.

Questions?

Regulated Liabilities Network (RLN) Project overview

HSBC

PUBLIC

What is the Regulated Liability Network?

The regulated Liability Network (RLN) is positioned as a FMI, operating a shared ledger with central bank money, commercial bank money and electronic money on the same chain. It has number of partitions for each regulated entity to be able to store its labilities.

Regulated liability network FMI

Central Bank Partitions	Commercial bank partitions	E-Money Partitions	Stable Coin Partitions
Central bank liabilities	*Commercial bank liabilities*	*E-Money liabilities*	*Stable coin liabilities*

The purpose of the RLN is to create a new substrate for sovereign, regulated currencies (i.e. central bank money, commercial bank money, and electronic money) that is 'always on', programmable' and 'multi asset' thanks to the adoption of the distributed ledger technology (DLT)

Regulated | Token Based | Multi Asset | Programmable

Atomic settlement | Unified Ledger

RLN has six core characteristics:

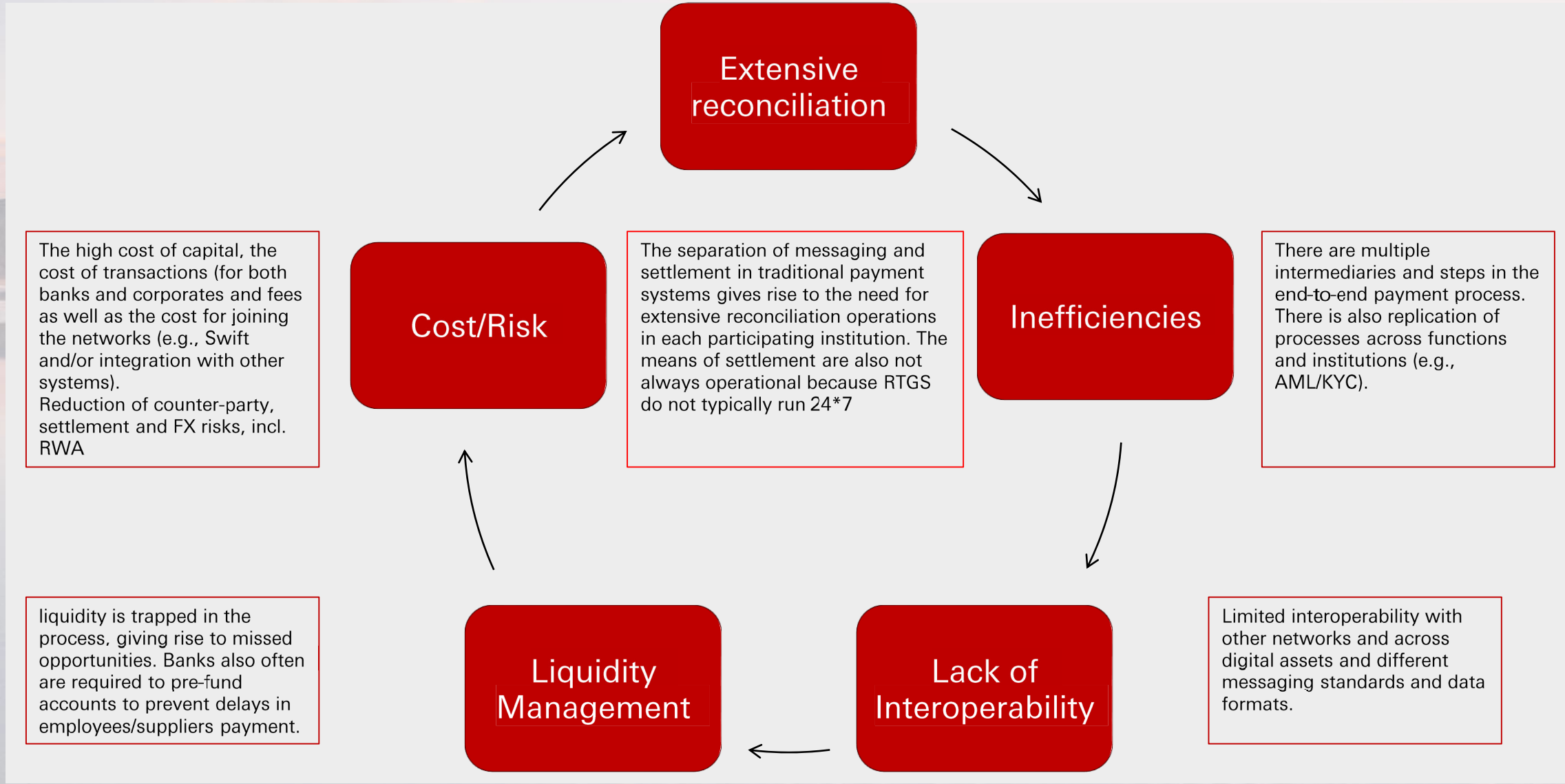
- Regulated: RLN applies only to digital money that are considered 'regulated liabilities'
- The regulated liabilities are tokenised and exchanged atomically over shared ledger, that are not a bearer instrument
- RLN could support exchange and settlement of multiple types of assets, including different types of currencies and asset classes
- The RLN leverage the use of smart contract to automate actions and support 24/7 settlement
- Shared ledger environment enables atomic settlement of transactions through simultaneously updated balances
- The RLN leverages a shared ledger to provide a more powerful, efficient and secure settlement system

Source of information: Regulated Liability Network - UK Discovery Phase .pdf (ukfinance.org.uk)

Stable coin is not yet regulated

PUBLIC

What problems RLN is solving?



Source of information: Regulated Liability Network - UK Discovery Phase .pdf (ukfinance.org.uk)

What has happened so far globally on RLN?

RLN Concept Note published

- The idea was initiated by Citi- Tony McLaughlin who then engage with multiple banks and payment market participants
- Regulated Liabilities Network: Making space for digital currency within the two-tier monetary system (finextra.com)
- Regulated Liability Network

Nov 2021

UK RLN POC

- A UK pilot conducted in collaboration with a number of financial institutions looked to test the POC of instant settlement
- Finality achieved by the exchange of commercial bank liabilities, with simulated GBP and USD CBDC settlement tokens to enable a real time transfer
- Tokenisation of participants' liabilities in their partitions in real time, on a shared ledger as fungible digital asset tokens
- ISO20022 messaging initiation and swift compatible PKI signature
- ey-rln-strategic-roadmap.pdf

Sep 2022

US RLN POC & UK Discovery Phase

- Coordinated by New York Innovation Centre – Federal Reserve Bank of New York, Members of the US banking community launched a proof of concept (PoC) project that will explore the feasibility of an interoperable digital money platform known as the regulated liability network (RLN)
- The experiment successfully simulated both the domestic and cross-border scenarios, identifying shared ledger technology as a potential solution to support payment innovation
- Coordinated by UK Finance with 10 participants including banks and card network, UK RLN assessed broad range of use cases such as consumer domestic payment, wholesale cross border payment, securities settlement, prioritised these case on business, tech and regulatory feasibility.
- Explored technical architecture for each of the use cases. Identified technology platform and carried out a suitability analysis

June – Sep 2023

Next phase of experimentation

- USA: REPO (Repurchase Agreement security tokenisation) use case
- UK: Prioritised retail domestic use case, REPO use case and cross border payments use case
- UK Discovery phase
- Regulated Liability Network US Proof of Concept Findings (rlnuspoc.org)

2024

PUBLIC

The opportunities of RLN

To evaluate the full potential for the European financial market, we need the Eurosystem to actively participate in the Central Bank role

Distributed Ledger Technology

24/7 payments

Regulated Liabilities

Domestic European network

- Interoperable and programmable commercial bank money
- 24*7 payments with instant settlement in central bank money
- EUR shared regulated ledger for regulated entities in cooperation with National Central Banks

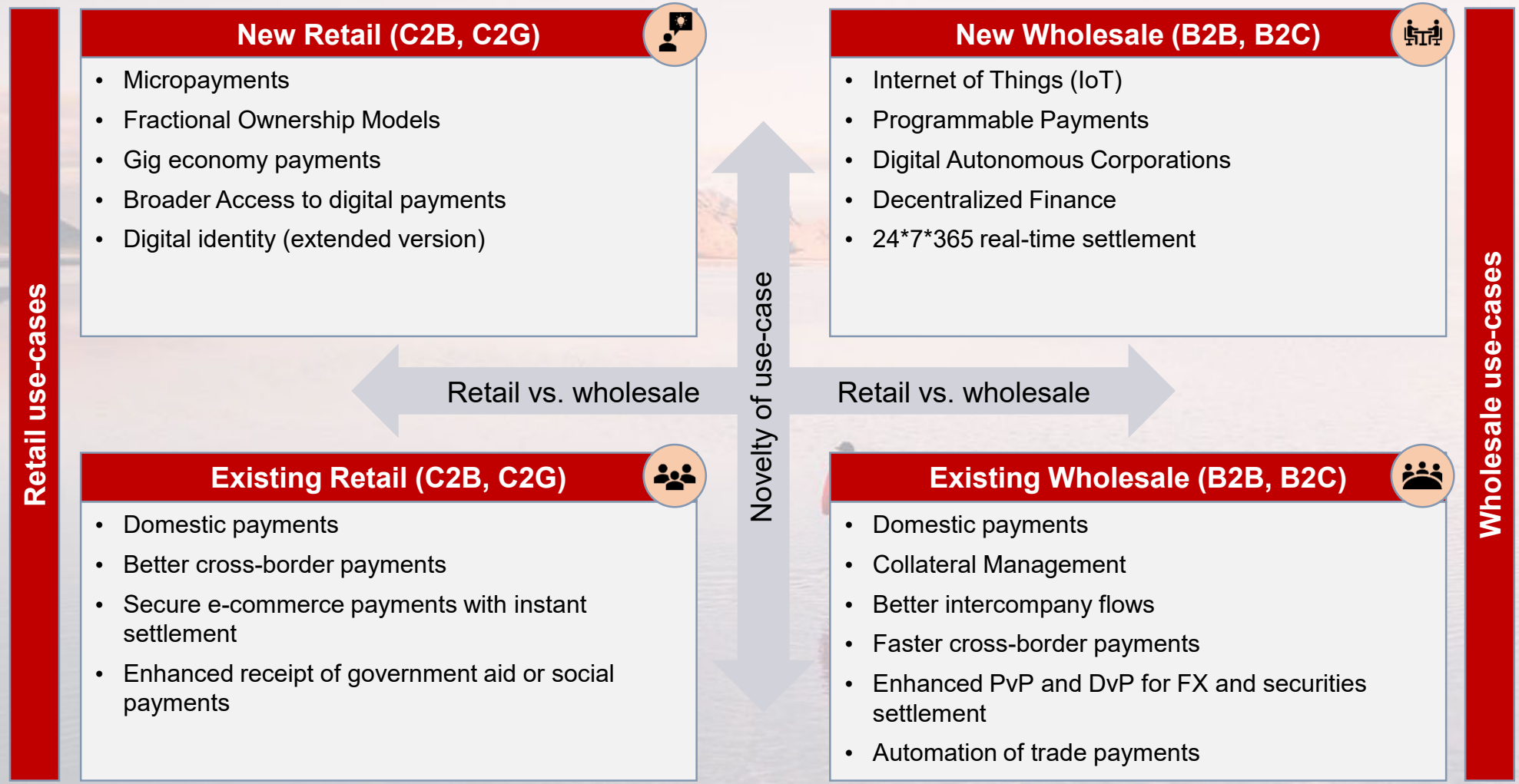
International network of RLN initiatives

- Connecting DLT-based international payment systems and facilitating DLT-based correspondent banking networks as there are more individual sandbox approaches (US, UK, Australia)
- Settle into Central Bank money, ECB to play an important role within RLN concept (direct partition or observer)
- Linking to the existing payment infrasturcture and should be highly integrated.
- Creating interoperability between various payment systems
- First tests successfully conducted (e.g. GBP-USD cross-border)

PUBLIC

The European RLN sandbox could support various use-cases

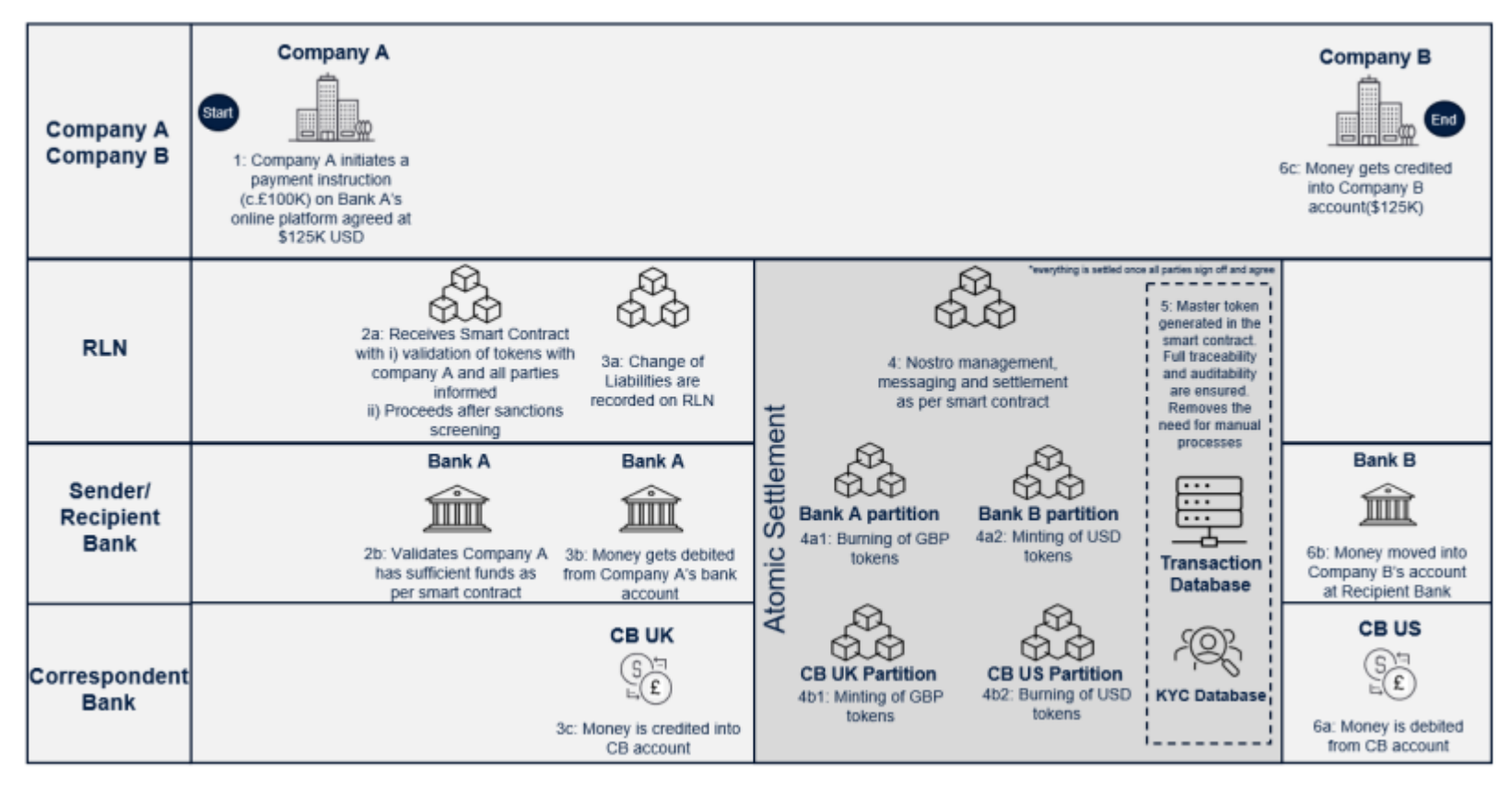
Use-case agnostic findings can subsequently be used profitably in the development of the payments infrastructure



Source of information: Regulated Liability Network

The European RLN sandbox could support various use-cases

Example of a wholesale – cross border payment (multi- currency) PvP use case



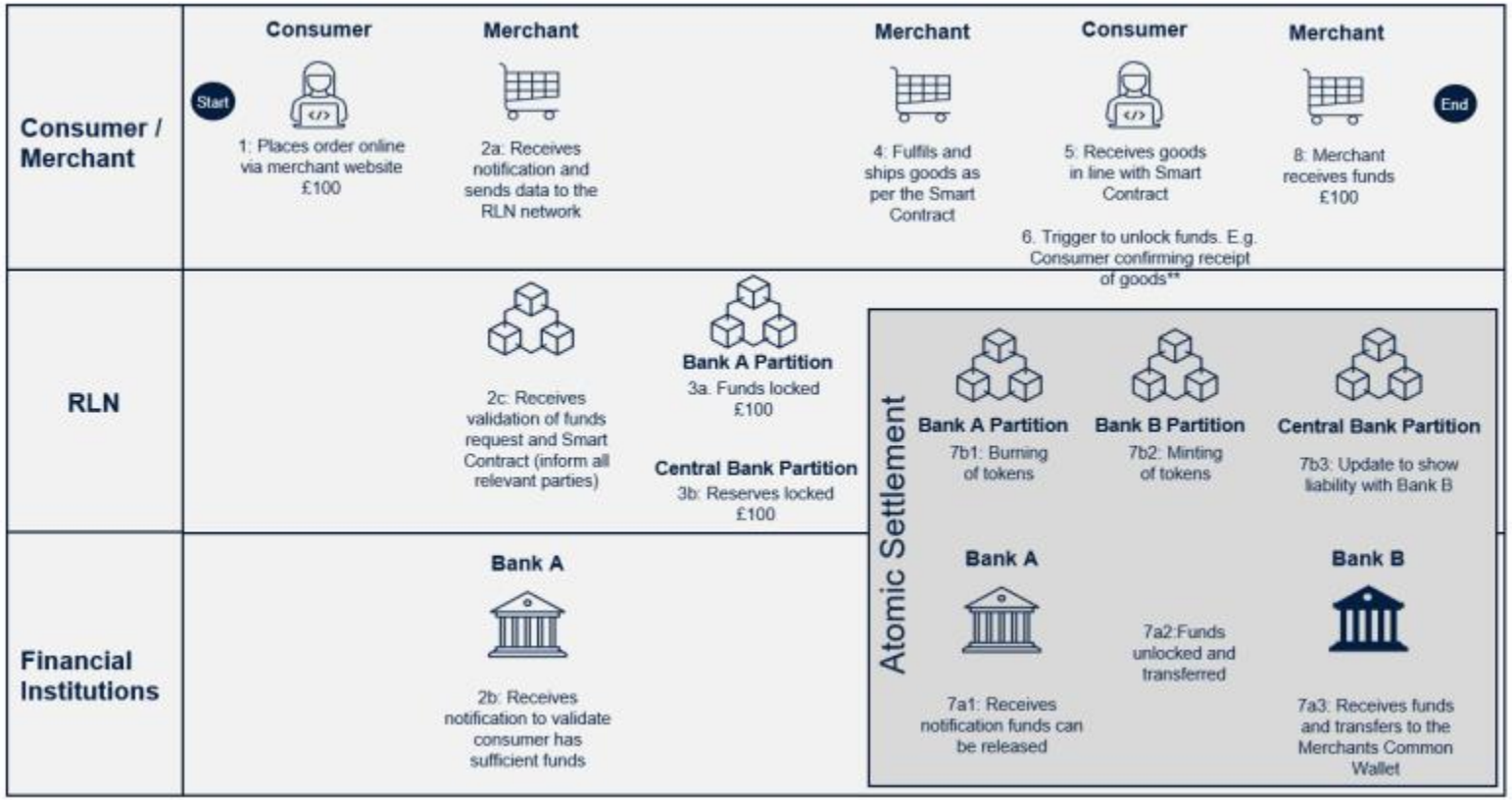
Bank A = Sender's bank
Bank B = Recipient's bank
CB – Correspondent bank

1. A UK based business (Company A) initiates a multi-currency (GBP to USD) cross-border payment via its bank's online banking platform. FX rate and any fees are agreed at this point.
2. All parties agree to the transaction prior to the transaction being orchestrated by RLN (these include the Company A, Company A's bank, a correspondent bank, a US based supplier (Company B), and Company B's bank).
3. RLN orchestrates atomic settlement, which includes the following steps: – Company A's bank burns GBP tokens. – Company B's bank mints USD tokens. – Correspondent bank mints respective GBP tokens and burn USD tokens to support the completion of the transaction.
4. The correspondent banks' central bank partitions on RLN reflects the change in commercial bank liabilities.
5. The US based supplier is (Company B) credited with the full USD amount.
6. For the purposes of this flow, it is assumed that sanction screening and other compliance checks will likely be carried out by each of the banks (although in the future this could be via a shared utility).

Source of information: Regulated Liability Network - UK Discovery Phase .pdf (ukfinance.org.uk)

The European RLN sandbox could support various use-cases

Example of consumer domestic use case flow (Delivery vs Payment with locking functionality)



1. All parties agree to the transaction prior to the merchant sending out the goods (these include the consumer, consumer's bank, the merchant, merchant's bank, and a delivery company).
2. RLN allows for the funds to be securely locked with a commitment for the merchant to be paid upon successful delivery of the goods.
3. Once the consumer is satisfied that the goods are delivered, and the order has been fulfilled (the exact method could vary but one example would be for the courier company to send the merchant proof of delivery) this would trigger the next step.
4. RLN orchestrates atomic settlement allowing the consumer's bank to unlock the funds and the merchant's bank to transfer the funds to the merchant.
5. A potential central bank partition on RLN could reflect the liabilities moving from the consumer's bank to the merchant's bank.

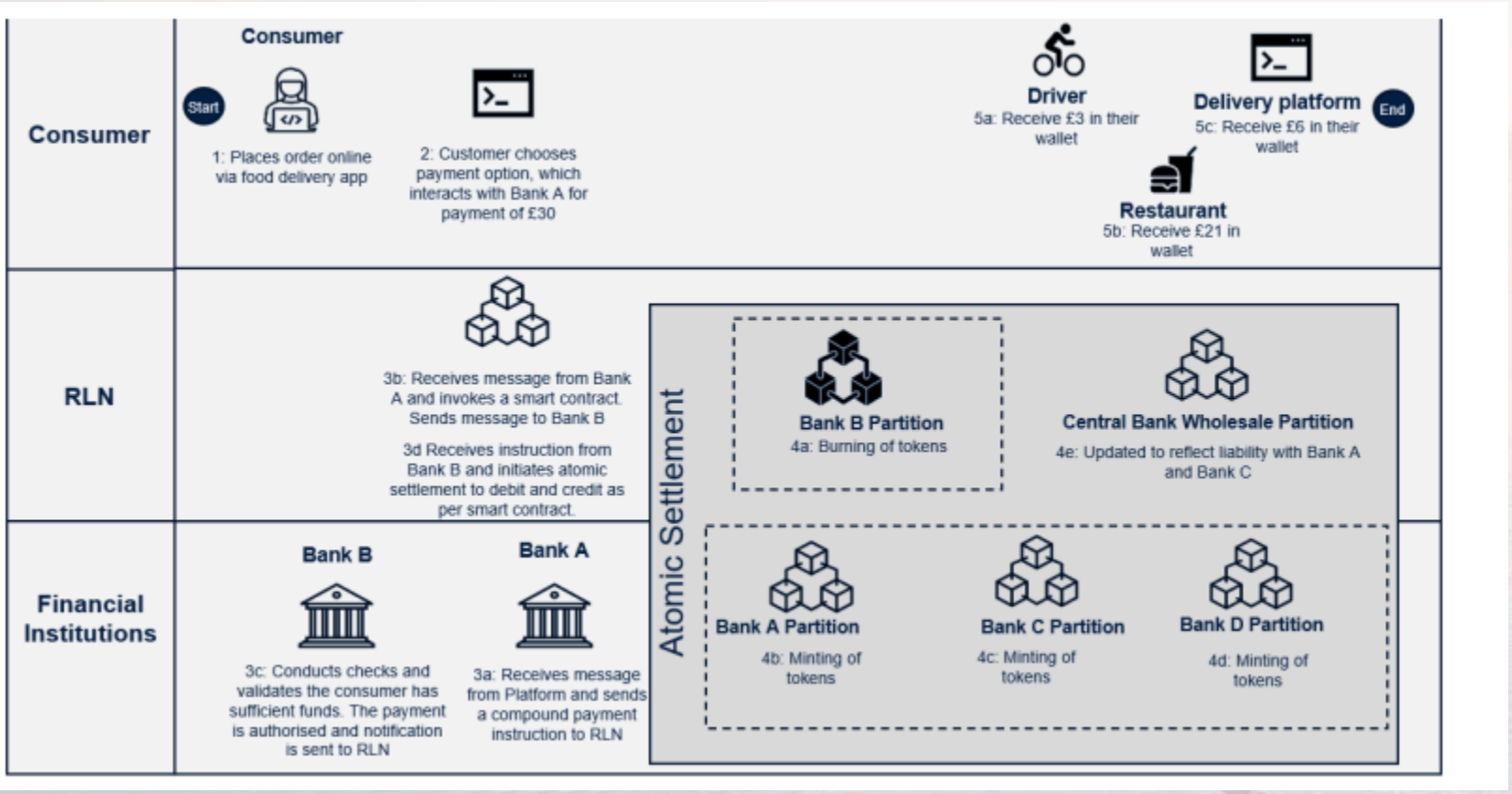
Bank A = Consumer's bank
Bank B = Merchant's bank

Source of information: Regulated Liability Network - UK Discovery Phase .pdf (ukfinance.org.uk)

PUBLIC

The European RLN sandbox could support various use-cases

Use-case agnostic findings can subsequently be used profitably in the development of the payments infrastructure



1. Places order online via food delivery app
2. Customer chooses payment option, which interacts with Bank A for payment £30

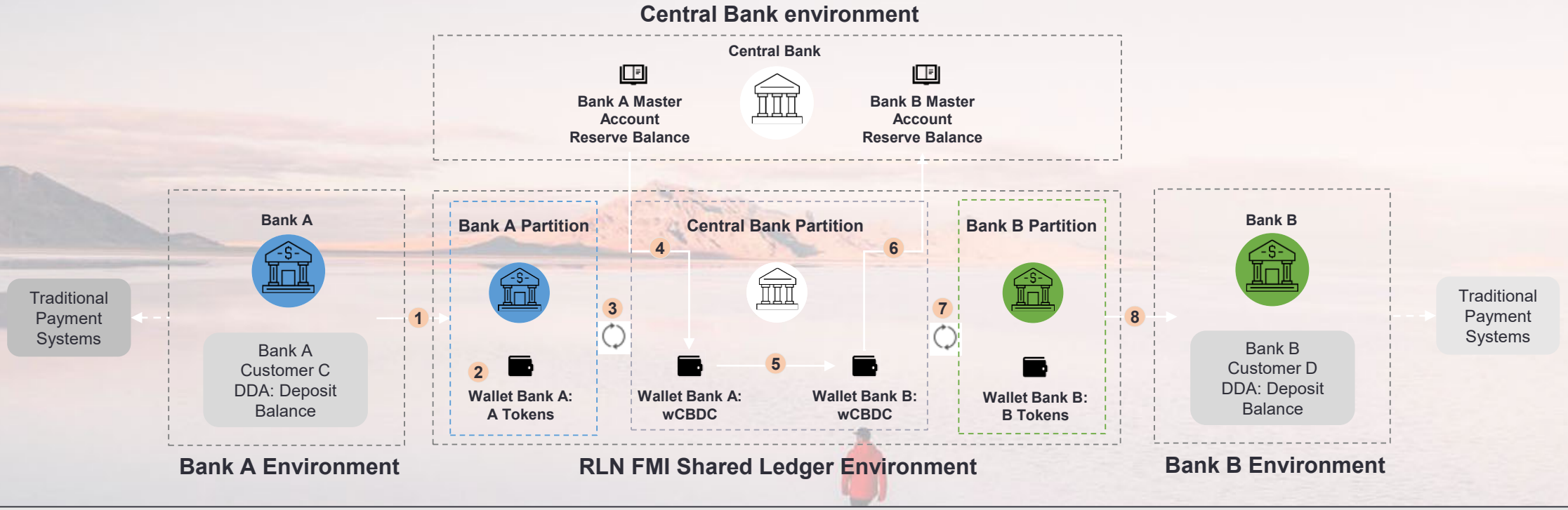
3a. Bank A receives message from platform and sends a compound payment instruction to RLN
3b. RLN Receives message from Bank A and invokes a smart contract sends message to Bank B
3c. Bank B conducts checks and validates the consumer has sufficient funds. The payment is authorised and notification is sent to RLN
4a. Bank B partition on RLN will burn of tokens
4b. Bank A partition on RLN will mint of tokens
4c. Bank C partition on RLN will mint of tokens
4d. Bank D partition on RLN will mint of tokens
4e. Central Bank Wholesale Partition – updated to reflect liability with Bank A and Bank C
5a. Driver receives £3 in their wallet
5b. Delivery platform receives £6 in their wallet
5c. Restaurant receives £21 in wallet

Bank A = Delivery Platform's bank
Bank B = Consumer's bank
Bank C = Driver's bank
Bank D = Restaurant's bank

Source of information: Regulated Liability Network - UK Discovery Phase .pdf (ukfinance.org.uk)

Sample transaction flow of the RLN EUR sandbox

The RLN FMI Shared Ledger environment enables atomic settlement of transactions through simultaneously updated balances



Step 1: A customer of Bank A transfers a portion of their deposit balance to an RLN Token balance. This function is provided by the electronic banking system of Bank A.

Step 2: The customer instructs a payment to a counterparty at Bank B.

Step 3: The RLN evaluates the ability to execute the end-to-end transaction.

Step 4: The Treasury Operations team at Bank A will have made sure that sufficient wholesale CBDC is available in their RLN Wallet to conduct the anticipated transactions for the day.

Step 5: The transfers of wholesale CBDC within the RLN environment is necessary to settle the transaction between Bank A and Bank B.

Step 6: The Treasury Operations team at Bank B will have real-time visibility over receipts into their RLN wallet holding wholesale CBDC.

Step 7: RLN updates the balances simultaneously to settle the transaction "atomically." Bank A, Bank B, and the Central Bank partitions are updated at the same time, and a single record is created of the settlement.

Step 8: The beneficiary of the payment may transfer the RLN Token balance to their deposit account if they wish. This function is provided by Bank B's electronic banking system.

- Source of information: Regulated Liability Network

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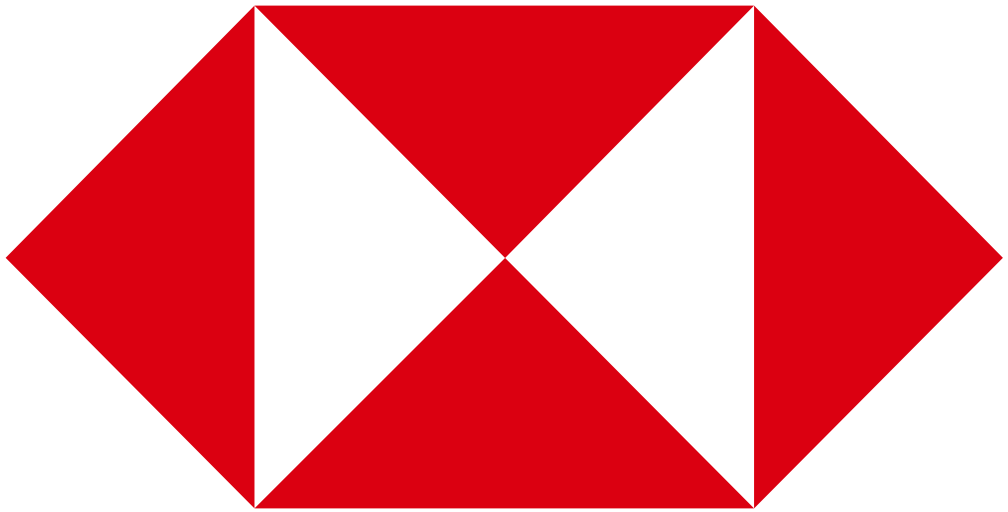


Agenda item 3: Ideas and proposals for PvP transaction settlement for Eurosystem exploratory work

Background: to advance the setup for PvP transaction settlement for Eurosystem exploratory work, a written procedure was launched after the second NTW-CG meeting, asking members to share ideas and proposals for PvP explorations. Members presented the key points of the written procedure outcome.

Inviting members to report on PvP business cases that could be explored during the Eurosystem exploratory work aims at information and idea sharing among members and with the interested public. The invitation does not constitute an endorsement by the Eurosystem.

3rd NTW-Contact Group meeting

07/09/2023

Goldman Sachs

Distributed Ledger Technology Business Case

3rd NTW-CG Meeting: PvP Business Case

7th September 2023

These slides were prepared for the purposes of the ECB New Technologies for Wholesale Settlement Contact Group only and should not be viewed as an indication of GS capabilities or proposed business

Distributed Ledger Technology Business Case

PvP cross-currency FX swap

Connect Market DLT to one of the CeBM DLT interoperability models, and synchronise the settlement of EURs between a cross-border DvP security issuance and its associated PvP cross-currency FX swap hedge

Product:	Cross-currency FX swap - OTC derivative
Market DLT:	Market DLT supporting both security and FX swaps, digitally via smart contracts
CeBM Solution (EUR):	Full-DLT Interoperability model
Settlement:	Payment vs Payment (PvP)
CeBM Solution (Non-EUR):	TBD

What are the objectives and opportunities of the business case?

- As financial market infrastructure evolves to adopt DLTs for *DvP securities transactions*, there is potentially a need to also evaluate DLTs for *PvP FX transactions,* and explore the benefits in linking/synchronising the two settlement types, in certain business scenarios. E.g., EU domicile issuer issuing a cross-border security settling in foreign currency and hedging via an cross-currency FX Swap
- Business case has the potential to generate: (i) reduction in settlement risks (e.g. via atomic T0 settlement); (ii) cross product netting benefits which improve wholesale funding impact; and (iii) improved operational efficiencies thereby reducing costs

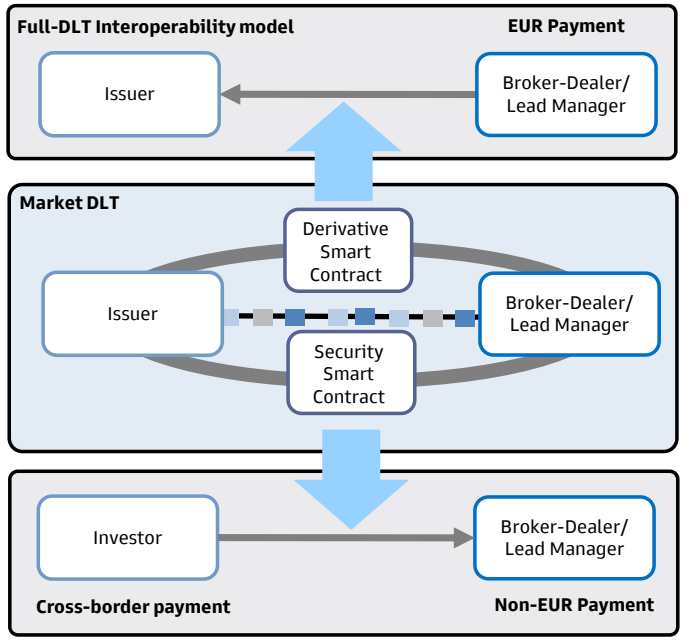
Why DLTs?

- **Standardization** – the industry developed data model drives common methodology to represent both securities and OTC derivatives on market DLTs using smart contracts (e.g. ISDA, ICMA and ISLA Common Domain Model)
- **Automation** – smart contract can potentially replace existing manual processes and create new efficient processes, e.g. enable PvP FX settlement *contingent* on successful DvP security settlement
- **Interoperability** – ability to connect with both traditional and DLTs based payment solutions

Why the Eurosystem exploratory work?

- **CeBM DLT interoperability** – Whilst all three CeBM DLT interoperability models could work, the Full-DLT Interoperability model is favoured given the ability to represent cash, security and derivative in token format, thus potentially enabling true atomic settlement across products, associated settlement types and across DLTs
- **Considerations –** alignment with non-EUR RTGS systems needs further exploration for the cross border payment synchronisation

Simplified Diagram Example



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PvP use cases on DLT

Applying DLT in the industry plumbing

Ludy Limburg, Group Treasury

Sept 2023

do your thing

PvP Use cases on DLT

Please note

- The use cases presented are not related to direct ING involvement
- This is a personal reflection of known initiatives in the market which could benefit from a DLT related settlement in central bank money.
- I'm not the expert on these initiatives – there are more materials available (publicly on Internet).
- I simply take the objectives/purpose of these initiatives for granted as well as the reason why DLT technology was used.

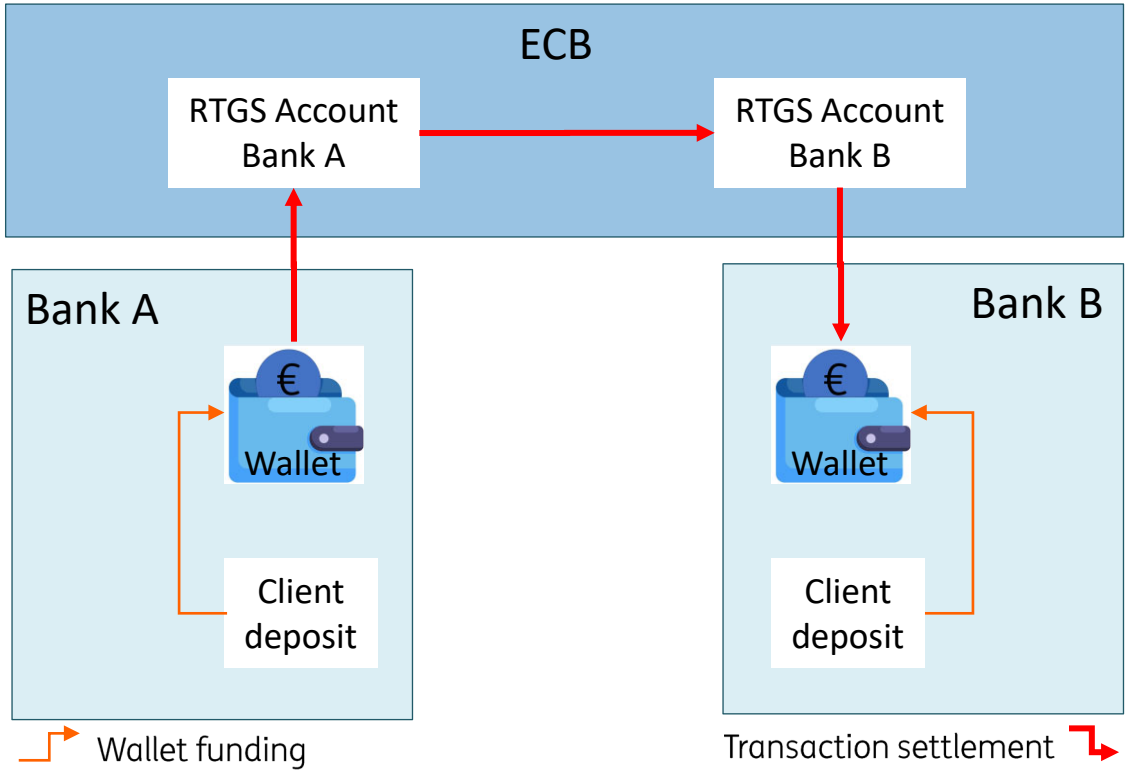
CBMT – Commercial Bank Money Token

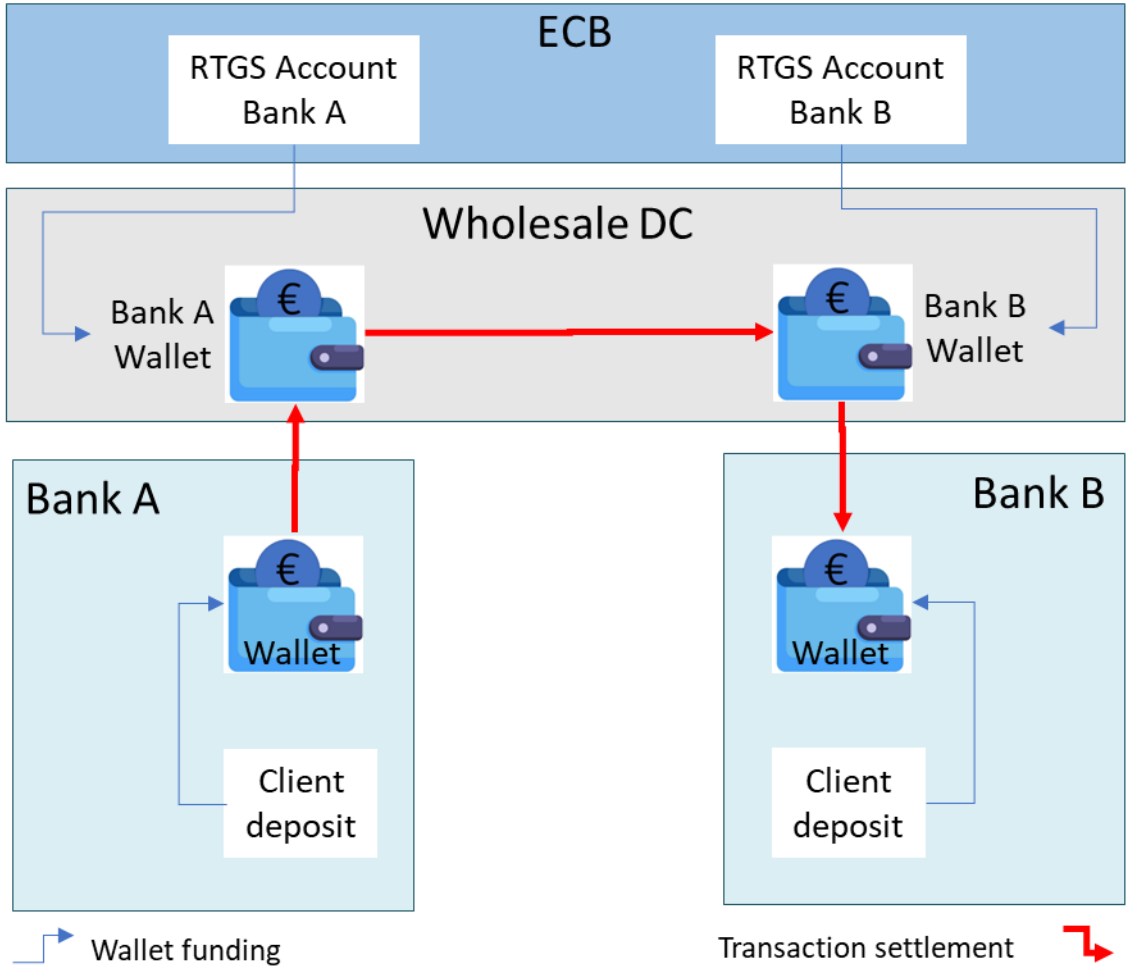
- An initiative by a group of mainly German banks to issue Tokenize deposits in order to enable a cash settlement on a DLT platform.
- https://www.bvr.de/p.nsf/0/8D37682344F86166C1258990002D677A/$file/20230317_GBIC_Working%20Paper%20on%20Commercial%20Bank%20Money%20Token_V1.5.pdf

FINTEUM

- Finteum platform has created an execution platform for global financial markets for institutional intraday FX swaps and repo.
- https://finteum.com/

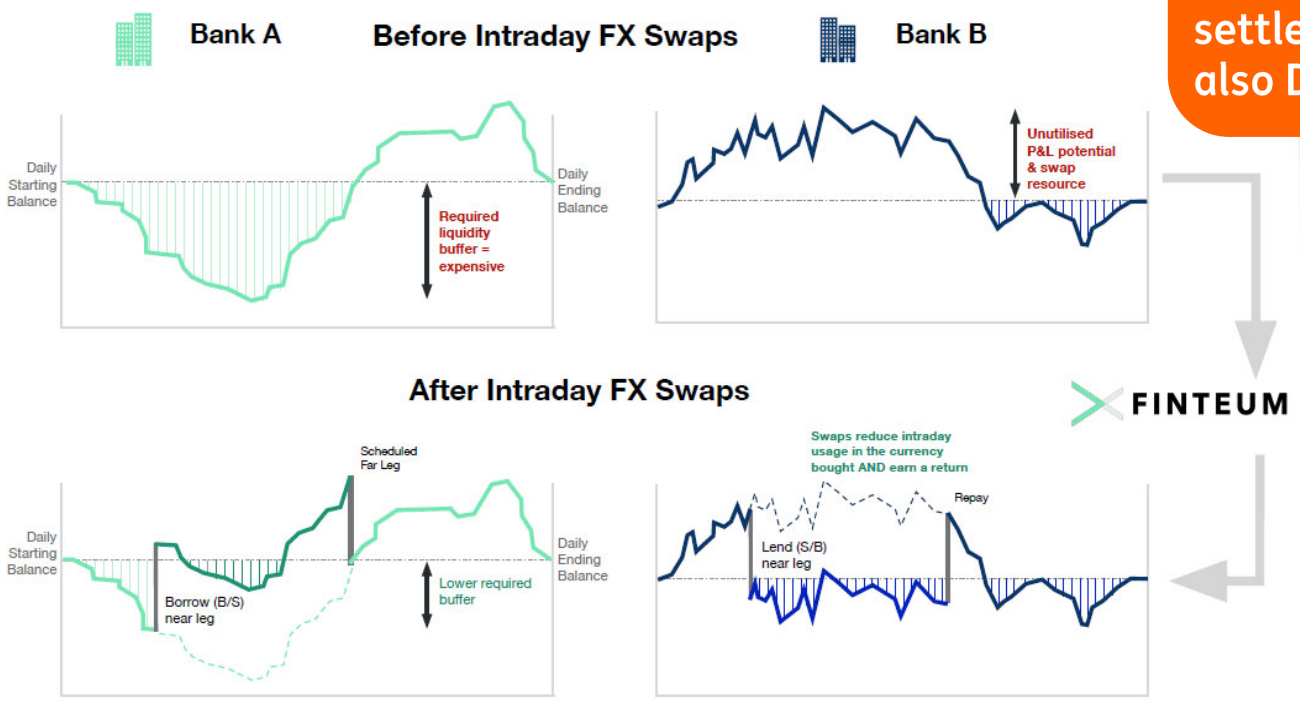
CBMT - need for a settlement leg.

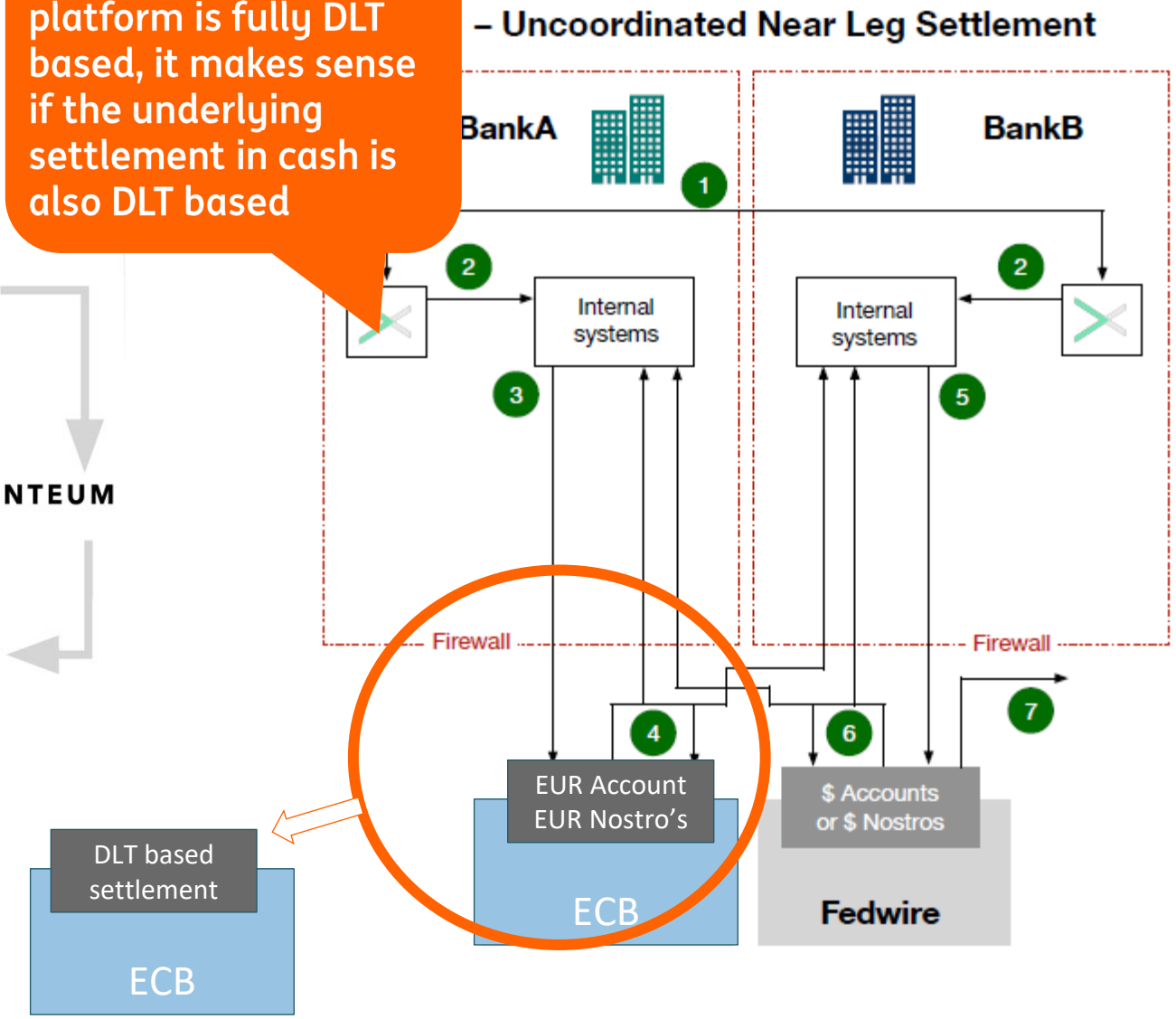




Finteum – Need for a settlement leg

If the Finteum platform is fully DLT based, it makes sense if the underlying settlement in cash is also DLT based





do your thing

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A wholesale CBDC for cross-border transactions

A contribution to the NTW-CG

September 7th 2023

Cross–border payments usinf dLoro/dNostro (1)

What is the **objective/purpose** of the business case?

*The business case suggest a way to achieving **faster**, **cheaper** and more **transparent** cross-border payments; it would simplify cross-border payments involving non-residents counterparts, simplifying settlement mechanisms, and **reducing errors** and **exceptions**. Using central banks money, the **counterparty risk** would be cancelled.*

- What is the problem the business case would address?
  - Cross-border payments and correspondent relation with **non-residents** counterparts;
  - Reduce **counterparty risk**;
  - Reduce **E&I**;
  - Improve 7/24 **settlement finality**;
  - **Decoupling** the (time) moment in which the European correspondents and the non-resident counterparts instruct, screen and confirm the payment.
- What is the opportunity the business case would create?
  - **Operational costs reduction**;
  - improve **speed**;
  - reduce **exceptions**;
  - increase **transparency**.

Cross–border payments using dLoro/dNostro (2)

How would **DLT overcome/fix the identified challenge(s)**?

*DLTs allow **instant**, **atomic**, **conditional** settlements. These three factors together would improve cross-border payments process. A fully automatic **programmability** obtained from the information contained in the instruction (**pacs.008**) would minimize errors and investigations.*

- Why would (only) DLT address the challenge(s)?
  - Defining **standard** conditional **smart contracts** obtained from a **pacs.008**;
  - **Conditionality** rules would depend on Regulations and AML/CFT.
- Where would DLT bring improvements where current infrastructures are unable to?
  - Introducing **automatically generated** conditional smart contracts.
- How would you address the challenge(s) **without DLT**?
  - Today Loro/Nostro are based on commercial bank money, and settlement finality is not obtained easily;
  - Using account based central bank money, we should build a nostro/loro structure like the one foreseen for the retail digital euro;
  - Conditionality should rely on a **payment system** which would finally settle in central bank money

Cross–border payments using dLoro/dNostro (3)

Why would you consider your business case as **relevant for the purpose of the Eurosystem exploratory work**?

*It would definitely address the cross-border payment innovation as required by **G20** (pillar 19) for the euro leg and set the technological basis to be interoperable with other CBDCs.*

- What are the pros and cons to take into consideration?
  - Pros are the business rationale above mentioned and the use of standard messaging;
- Which features of the interoperability-type solutions would be crucial for your business case?
  - Interoperability with other CBDCs (USD, GBP, YEN, …);
- How would the interoperability-type solutions make a difference for your business case?
  - Interoperability would simplify the FX settlement finality and facilitate an FX market with immediate finality.

Cross–border payments

The multijurisdictional issue

Intermediaries may operate with Central Bank Money (CeBM) only in the jurisdiction in which they are authorized and regulated.

To operate in "foreign" jurisdictions, they must access the foreign currency with a correspondent bank; therefore, in foreign jurisdictions they are allowed to access only to a Commercial Bank Money.

This situation gives to central banks and governments a strict control on the currency; it does not "migrate" abroad with no control.

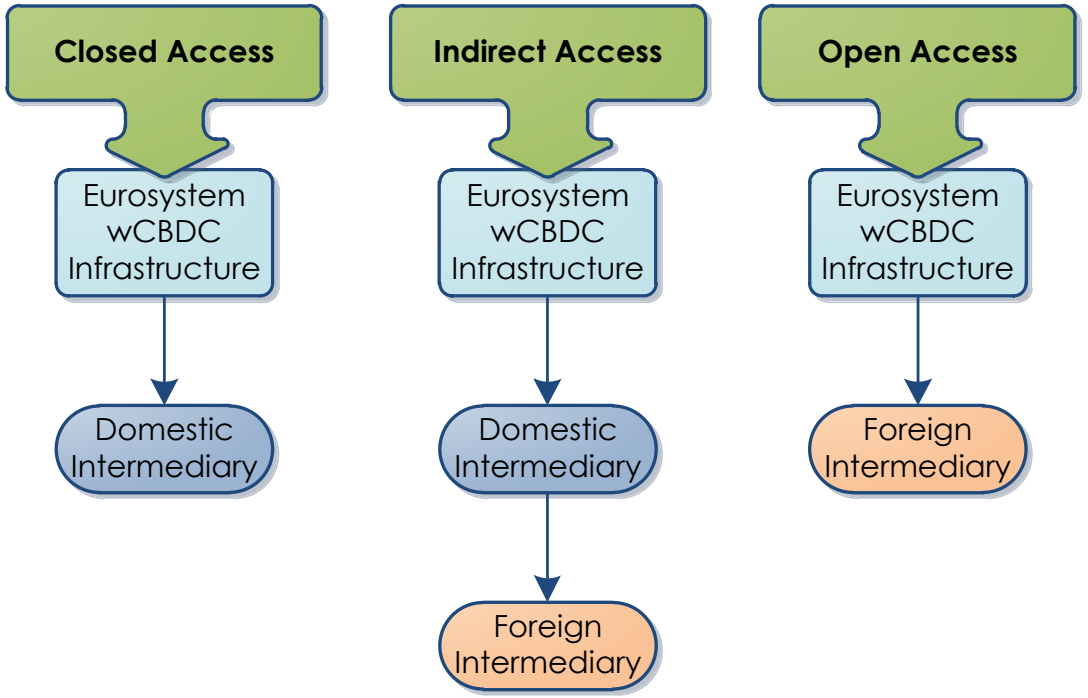
The fact that cross-border payments are executed mostly by intermediaries which do not access directly the central bank money causes inefficiencies, high costs and lack of transparency.

Using a digital wCeBM, we could have a higher efficiency without losing sovereignty and control on the currency. Let's see how.

Cross-border use of a wCBDC

Creating a «modern» correspondent bank

- We may imagine three scenarios for the Eurosystem wCBDC
  - **Closed access**: only domestic intermediaries may access the wCBDC; concerning the cross-border activities there is no benefit using the wCBDC;
  - **Open access**: both resident and non-resident intermediaries are allowed to hold a wCBDC's deposits, and to instruct payments; large amount of Central Bank euro could be in "foreign" hands, virtually with difficult control by the authorities; *e.g.* imposing sanctions could become nearly impossible.
  - **Indirect access**: only domestic intermediaries access directly the wCBDC, but they are allowed to intermediate services on behalf of non-resident intermediaries; they can open subaccounts (*digital Loro accounts*) for them, but control on movements would remain in their hand.

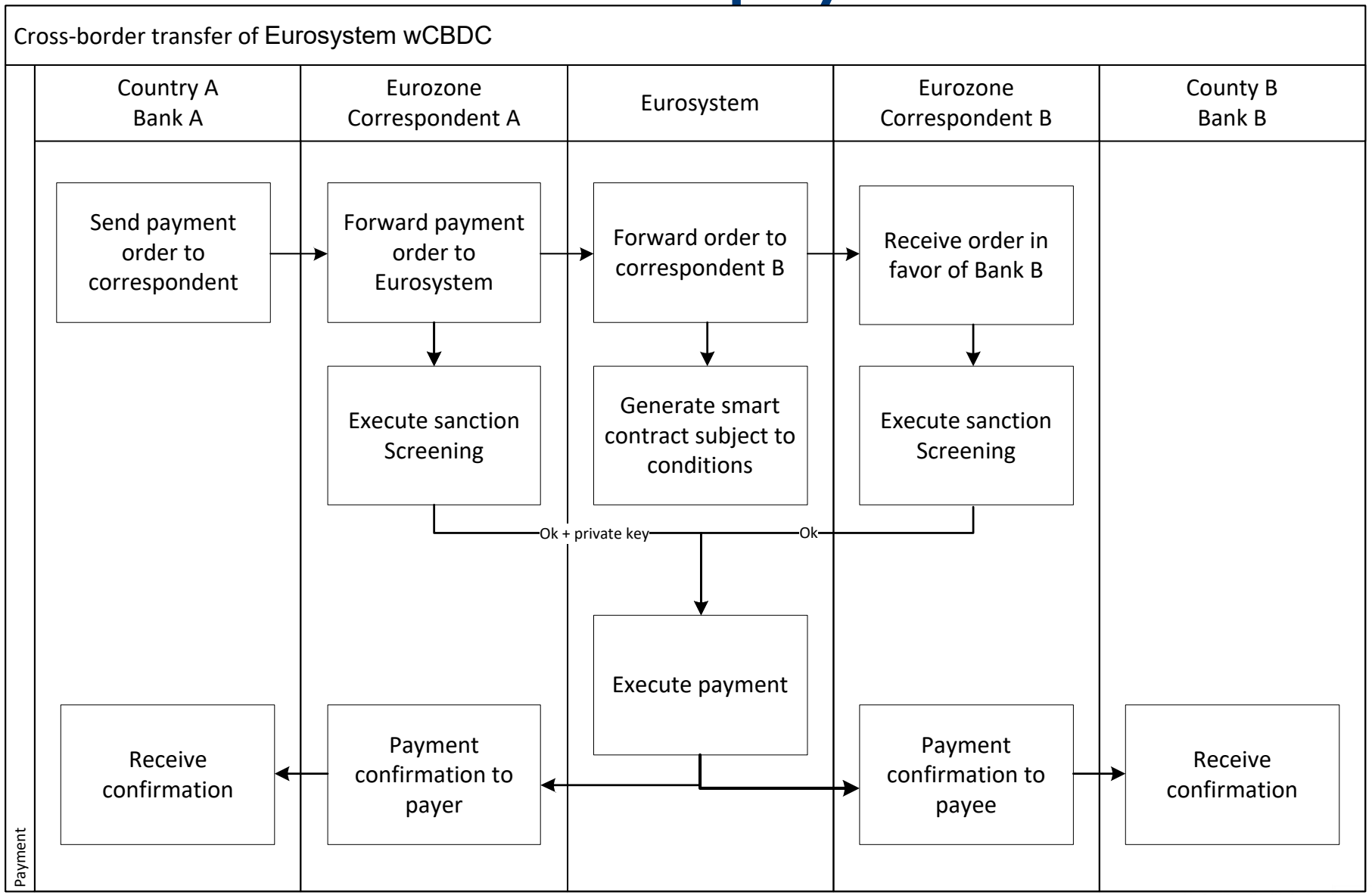


How would the digital Loro account work?

- The **dLoro** account would be a segregated digital account (no omnibus);
- The **property** of the asset would be of the **non-resident intermedary** (NRI); exactly as it happens today with loro accounts;
- The **NRI** would use its **public key** as address to receive payments;
- The **RI** would keep the **private key** of the NRI to istructuct payments on behalf of the NRI;
- It has to be decided at regulatory level if the **dLoro** asset would enter in any form in the **RI balance sheet or regulatory reporting** (as if it was a third party's custody).
- Communications among banks may remain with traditional ISO standard. A **pacs.008** is sent from the instructing bank and it is used to generate a **smart-contract** (diagram in the next page)

- The clients' deposits would be in the Central Bank's account; the counterparty risk would be zeroed.

Execution of a cross-border payment



dLoro/dNostro

What are benefits?

This business model do not replicate on a new technology an old business model, but introduces a few innovation factors.

- Non-resident intermediaries **own** their digital accounts;
- The correspondent bank counterparty **risk** disappears;
- Intermediaries may ask to be paid on their d-accounts and the settlement process is simplified, instant and 7/24; the intermediary can use a "**public key**" to be paid on their account;
- Controls remain with the domestic correspondent which has the "**private key**" of the account, and the the euro sovereignty is granted;
- A proper standard instruction (pacs.008) is enough to allow the Eurosystem to code a **conditional payment**; a V-mode would be suitable;
- Conditions for the execution would be the approval of the **compliance** screening of both intermediaries and the communication of the **private key** from the payer intermediary;
- A blockchain-like DLT should be the best infrastructure.

Comparison between the two models

Potential benefit	dLoro/dNostro	RLN (NY FED)
availability	24/7	
finality	Instant end-to-end settlement finality.	
efficiency	Simplify flows instructing payments directly from a digital account to another digital account. Shorter intermediaries' chain.	Upfront identification of exceptions, reducing reconciliations.
Counterparty risk	Third parties' assets accounted directly with the Central Bank. No counterparty risk.	Third parties' assets on the correspondent books. Counterparty risk as today.
Sovereignty	Assets remain under control of the EU bank which retain the private key, therefore of the Eurosystem.	As today.
Programmability	Automation through on-ledger business logic. A predifined "smart-contract" template might be defined, starting from the incoming message (*e.g.* pacs.008).	Automation through on-ledger business logic.

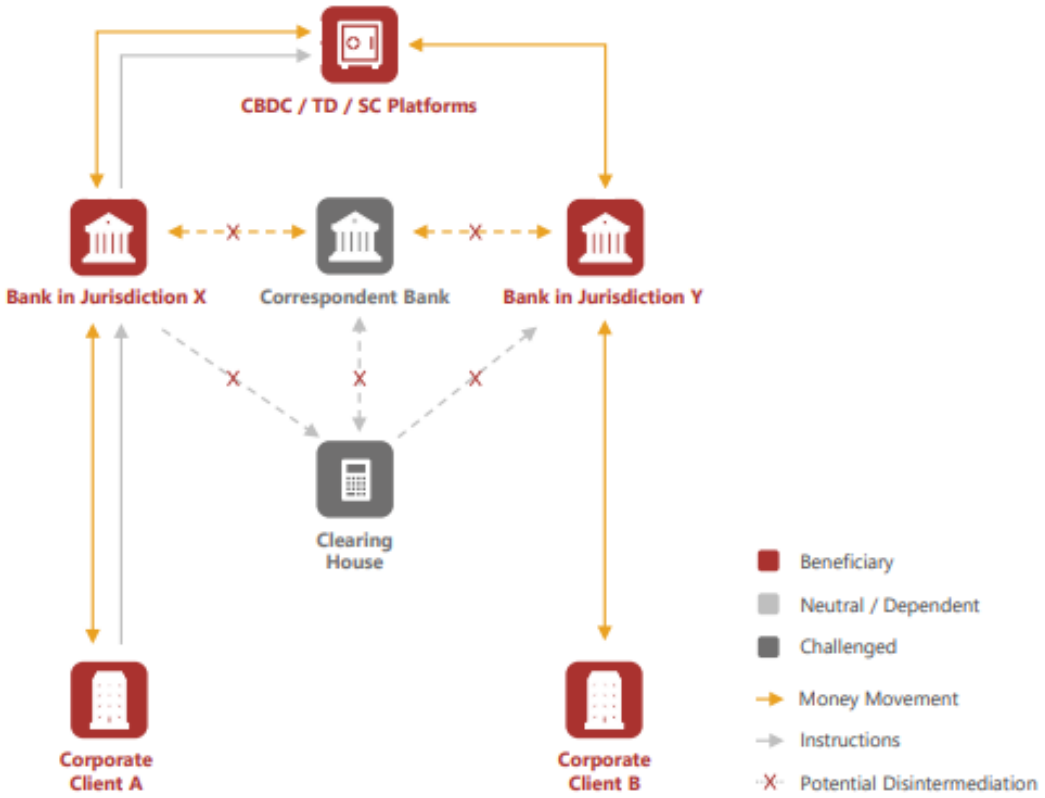
onyx by J.P.Morgan

PvP Use-case: Multi Currency Settlement

July 2023

PvP Perspective

Industry Disruption
PvP Perspective



Source: Project Dynamo June 2023
https://www.bis.org/innovation_hub/dynamo_study.pdf

Worthy Endeavour
Wholesale Operation Pain Points

PAIN POINTS

LENGTHY SETTLEMENT TIME
Varying payment cut-off times across regions and the long wait in sequential batch processing may delay settlement

LACK OF TRANSPARENCY
Delivery times often vary when multiple intermediaries are involved, making it difficult to provide real-time traceability

HIGH TRANSACTION COST
Intermediary access fees are often passed on by banks and hence incurred directly by end customers

Benefits of a DLT based PvP solution

a. **'Atomic' Settlements and Settlement Finality**: Replacing today's sequential operational model with 'atomic settlement', i.e. simultaneous settlement, will be critical to address the pain points around trapped liquidity, settlement risk, transaction turnaround time and the lack of visibility

b. **24/7 Infrastructure Availability**: Designed as "always on" infrastructure that ensures the entire payment-lifecycle processes without cut-offs, and operates round-the-clock to support regional and global money flows

c. **Shortened Transaction Chains**: Reduction in the number of intermediaries involved in the end-to-end payment process through the usage of CBDC for settlement, leading to a reduction in transaction fees and liquidity requirements

onyx by J.P.Morgan

Usecase: PvP transaction on a Multi-CCY Settlement Platform (Partior[1])

Description of Idea:

- Partior infrastructure can facilitate transactions between settlement banks to offer correspondent banking services on its DLT based platform, and to record nostro account balances of its platform-participating correspondent banking customers or **"participant banks"**, using the platform to effect and record book transfers between its participating banks.
- Participating banks currently transact in **commercial bank money** of different currencies in the form of deposit liabilities of the settlement banks.
- Partior is currently designed for transaction in commercial bank money but can also support **wCBDCs issued on the platform** directly by central banks.
- Partior can potentially **orchestrate PvP** transactions between settlement banks of different currencies (for example EUR vs SGD) by different settlement banks or issuers (commercial banks or central banks).

Problem /opportunity:

- DLT or blockchain technology is used to provide the security and assurance to enable the concept of **"shared ledgers"**, providing the confidence for settlement banks to record their deposit liabilities on this external shared platform.
- While commercial bank money is sufficient for most type of transactions, there could be reasons for the **need for wCBDCs,** including the need for safety when transacting in very high value payments, resulting in a **preference for settlement in risk-free assets issued by central banks.**
- CBDCs could potentially be issued on a platform like Partior, where a central bank takes on the current role of the settlement bank.
- Partior can enable PvP settlement using central bank or commercial bank money through the same technical mechanism.

Reasons for need for wCBDCs:

- wCBDCs could be useful in enabling settlement across settlement banks. Currently the "settlement banks" do not themselves exchange funds as there is no wholesale settlement mechanism on the Partior platform.
- The introduction of **wCBDCs as a settlement mechanism** for the settlement banks will enable **participant banks to easily pay other participant banks,** not just within their own settlement bank's books, but also those holding accounts at other settlement banks on the platform.
- This alleviates a key concern of single-tier wCBDC models, where the central bank may need to take on new roles with respect to institutions the central bank would not typically maintain a relationship with, such as a foreign commercial bank.

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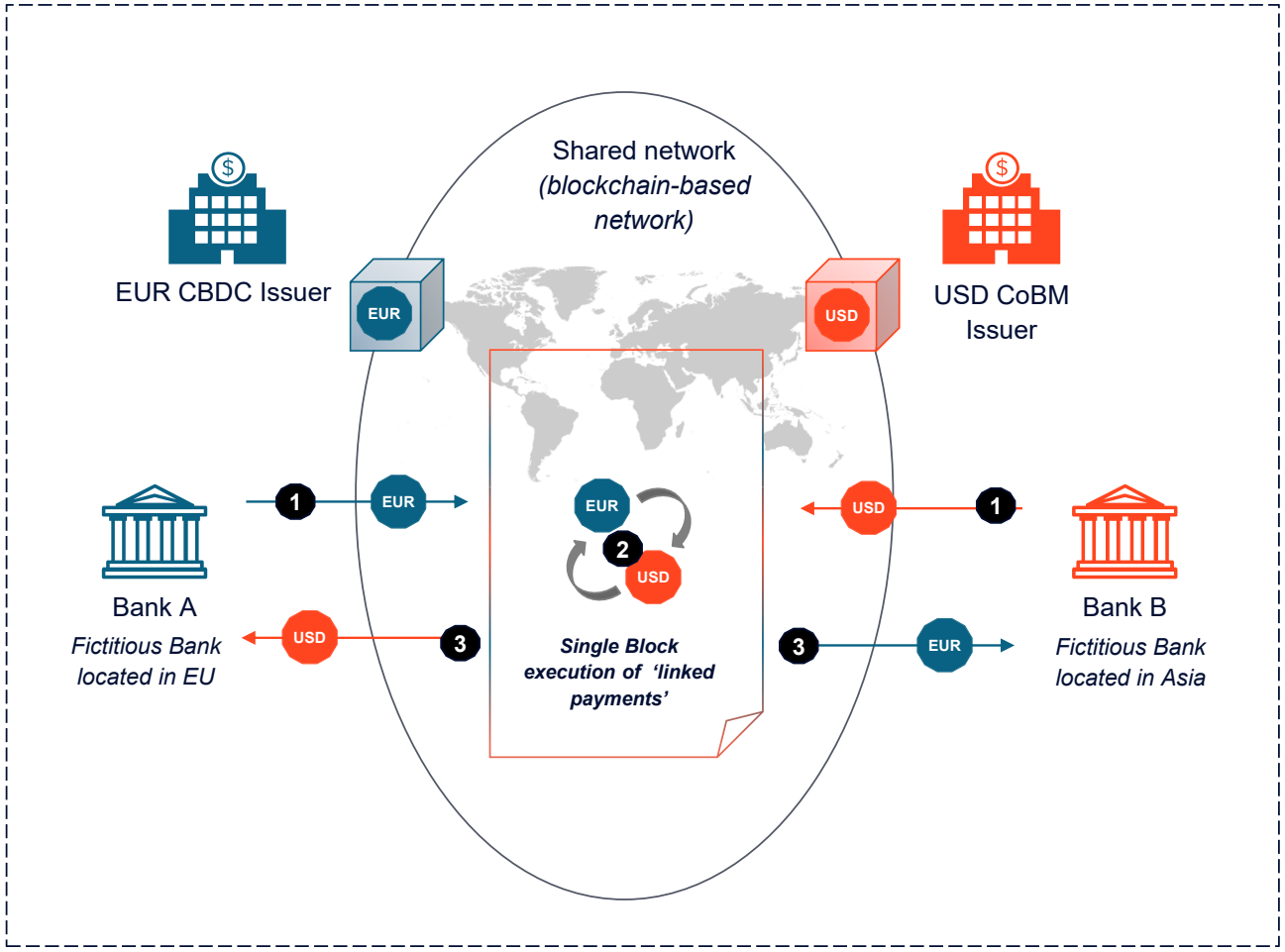
Conceptual Design:
PvP transaction on a Multi-CCY Settlement Platform (Partior[1])



- Partior is a J.P. Morgan joint venture with Temasek, DBS and Standard Chartered
- Partior provides the ability for banks and financial institutions to settle in Commercial bank money
- Ready for Central Banks to issue CBDC to participating FIs right on the platform
- Interoperability with JPM Coin System to support multi-asset and currencies

Steps/operations:

1. Bank A and Bank B on Partior agrees to trade USD for EUR, with USD being commercial bank money and a deposit liability of JPM, and EUR being a CBDC.
2. Bank A and Bank B initiates a "linked payment" with a common identifier. This identifies the USD payment from Bank A and EUR payment from Bank B as linked and must be performed in an atomic swap.
3. Partior waits for both relevant transaction to be initiated, matches them based on the common identifier, and performs the 2 payments as a set of transactions settled within a single "block", ensuring the atomicity of the 2 transactions.

Non-euro currencies: USD

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Partior[1] – Blockchain-based Clearing and Settlement Infrastructure

Allowing participating entities to transact 24/7 directly and securely with each other on a single, shared ledger

PARTIOR

Partior is a J.P. Morgan joint venture with Temasek, DBS and Standard Chartered.

Next-gen Market Infrastructure

Provides 24/7, multi-currency real time gross settlement (RTGS) capabilities leveraging the existing tier liability structure

Programmable Payments

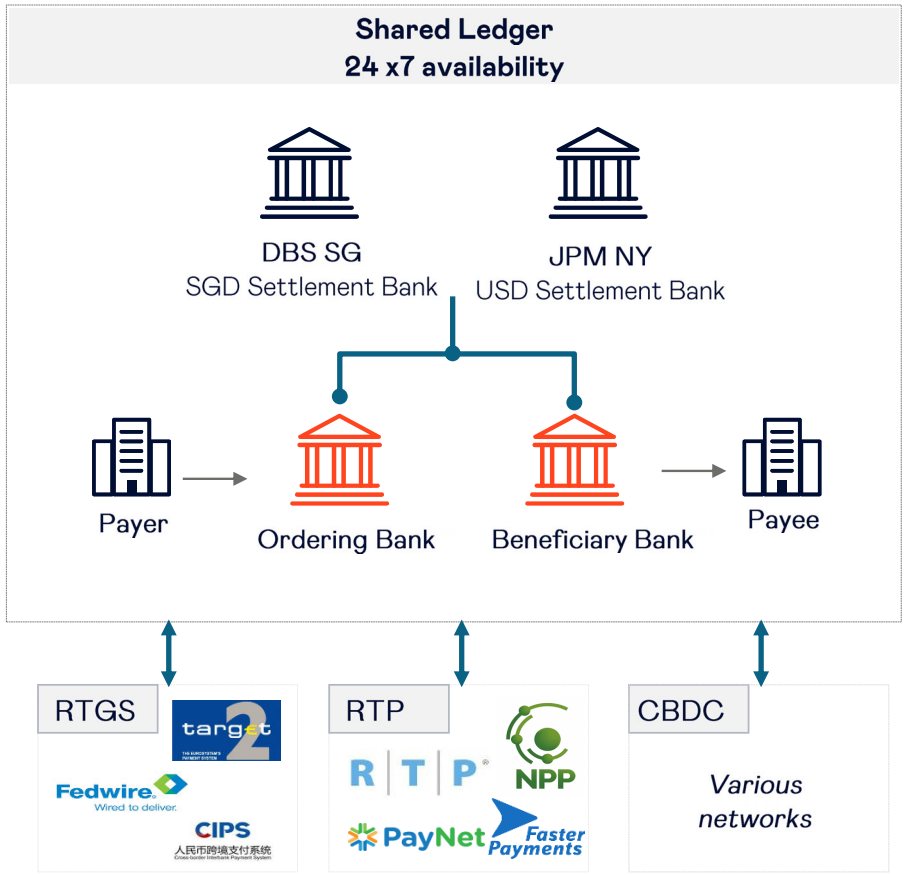
Enables next-generation, programmable value transfer through a common and open platform for participating banks and their customers in real-time

Global Interoperability

Designed to provide global connectivity across domestic Real-time Payments (RTP), RTGS and Central Bank Digital Currencies (CBDC) networks

Future-Ready

Ready for Central Banks to issue CBDC to participating FIs on the platform



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Expected Benefits for Participants

Partior is a global, inter-bank network – leveraging blockchain technology – that enables real-time multicurrency cross-border value transfer, and which may lower costs, optimize liquidity, and reduce other issues related to payment processing.

Multi-currency Shared Ledger

Multi-currency shared ledger across participants, that enables atomic settlement

Payment Pre-validation

Platform supports payment pre-validation which improves certainty of payment and reduces post transaction handling

ISO 20022 Based

ISO 20022 standards providing for additional capabilities to carry data payloads

24x7 Real-time Processing

24x7 clearing and settlement infrastructure to support round the clock business transactions across the globe

Programmable Payments

Leveraging smart contracts to create new payment instruments based on pre-defined business logics

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Partior Potential Use Cases[1]

Multi-currency Offshore Clearing
- Create multi-currency offshore clearing capabilities using shared ledger rails

Cross-border Payments
- Reimagine cross-border payments by addressing existing friction and pain-points

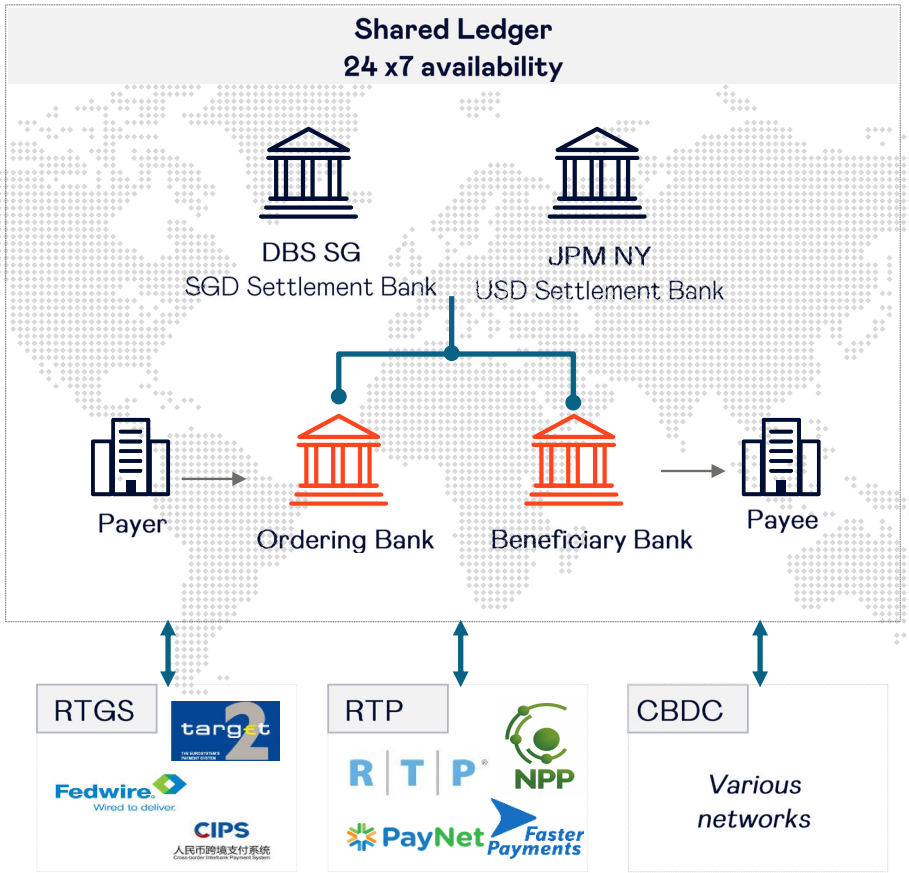
FX PvP
- Create capabilities for currencies globally including EMDE (viz RMB)

FX Intra-day Swaps
- Create a tradeable intra-day liquidity market using instruments like FX Swaps

DvP for Listed Securities and Digital Assets
- Offers atomic DVP Settlement capabilities across listed securities and cash

And many more such as:

- Conditional Payments
- Enterprise solutions: programmable liquidity management, just-in-time payments



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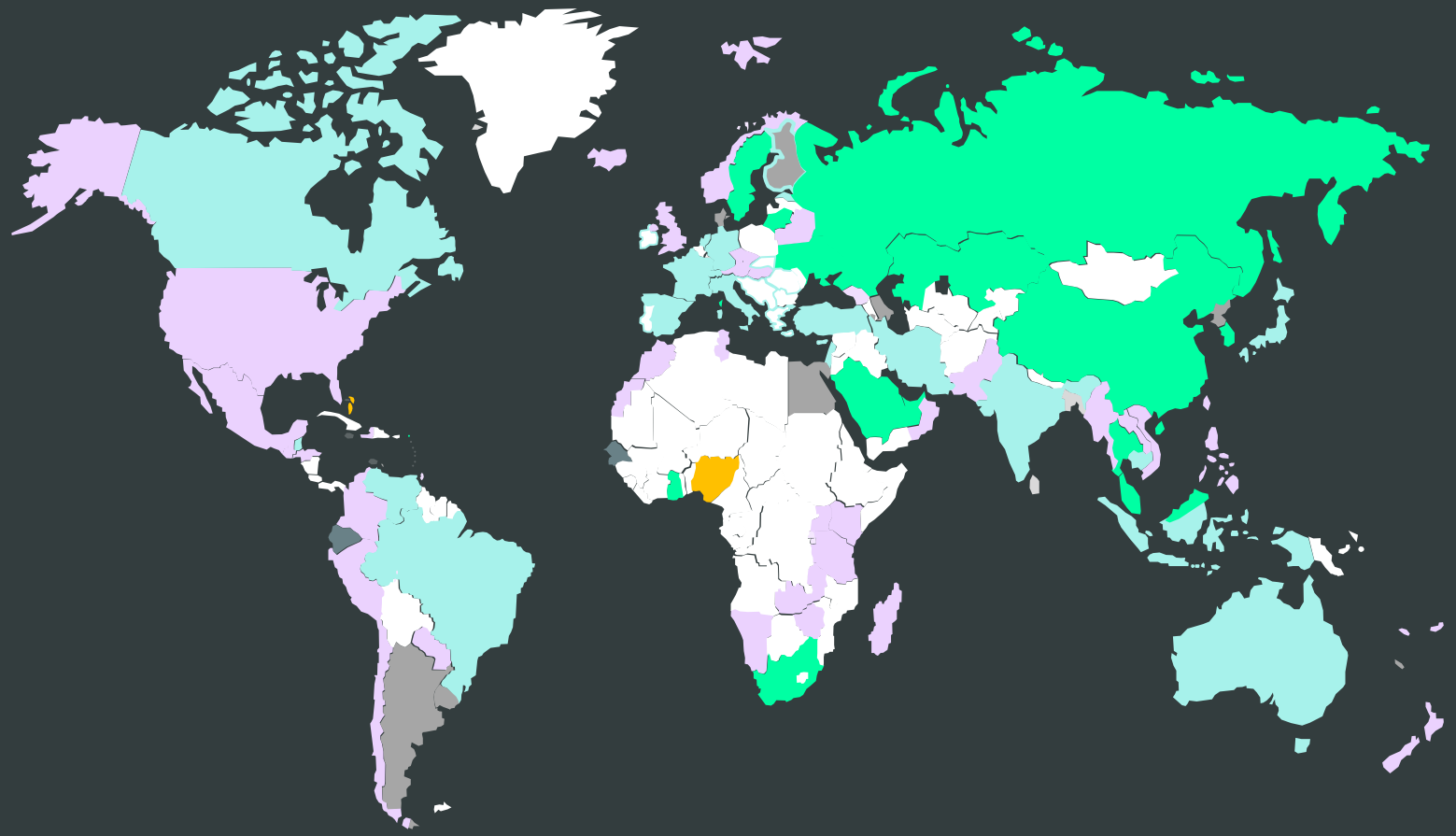
Interlinking CBDCs for PvP cross border payments

Marianne Demarchi
Chief Executive Europe
Swift

September 2023

CBDC exploration is gathering momentum – *including India with the Digital Rupee Pilot, UAE Digital Dirham initiative and other ongoing trials in China, Nigeria etc…*

Interlinking CBDCs for PvP cross border payments



Over 100 countries exploring a CBDC accounting for 95% of global GDP

10 countries have launched a digital currency

24% of central banks plan to issue a CBDC in 1-2 years

Sources: Atlantic Council CBDC tracker
OMFIF FoP report

Swift

What is the objective/purpose of the business case?

Numerous CBDC platforms will co-exist globally for some time to come

Some of the platforms will be powered by DLT, but not all

The platforms will need to interoperate with each other

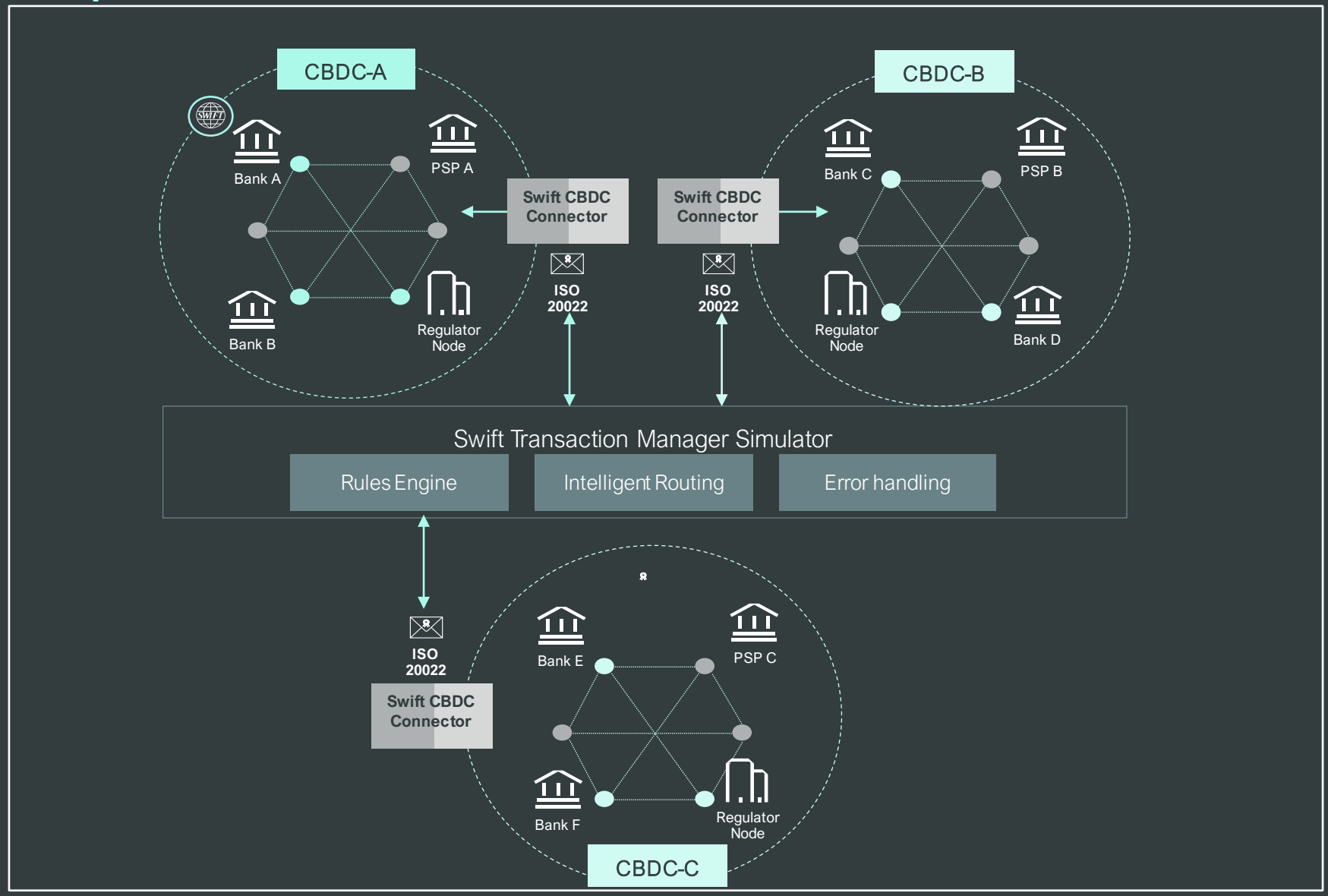
Swift's role puts it in a unique position to join up the various platforms and enable transactions to efficiently flow between them

Swift

How would DLT overcome/fix the identified challenge of interoperability?

Our vision: CBDC Connector to interlink and interoperate multilateral cross border CBDC / DLT platforms

Interlinking CBDCs for PvP cross border payments



Swift

Interlinking CBDCs for PvP cross border payments

CBDC Experiment 2022: We demonstrated interoperability in a controlled environment …and applied similar approach to tokenized asset platforms, in line with the purpose of the Eurosystem exploratory work

Flows tested between various network implementations: Quorum to Corda, RTGS to Corda, and Corda to Quorum, focused on inter-network communication through the Swift platform

Our goals:

- **Agnostic to the ledger technology**
- **Make it interoperate in a seamless manner with other payment systems**
- **Policy, rule book, consensus mechanism implemented by the CBDC should be local to the CBDC and not influence other parties**
- **Standardized way of implementing atomic payment. This approach provides the flexibility for the network operators of the CBDC to implement these rulebooks per their policy**

Allowing for:

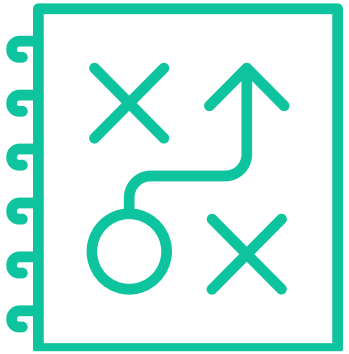
- **Seamless transaction flow on a scalable model**
- **Local flow within the CBDC network**
- **Cross-border by SWIFT connector: No intermediary message initiation required**
- **Simple enablement and integration of domestic CBDC networks into cross-border payments**
- **ISO 20022 and PKI can provide interoperability**

Swift

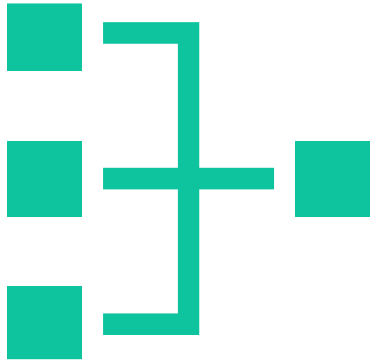
Interlinking CBDCs for PvP cross border payments

To validate the experimental CBDC solution, Swift set up a collaborative sandbox in Q4 2022. Swift has published the report in March 2023, sharing successful results

With our experiment, we demonstrated that we could interlink CBDC and payment systems globally



We took this a step further and opened our CBDC solution for testing with our community though the sandbox



The solution was deployed in a Sandbox hosted by Kaleido and used two blockchain networks; Quorum and Corda

18 participants were involved incl. the Banque De France, the Deutsche Bundesbank, the Monetary Authority of Singapore, BNP Paribas, HSBC, Intesa Sanpaolo, and UBS

We worked with our participants over 12 weeks, testing and gathering feedback on the Sandbox

Overall Sandbox experimentation was successful with participants seeing clear potential and value in the solution

Swift

Interlinking CBDCs for PvP cross border payments

In 2023, we have gone further with CBDCs.

We have two parallel initiatives in-flight –

1. **CBDC Interlinking Solution: beta version testing**
2. **CBDC Sandbox Phase 2: for new use cases**

CBDC Interlinking Solution
Beta version developed
Testing now starting with 3 Central Banks

CBDC Sandbox Phase 2 kicked off
focused on new use cases
Underway with +30 participants

We propose further experimentation through the NTW-CG

Swift

Swift