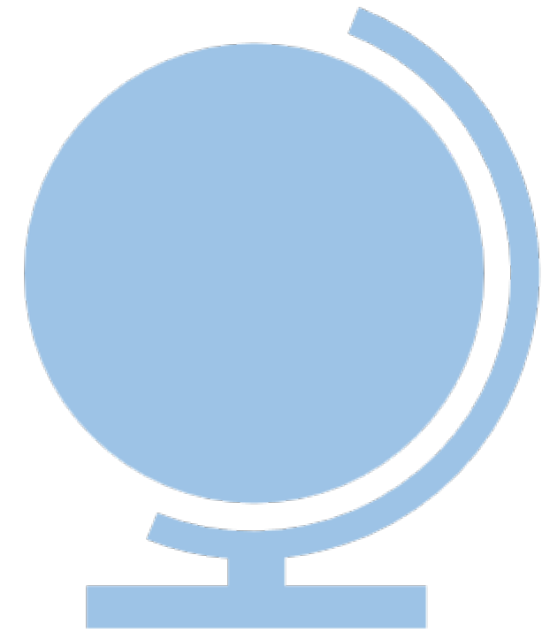# BIS Innovation Hub recent initiatives and developments in market infrastructure and CBDCs

ECB Operations Management Group, 28 November 2024

Presentation by BIS Innovation Hub Eurosystem Centre

# Agenda (14:05-14:55):

1. Project Rialto
2. Project Agora
3. Project Meridian FX
4. Q&A

# Project Rialto

Improving instant cross-border payments with wCBDC settlement

Massimiliano Cologgi, Adviser, BISIH Eurosystem Centre

# Problem statement and background

- Two promising approaches to improve cross-border payments:

    1. interlinking of instant payment systems (eg project Nexus) and

    2. interoperability of CBDC arrangements (eg projects Dunbar, Jura, Mariana, Icebreaker).

- Several remaining issues:

    - inefficiencies of correspondent banking and third-party risks in FX,

    - limits to the reachability of decentralised solutions,

    - interoperability between NextGen and existing market infrastructures.

- Integrating the two approaches has not been explored yet and might provide answers to advance cross-border payments.

# Project overview

- Rialto aims to demonstrate the technical feasibility of retail cross-border payments using:
    1. interlinked instant payment systems (existing infrastructure).
    2. an automatic FX wholesale conversion layer that allows the use of wCBDC as a safe settlement asset (next generation infrastructure).

- The Project will prototype a modular FX component for use in conjunction with interlinked instant payment systems and other digital asset systems.

| **Market infrastructure** | **FX services** | **Settlement** |
|---|---|---|
|  |  | **CeBM** |
| **Interlinked IPSs** | **Automatic FX** | **wCBDC settlement** |

# Proposed solution (PoC)

1. Payments are initiated by PSPs, processed, and cleared by domestic interlinked IPSs.

2. Currency conversions are performed using a transnational wCBDC network.

3. The two systems are integrated in an efficient and secure manner.

**Sketch of experimental architecture**
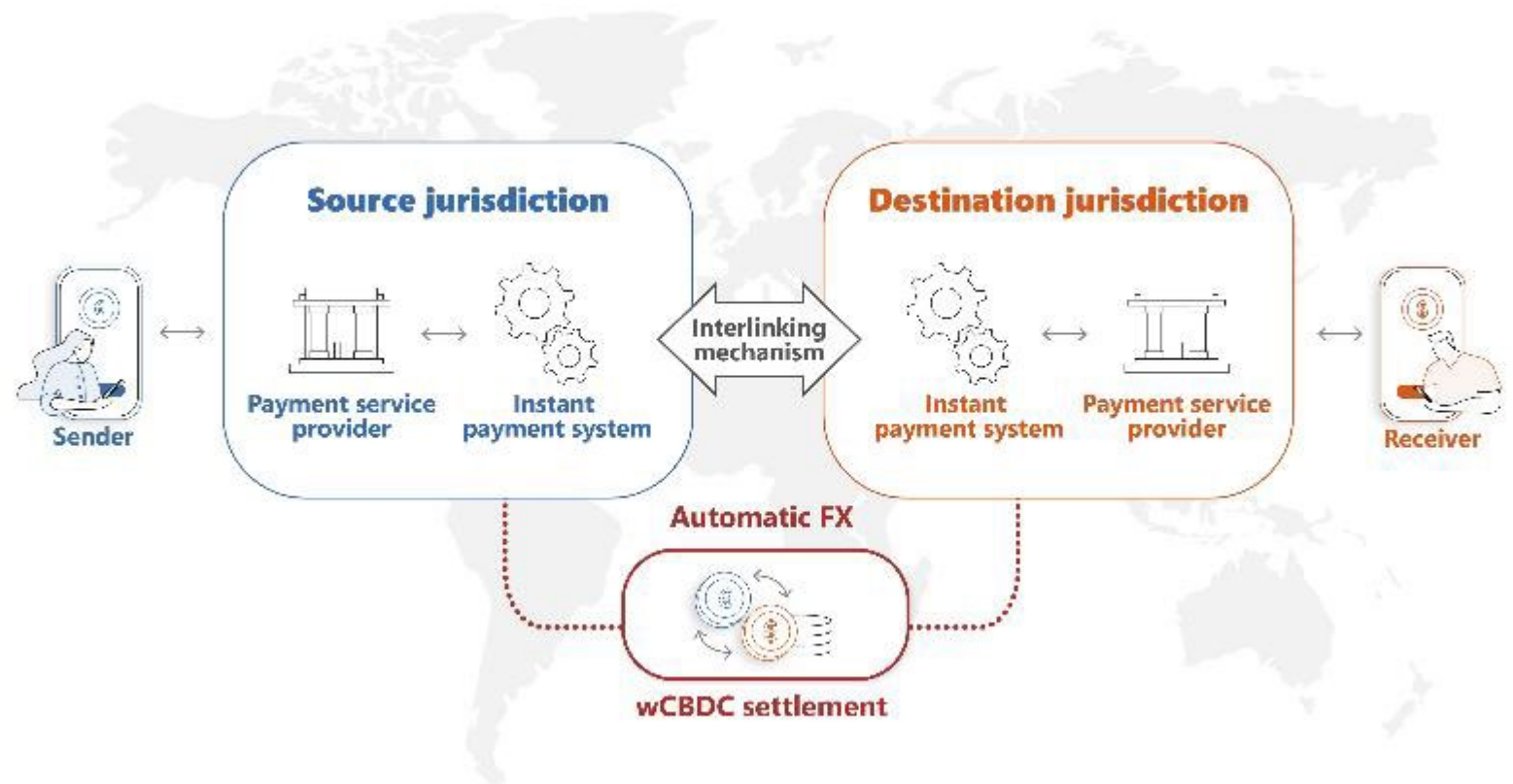
# FX related risks and settlement in cross-border payments

- Settlement is currently through *nostro-vostro* accounts (CoBM), although for certain currencies CeBM arrangements are available at the wholesale level (eg, CLS).

- Achieving **PvP** settlement in **CeBM** (wCBDC being one example) would be a key innovation in the retail cross-currency payments market (~USD 1,000 bn) and reduce several risks (Box 1).

| Box 1: Overview of FX related risks in cross-border transactions | | |
|---|---|---|
| **Liquidity risk**<br><br>The risk that a given currency cannot be traded efficiently in the market for the purpose of processing the cross-border payment. | **Credit risk**<br><br>The risk that one party to the cross-border payment might not be able to meet its related credit obligations. | **Settlement risk**<br><br>The risk that the cross-border transaction cannot be settled, and payment obligations are left undischarged. |
| Example:<br><br>A PSP is unable to meet its cross-border payment obligations in a timely manner due to illiquidity in a specific currency corridor. | Example:<br><br>In the event of a default or non-performance of one party to the cross-border payment, a PSP may be forced to return to the market to obtain the currency it had expected to receive, leading to a larger risk of exposure. | Example:<br><br>Existing PvP settlement arrangements are unavailable, or unsuitable for certain trades, or market participants find them too expensive (BIS, 2022c estimates indicate that 1/3 of FX transactions are exposed to this risk). |
| Rialto:<br><br>Providing access to CeBM when a payment is being made will reduce this risk. | Rialto:<br><br>PvP and CeBM settlement can reduce this risk by allowing a payment to be settled in public money and provided funds are available in the technical accounts with the central bank. | Rialto:<br><br>The integration of existing FMIs with innovative ones can provide better access to programmable money and PvP settlement and reduce settlement risk. |

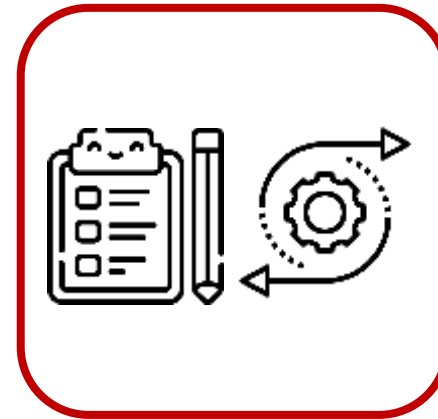# FX market making mechanisms today and in the future

- The exchange of currencies will be facilitated through **FX providers** or innovative mechanisms:
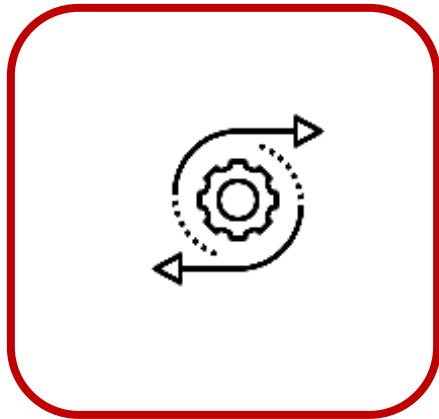
Automated
Market Makers
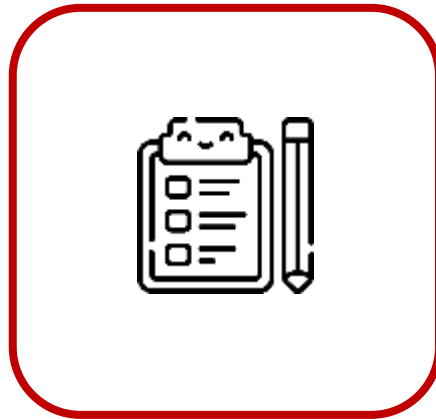
Limit Order Books

Hybrid solutions

- Liquidity management, speed of execution and transaction costs will determine their success.

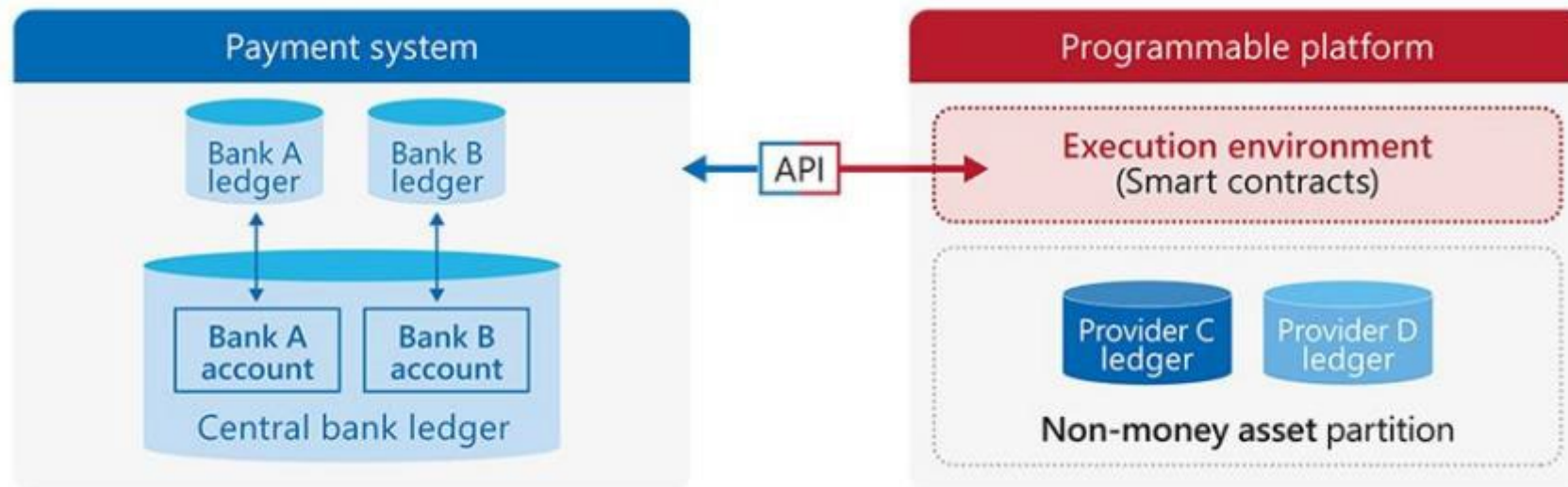# Example of innovative FX solutions and the role of banks

- **Smart contract** that holds liquidity in a pool and acts as a counterparty in FX transactions.

- **FX rates** based on an algorithm (depends on quantities in the pool).

- **Liquidity providers** earn returns.

- **Liquidity takers** pay fees.

- Price spread is closed by **arbitrageurs**.
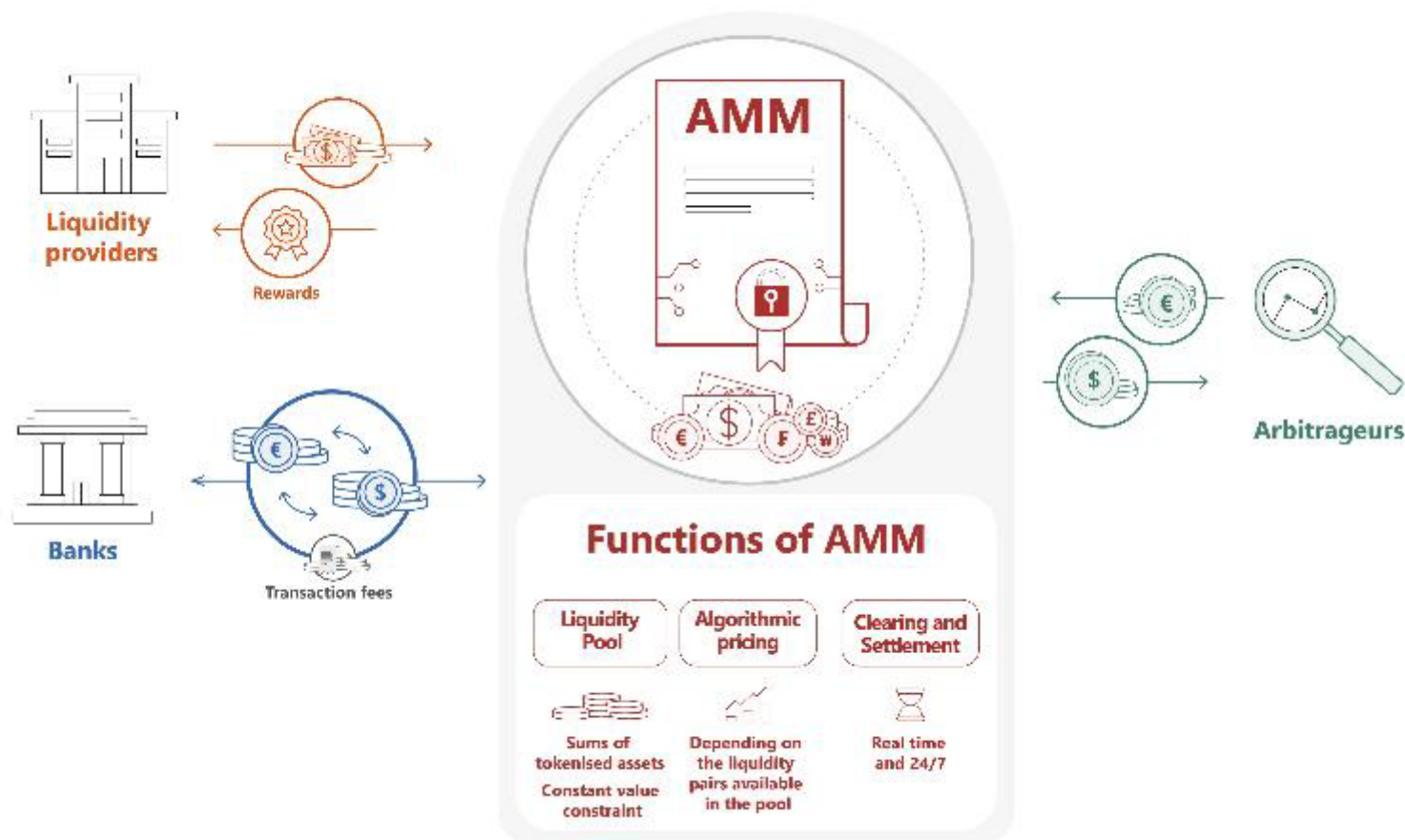
# Integration of existing payment systems to tokenized platform

● Current payment systems based on a flow of messages and instructions can in principle be connected to programmable platforms through standardised APIs and remote procedure call (RPC).

## A. Payment messaging model

| Payment system | Programmable platform |
|---|---|
| Bank A ledger, Bank B ledger | Execution environment (Smart contracts) |
| Bank A account, Bank B account | Provider C ledger, Provider D ledger |
| Central bank ledger | Non-money asset partition |

API

Source: BIS Annual Economic Report 2023.

**BIS** Innovation Hub

Thank you!

https://www.bis.org/about/bisih/topics/cbdc/rialto.htm

# Project Agorá

*A cross-border payment application of the Unified ledger*

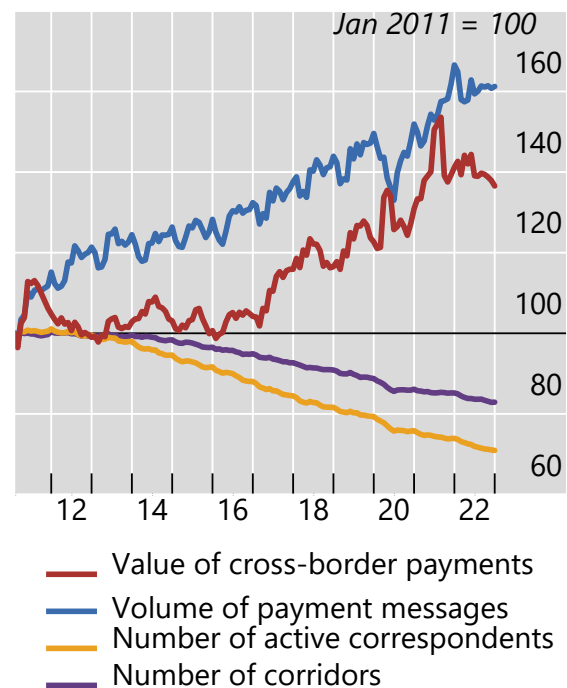Stephanie Haffner, Eurosystem Centre Adviser
Daniel Eidan, Swiss Centre Adviser

# Agorá

{αγορά */a-go-rah/*}

"marketplace" in Greek

# The cross-border payments landscape

### Banks have been retreating[1]



*Jan 2011 = 100*

— Value of cross-border payments
— Volume of payment messages
— Number of active correspondents
— Number of corridors

### The decline is global[2]



*2011–22 change, %*

Number of: ▭ Active correspondents
● Corridors
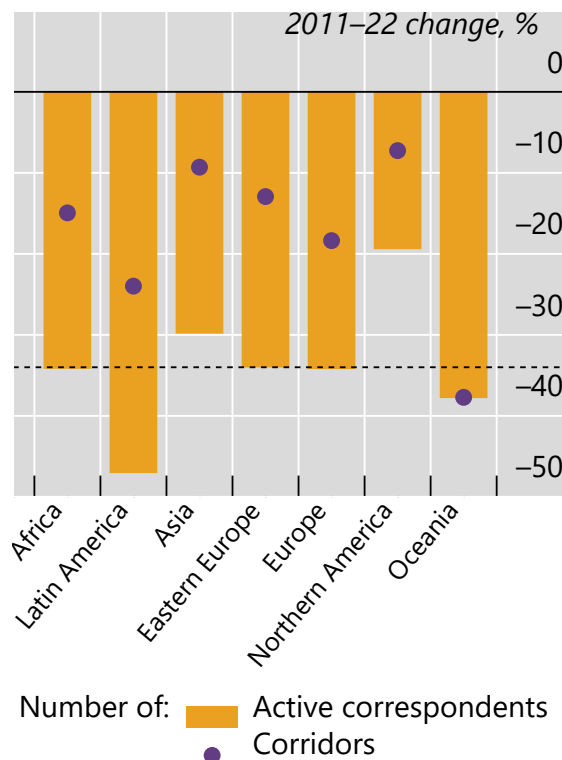
### Some regions are less connected[3]
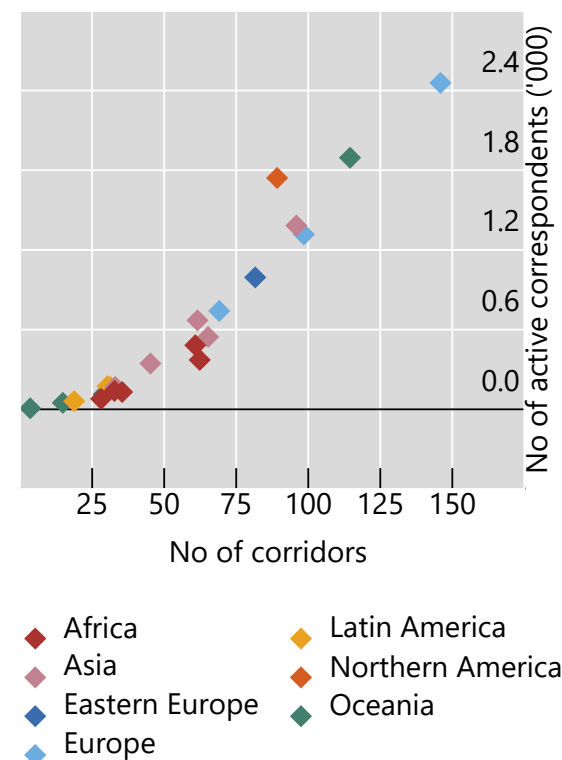


No of active correspondents ('000)

No of corridors

◆ Africa ◆ Latin America
◆ Asia ◆ Northern America
◆ Eastern Europe ◆ Oceania
◆ Europe

# What are the main problems in cross-border payments?

- They are **slow, costly and opaque** for consumers



G20 cross-border programme

- KYC
- AML/CFT
- Sanctions compliance
- Operational costs
  - Tech, training, audits and reporting
- Infrastructure costs
- Data privacy and security (GDPR)
- Penalties and fees
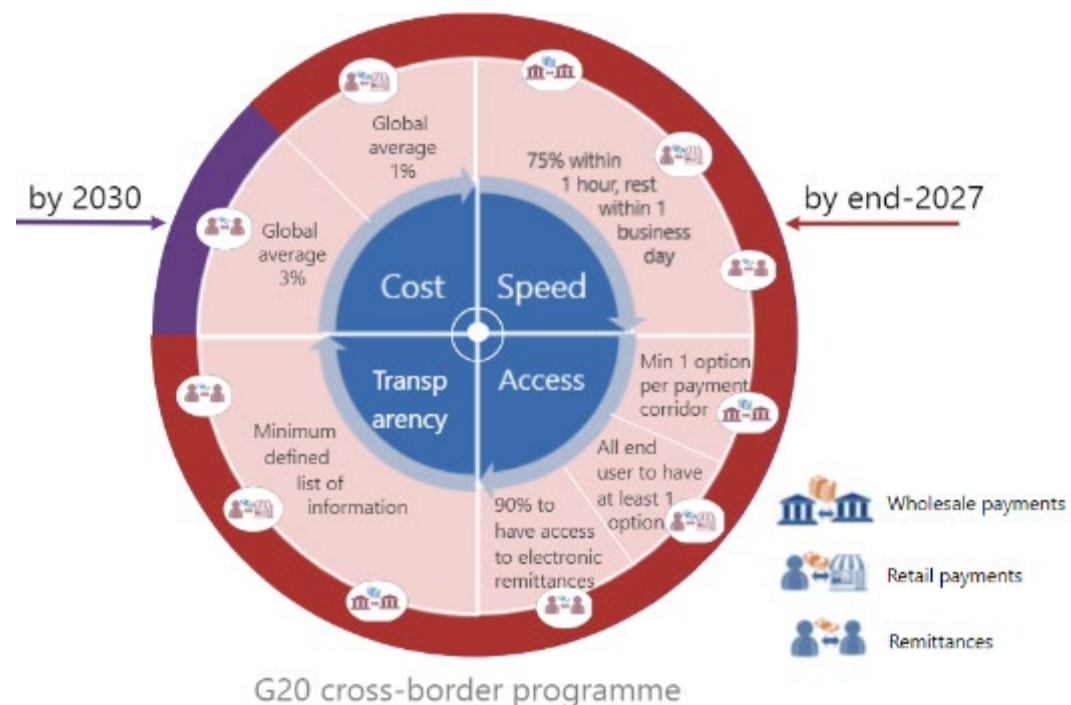
- They are **costly and risky** for banks

# What is a token?

**Rules**
*What the asset can and cannot do
(eg be used in smart contracts)*

**Information**
*What the asset is, where it
comes from, who owns it, etc*

token **core**

token **service**

BIS
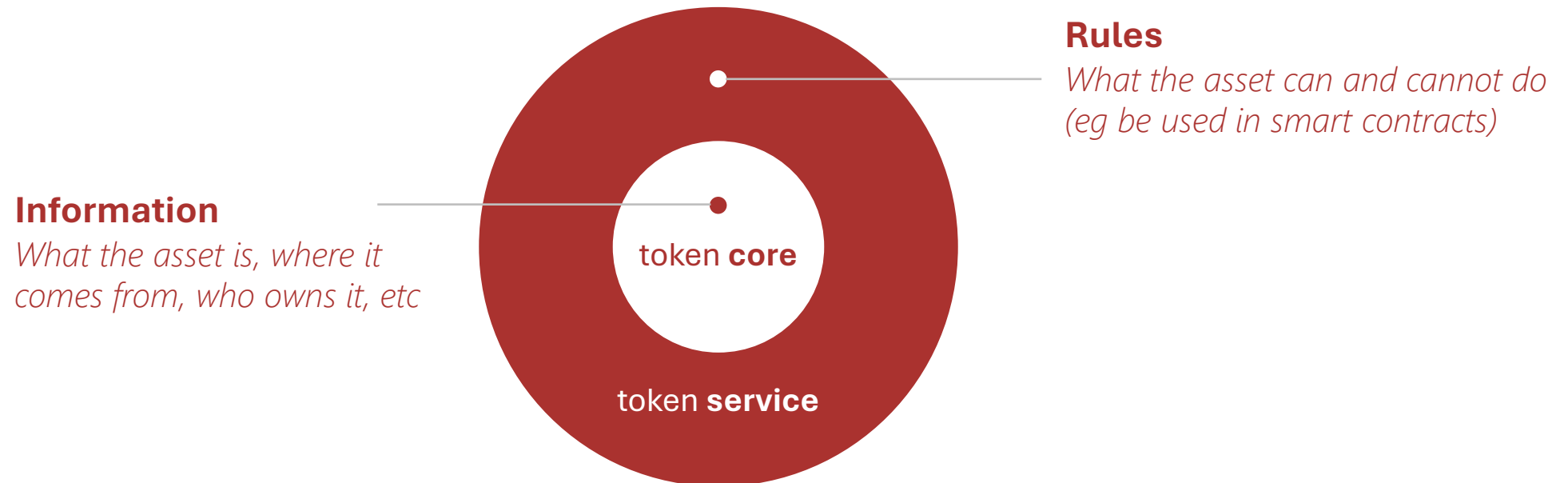
# What is a Unified Ledger?

## Annual Economic Report **2023**

**Chapter 3** – Blueprint for the future monetary system: improving the old, enabling the new
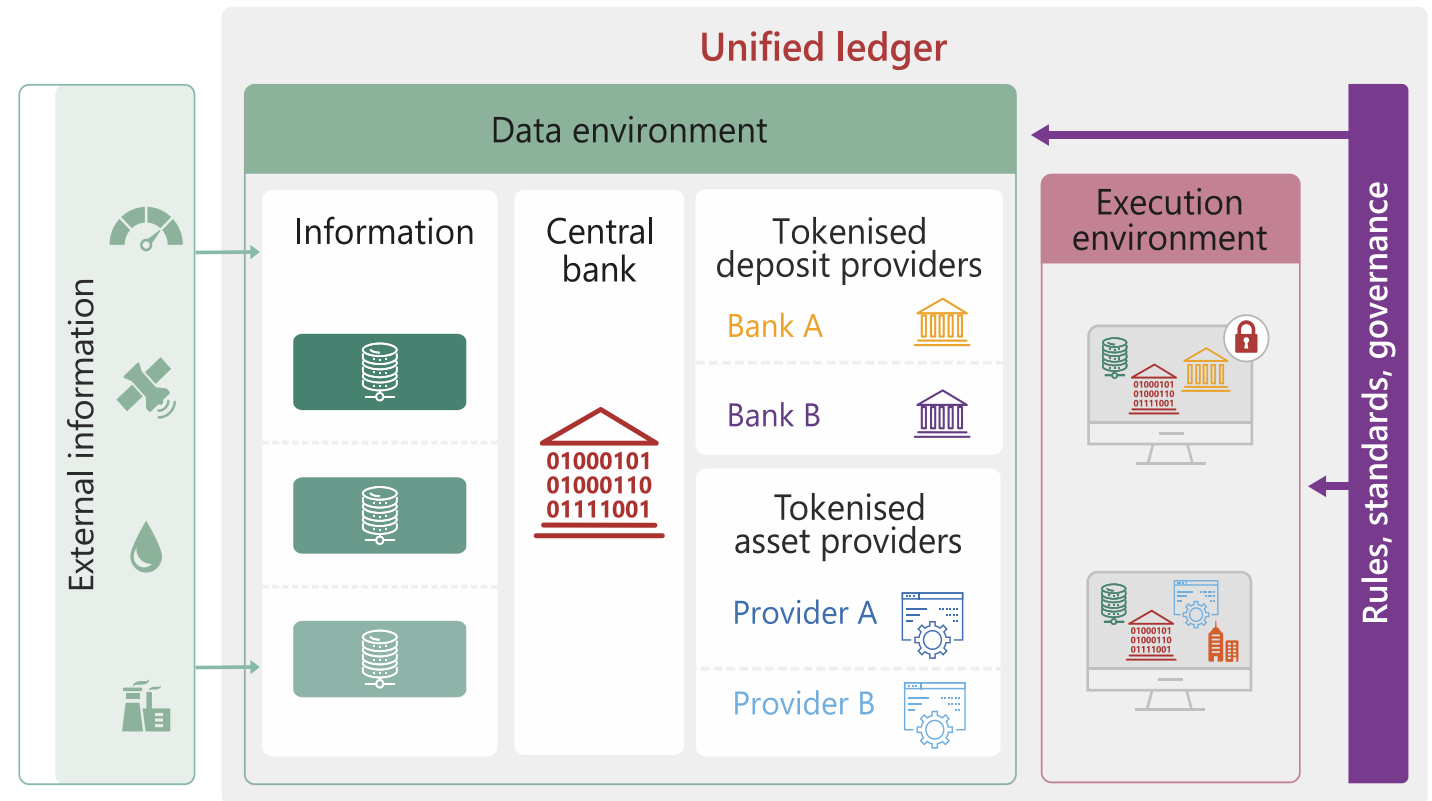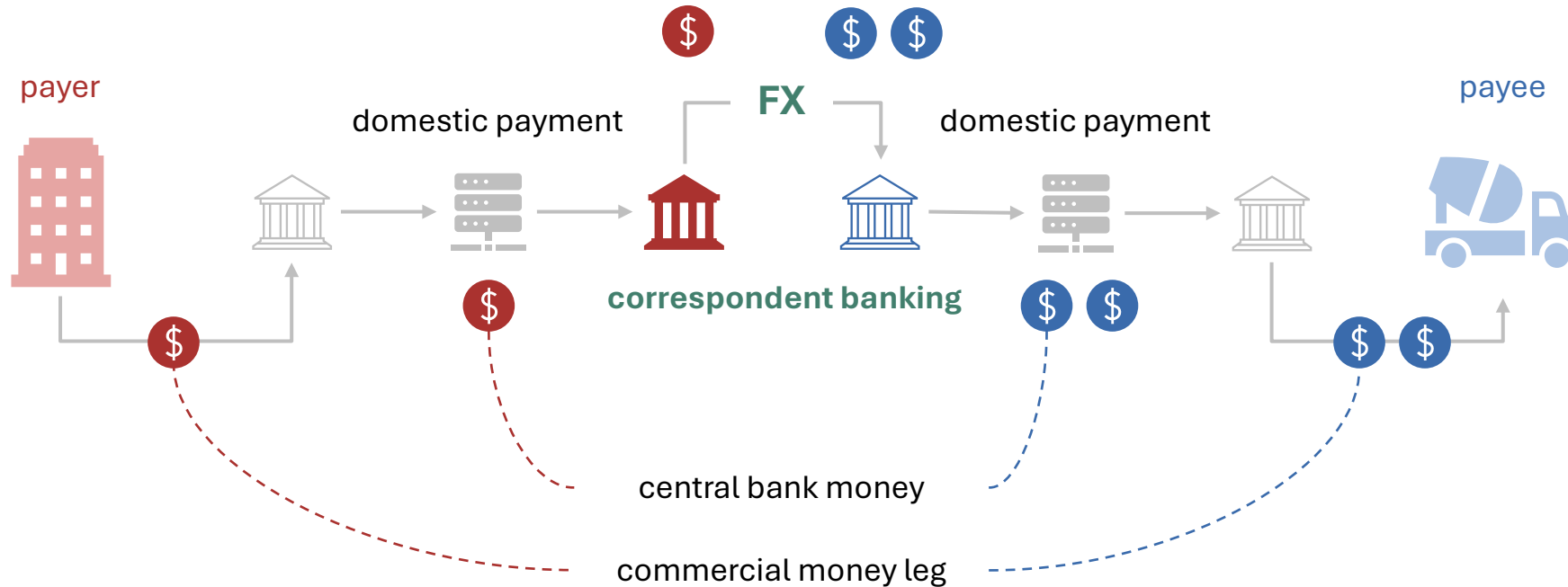
# Hypothesis

*By implementing the correspondent banking model on a programmable platform we can increase efficiency, lower costs and reduce risks.*
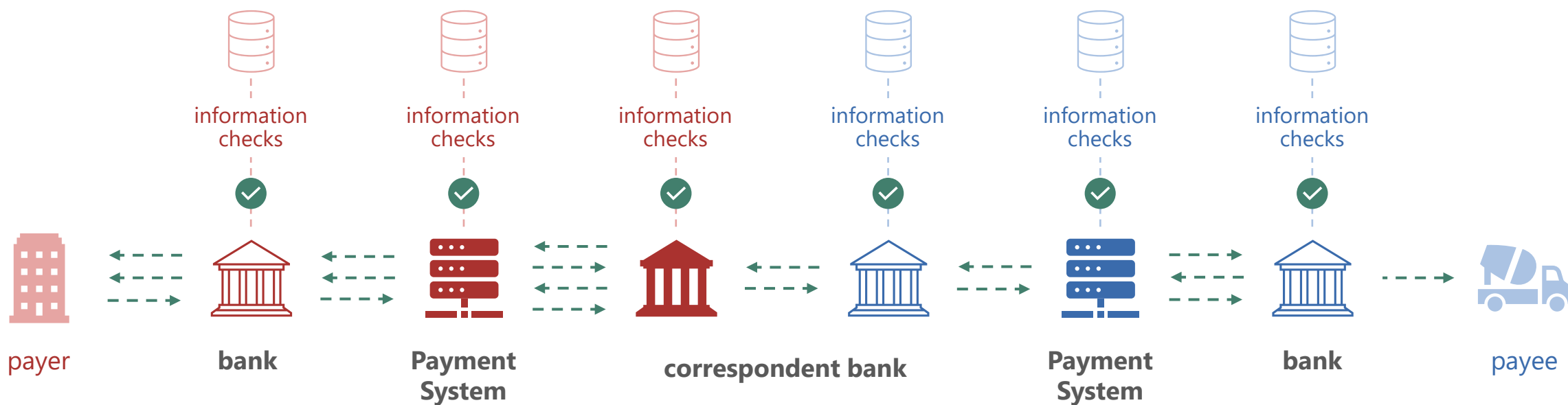
# The cross-border payments use case

wholesale cross-border payments
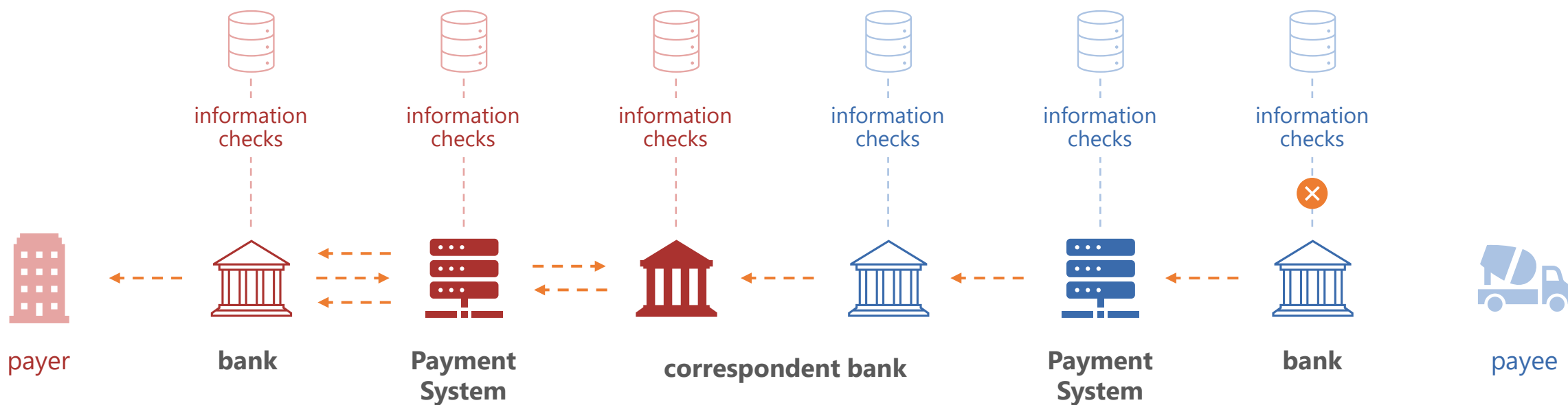done today

# The cross-border payments illustration

payment messages (happy path)

# The cross-border payments illustration

payment messages (**failure** in delivery of funds)

# The cross-border payments illustration

payer • Bank • Payment system • Correspondent bank • Payment system • Bank • payee

Information checks (×6)
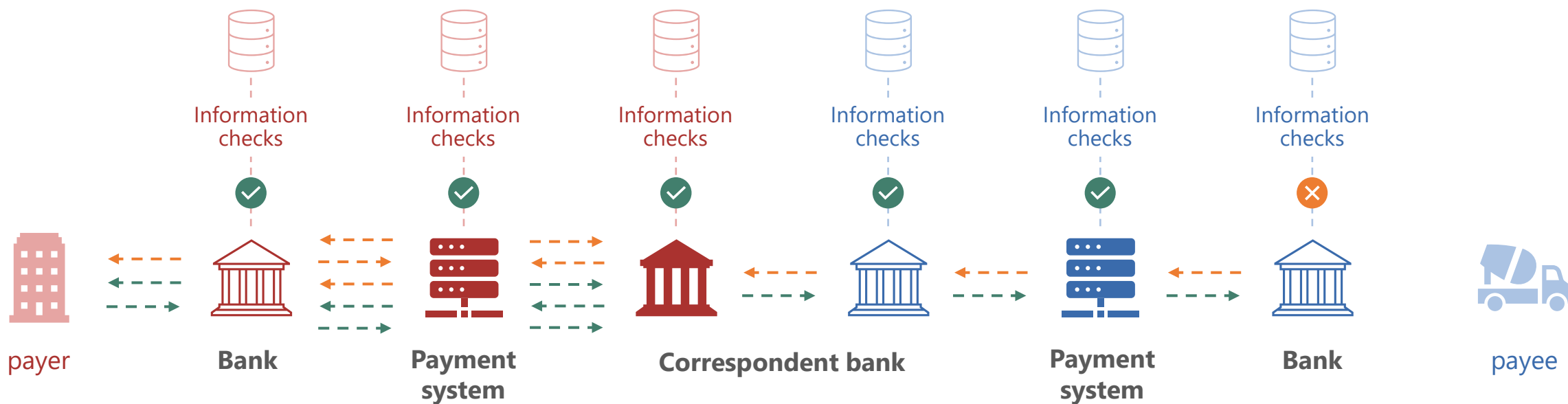
Payment messages (happy path)

Payment messages (**failure** in delivery of funds – refund path)

# Institutional silos…



payer

silo — Acme's bank

silo — Payment system

silo — Origin correspondent bank

silo — Destination correspondent bank

silo — Payment system

silo — Bolt's bank

payee
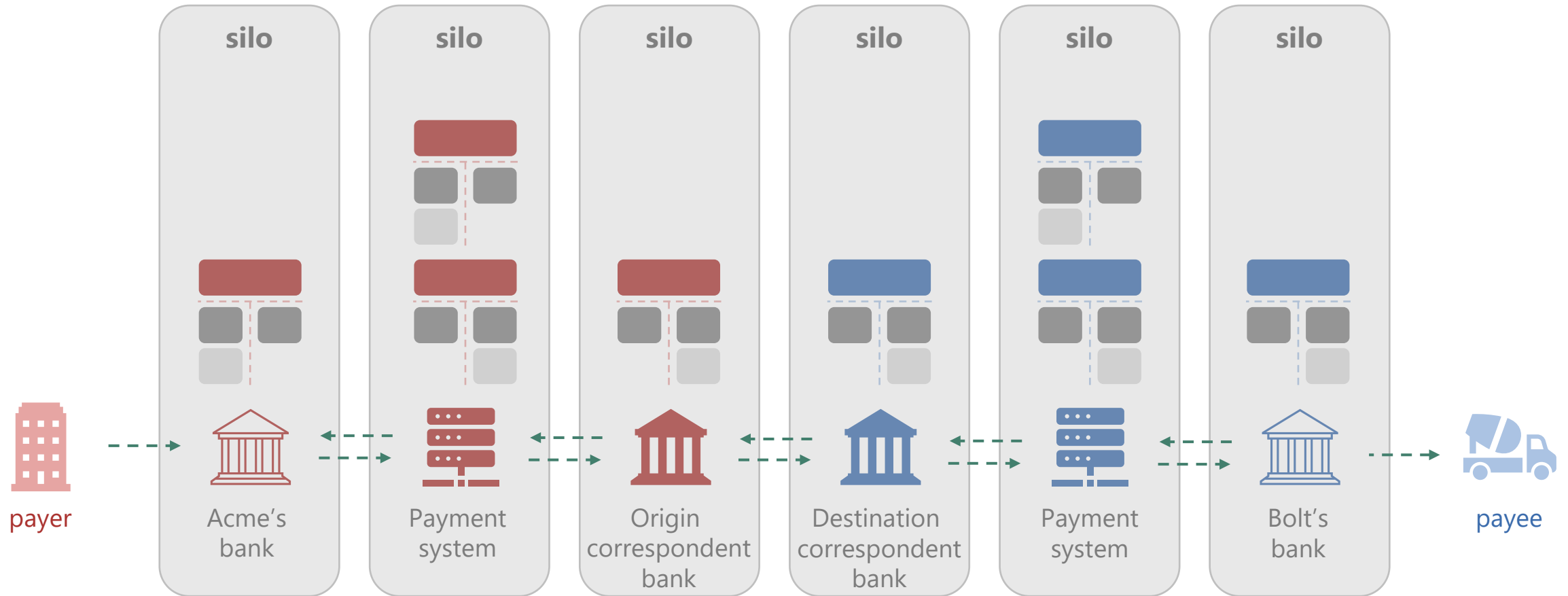
# Different legal and regulatory frameworks...
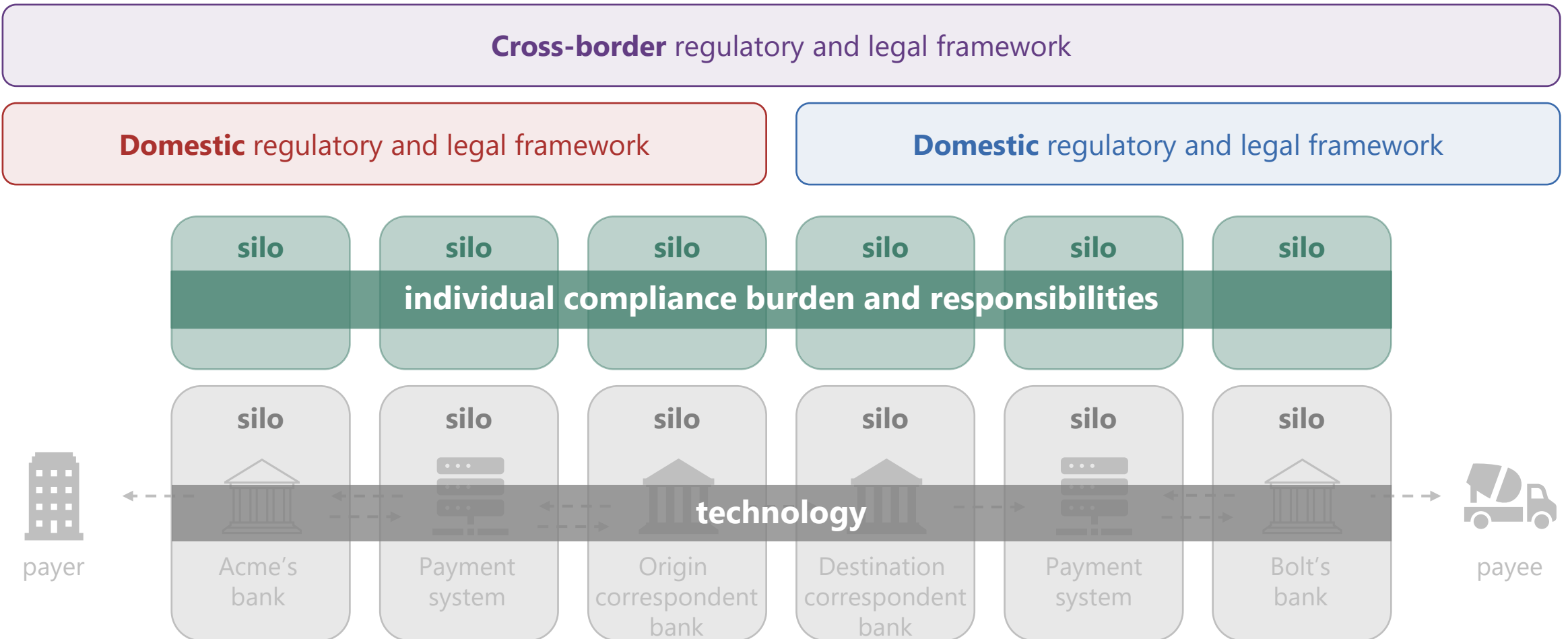
# Cross-border payments in Agorá



payer's Bank     Central bank     Correspondent bank corridor     Central bank     payee's bank

collective effort

Atomic settlement
*(synchronous transaction through a smart contract)*

**Agorá**
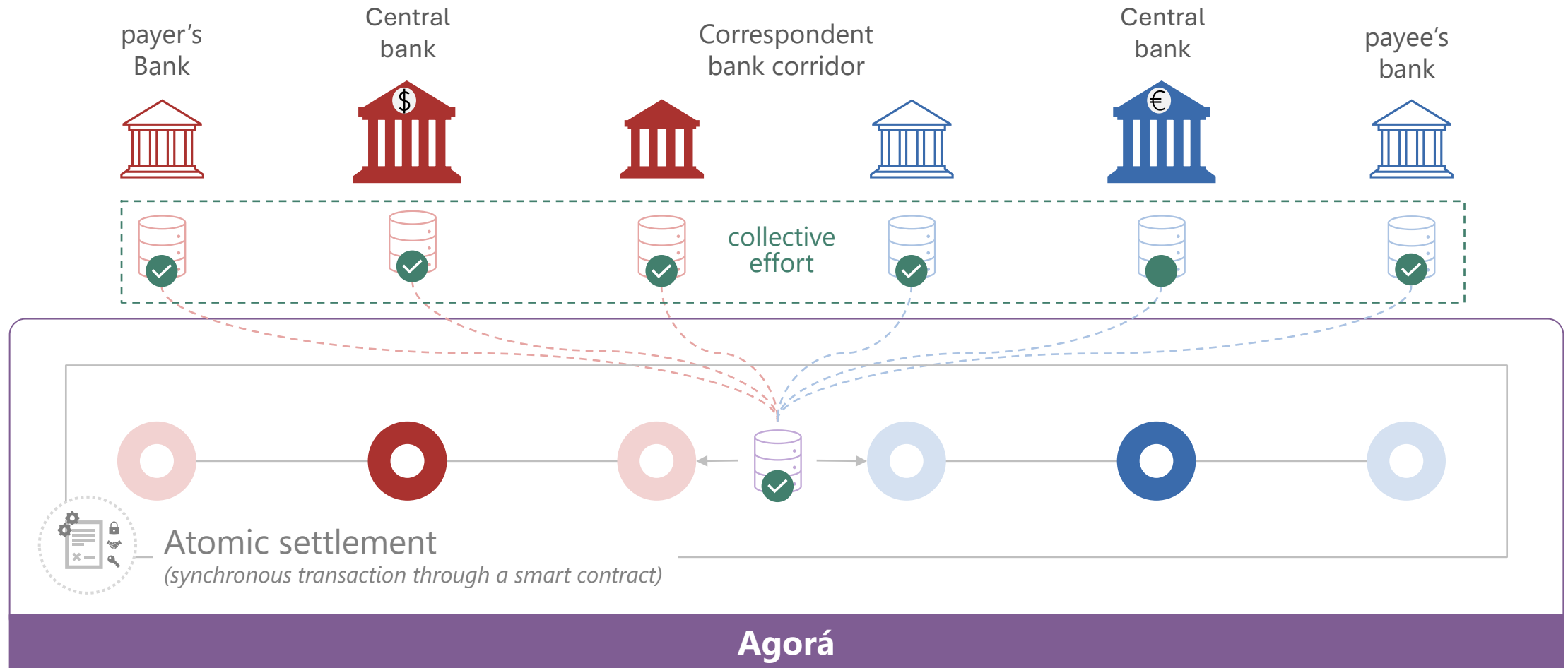
⬤ **wholesale central bank** monies     ⬤ **commercial bank** monies

# Project structure a public private collaboration
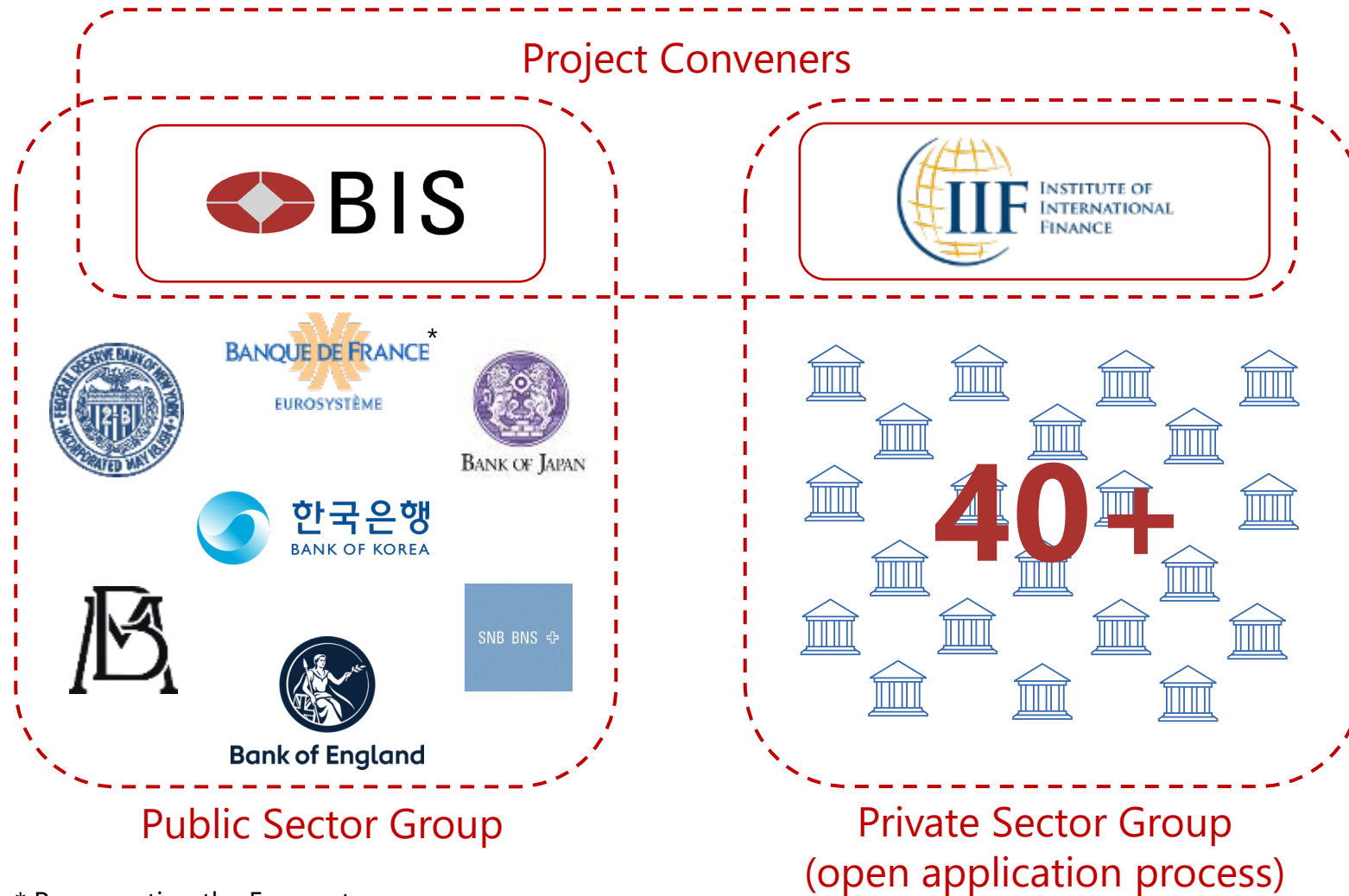
# Seven Central Banks



All 5 international currencies, and more...

# Private sector participants

| No. | Entity Name |
|---|---|
| 1 | Amina Bank |
| 2 | Banco BV |
| 3 | Banco Santander |
| 4 | Banorte |
| 5 | Banque Cantonale Vaudoise |
| 6 | Basler Kantonalbank |
| 7 | BBVA |
| 8 | BNP Paribas |
| 9 | BNY |
| 10 | CaixaBank |
| 11 | Citi |
| 12 | Commerbank AG |
| 13 | Crédit Agricole CIB |
| 14 | Deutsche Bank AG |
| 15 | Eurex |
| 16 | Euroclear S.A./N.V. |
| 17 | FNBO |
| 18 | Groupe BPCE |
| 19 | Hana Bank |
| 20 | HSBC |
| 21 | IBK |

| No. | Entity Name |
|---|---|
| 22 | Intercam Banco |
| 23 | JP Morgan Chase Bank, N.A. |
| 24 | KB Kookmin Bank |
| 25 | Lloyds Banking Group |
| 26 | Mastercard |
| 27 | Mizuho Bank |
| 28 | Monex |
| 29 | MUFG Bank Ltd. |
| 30 | Natwest Group |
| 31 | NongHyup Bank |
| 32 | PostFinance Ltd. |
| 33 | SBI Shinsei Bank Ltd. |
| 34 | Shinhan Bank |
| 35 | Six Digital Exchange (SDX) |
| 36 | Standard Chartered Bank |
| 37 | Sumitomo Mitsui Banking Corporation |
| 38 | Swift |
| 39 | Sygnum Bank |
| 40 | TD Bank N.A. |
| 41 | UBS |
| 42 | Visa |
| 43 | Woori Bank |

# Private sector diversity

## Business model
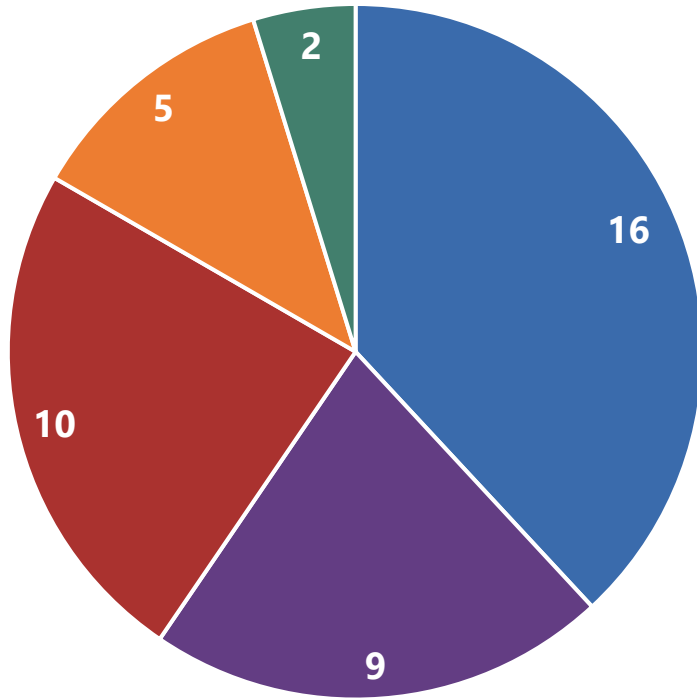


- G-SIBs
- D-SIBs
- Other banks
- FMIs
- Cards networks

## Geographic
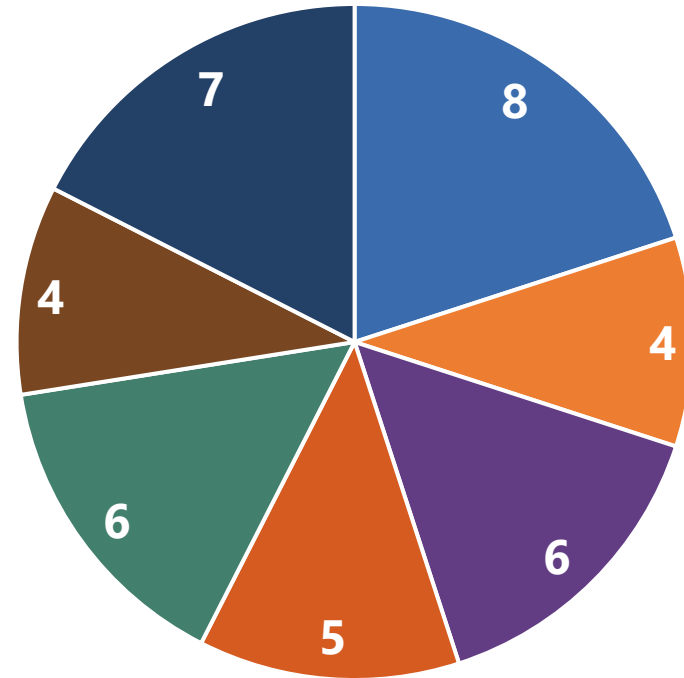


- Eurozone
- Japan
- Korea
- Mexico
- Switzerland
- United Kingdom
- United States

# Project outputs



**Platform prototype**



Project Agorá
Convened by the
BIS  IIF

Agorá
**Final report**
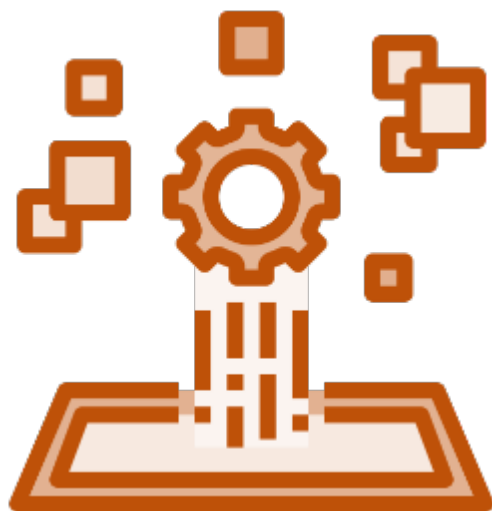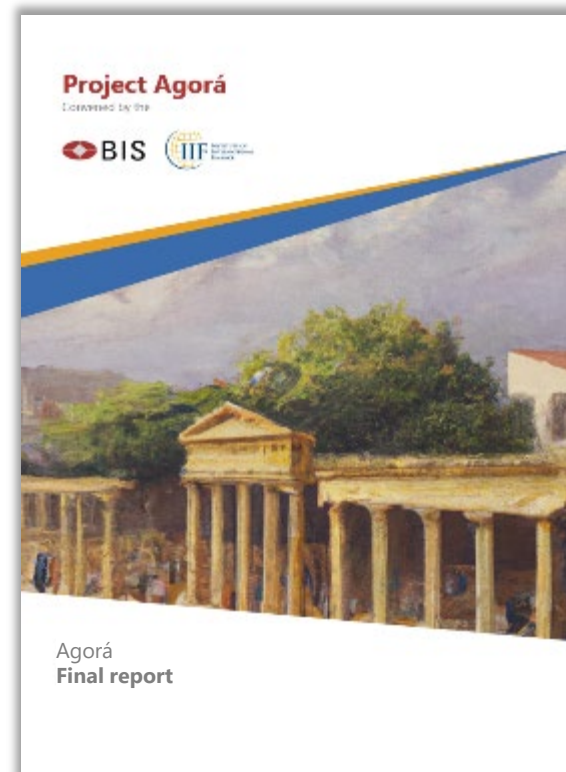
**Final report**

# Summary

- The goal is to bring together the private and public sectors from different jurisdictions to experiment on how tokenisation can improve cross-border payments

- Demonstrate value while preserving key aspects of correspondent banking structure and central bank access policies

- Perfecting intermediaries, not replacing them

- Build a prototype to test the technical feasibility of a programmable platform to support cross-border payments.

Agorá

# Project Meridian FX

*Improving FX transactions through synchronised settlement*

Stephanie Haffner, Eurosystem Centre Adviser

# Project Meridian (2023) was the genesis of Project Meridian FX

- Project Meridian, run by the London Centre and Bank of England, was completed in 2023, and experimented with the concept of **synchronisation via a synchronisation operator.**

- Synchronisation involves settling a transaction using central bank money in an RTGS system - funds move **if and only if** an asset on another ledger also moves, reducing risks and increasing efficiencies.

- Project Meridian built on the existing concept of **interlinking asset ledgers with RTGS systems**, but demonstrated how a synchronisation operator can orchestrate **synchronised settlement in central bank money** using housing transactions in the UK as an exploratory use case.

# Project Meridian Overview

**1 Request settlement service**

To start a transaction, counterparties appoint a synchronisation operator.

**2 Buyer commits funds**

Reservation of the buyer's funds for the transaction by applying a hold is instructed.

**3 Funds reserved**

To prevent the funds or assets being used in other transactions, an earmark is placed. This can last for minutes, and approval is needed before they are placed.

**4 Settlement**

Final settlement is achieved when the synchronisation operator instructs funds to move from the buyer's bank to the sellers in the RTGS system. Ownership of the asset changes.

**5 Balances updated**

The buyer's and seller's bank account balances are updated after settlement finality is achieved.

**6 Confirmation of settlement**

End users receive confirmation that the transaction has been completed, and the digital deed is sent to HM Land Registry. Remaining steps in the house purchase process can now occur.
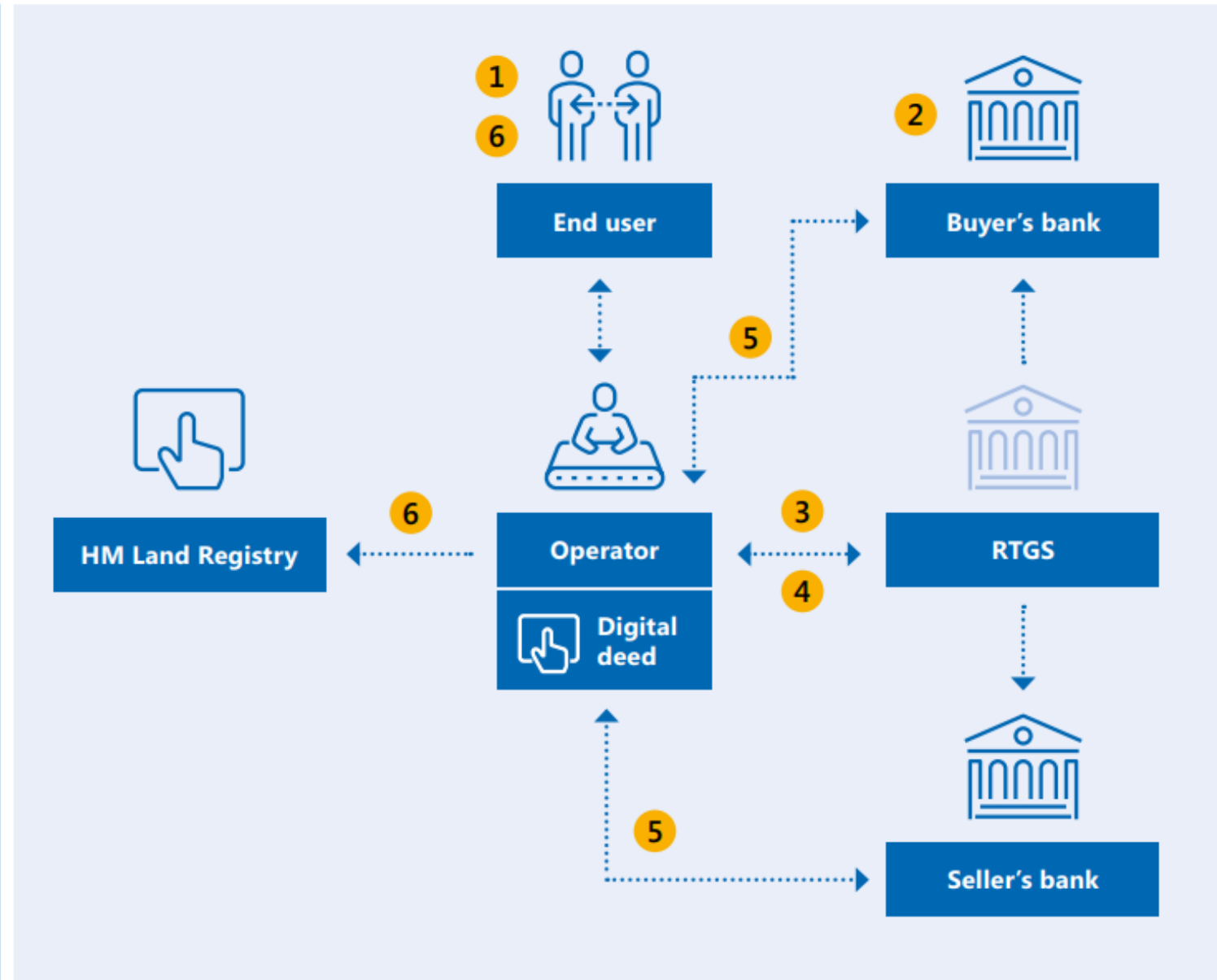
# The Project Meridian report recommended applying the Meridian prototype to FX transactions

- The Project Meridian report noted that achieving **synchronous settlement** for a **foreign exchange transaction** would involve **simultaneous actions** in RTGS systems **in two jurisdictions:**

  - A prototype would need to **send symmetric instructions to two RTGS systems**, one for each currency.

  - Then, once **earmarks are confirmed** in both currencies, the synchronisation operator could **trigger settlement across the two RTGS systems simultaneously**.

# Project Meridian FX: Objectives

- Meridian FX builds upon the concept of the synchronisation operator (SO) from Project Meridian and explores or experiments with connecting asset ledgers across **two RTGS systems** based in different jurisdictions.

- The RTGS connections also include those which are **DLT-based**, in order to test how the SO could support interoperability between existing and new technologies.

- The aim is to successfully orchestrate the settlement of a **payment versus payment (PvP) instant FX transaction**.

# Meridian FX: Key Objectives

- **Core Objectives**:
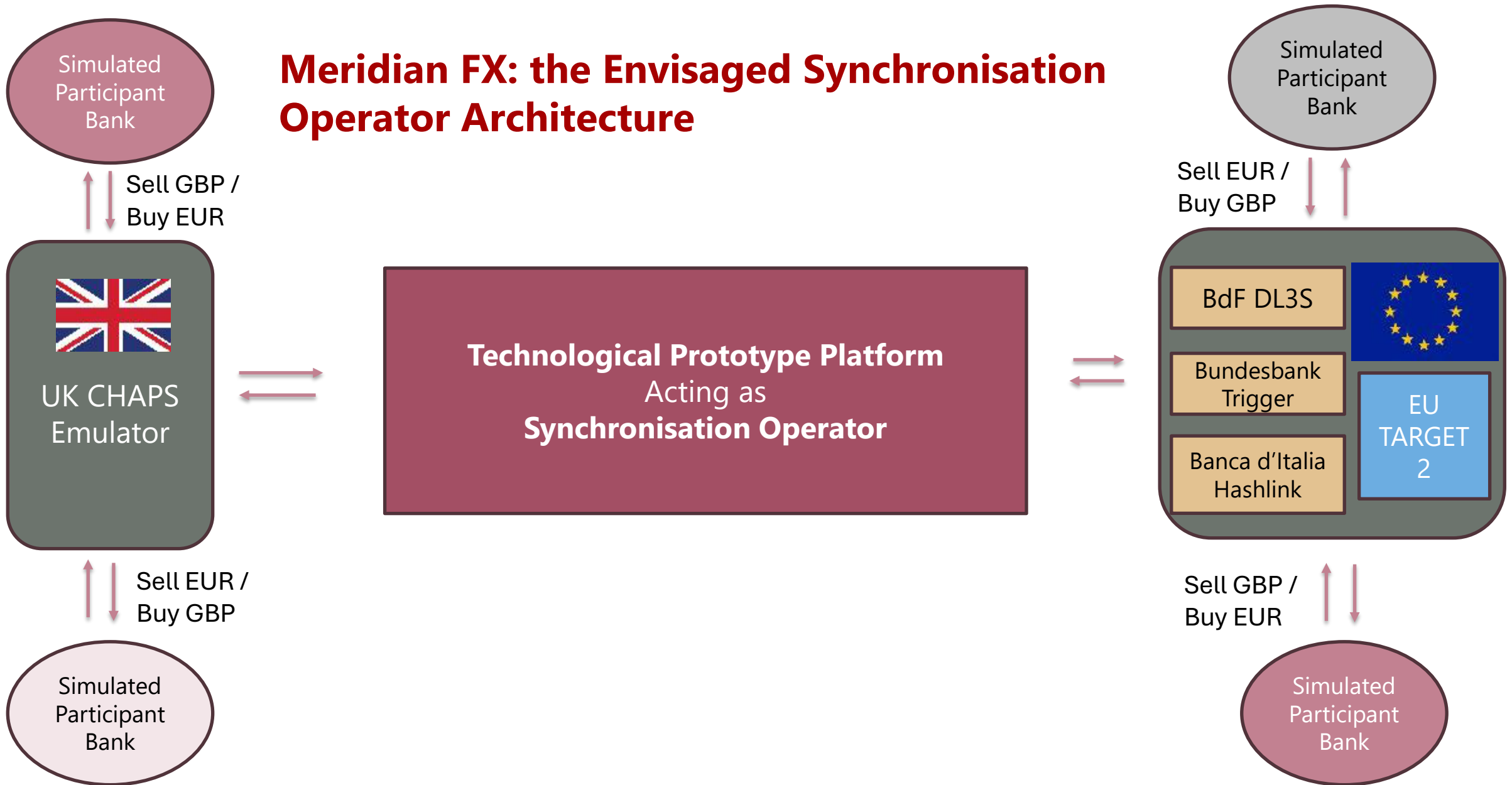  - Synchronised settlement of PvP involving different RTGS systems

  - Synchronised settlement of PvP involving ledgers based on different technologies (central and DLT)

- **Extension Objectives**:
  - Liquidity: How might a synchronisation operator minimise liquidity needs?

  - Control points: How might a synchronisation operator balance the need for (user) control points with other considerations?

# Meridian FX: Actions

- Meridian FX is a joint project between the BIS Innovation Hub's **London Centre** and **Eurosystem Centre**.

- Meridian FX tests mock connections between the **Bank of England's CHAPS RTGS** system, and the **Eurosystem's TARGET 2 RTGS** system. The goal is to demonstrate a successful **GBP:EUR transaction**.

- On the EUR side, the experiments use **the Eurosystem's three potential solutions** for wholesale central bank settlement interaction between TARGET services and DLT platforms. These are:

  - The Banque de France's DL3S DLT solution
  - The Banca d'Italia's TIPS-Hash-Link solution
  - The Bundesbank's Trigger solution

# Meridian FX: the Envisaged Synchronisation Operator Architecture



Simulated Participant Bank

Sell GBP / Buy EUR

Simulated Participant Bank

Sell EUR / Buy GBP

UK CHAPS Emulator

**Technological Prototype Platform**
Acting as
**Synchronisation Operator**

BdF DL3S

Bundesbank Trigger

Banca d'Italia Hashlink

EU TARGET 2

Sell EUR / Buy GBP

Simulated Participant Bank

Sell GBP / Buy EUR

Simulated Participant Bank

# Meridian FX: The Timeline

- Early June 2024: Public launch

- **Sept-Dec: Run core experiments**

- Dec 2024 -Jan 2025: Work on extension objectives

- Spring 2025: Publish report

**Thank you for your attention!**

**Questions anyone?**