ABI Associazione Bancaria Italiana

Wholesale CBDC: evolution of settlement systems and future perspectives

Understanding how money moves in the financial system — and how it may change.

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What really happens when money moves?

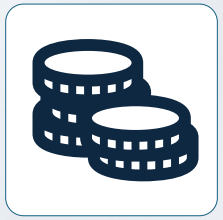
Agenda

1. What is Settlement?
2. The Global Policy Shift
3. Deep Dive: The Eurosystem Approach
4. Drivers Shaping the Future of Settlement

What is Settlement?

"Final **settlement** is the **irrevocable** and **unconditional** transfer of an asset or financial instrument, or the discharge of an obligation."

Principles for Financial Market Infrastructures (PFMI)



Settlement = **final and irrevocable transfer of money** or securities

Crucial for financial stability because it **eliminates credit & liquidity risk**

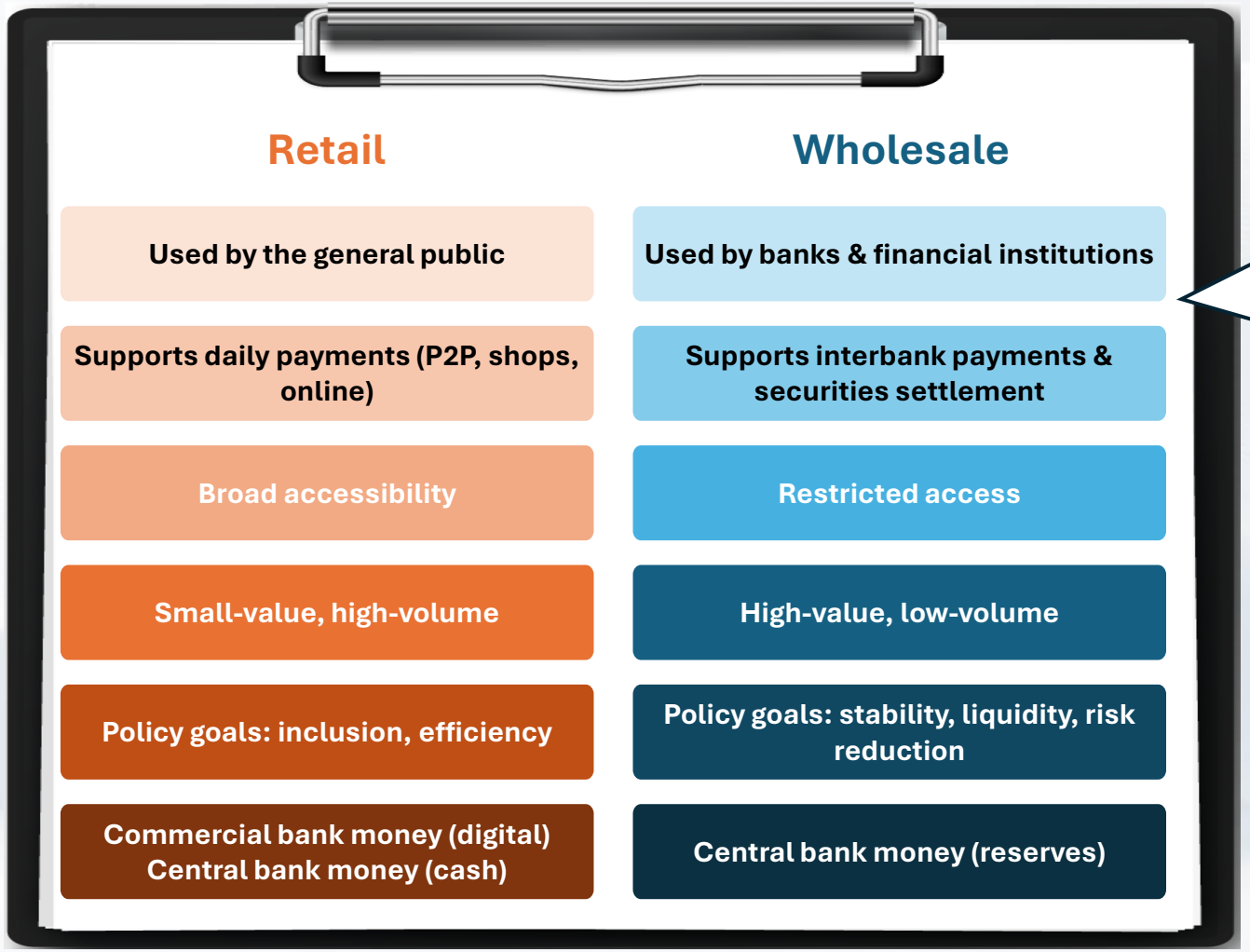
In wholesale markets, settlement typically occurs in **central bank money** (safest asset)

https://www.bis.org/cpmi/publ/d101.htm

Trade → Clearing → Settlement

	Trade: Agreement on terms	**Clearing**: Calculation & Netting	**Settlement**: Final, irrevocable transfer of cash/securities
London, 1850 	Two merchants meet at the Royal Exchange in London: Mr. Smith, an English cotton trader and Mr. Dupont, a French textile importer They negotiate face-to-face and agree on a sale of 10 bales of cotton for £1,000. The agreement is handwritten in their ledgers — a simple promise between the parties. 1	Mr. Dupont goes to his bank in Paris, which sends a payment instruction by letter to its correspondent bank in London. Clerks check the customer's balance, verify documents, and reconcile entries by hand. If the two banks owe each other money for other trades that day, they may perform manual netting to reduce the final amount to be settled. 2	Two typical methods in the 1800s: Correspondent banking transfer: The London bank debits the French bank's correspondent account and credits Mr. Smith's account. Physical settlement: For large transactions or between certain banks, settlement could involve shipping gold or banknotes using trusted couriers. 3
Europe, 2026 	Two European banks execute transaction on an electronic trading platform on behalf of their clients. The trade is confirmed digitally within seconds with full audit trails. 4	Clearing is automated and integrated. Positions and obligations are calculated in real time. Risk controls, margin checks, and matching algorithms run automatically. Systems like T2 and T2S coordinate cash and securities processes across the Eurosystem. 5	Final settlement takes place on T2/T2S, the Eurosystem's new Real Time Gross Settlement (RTGS) platform. Funds move instantly and irrevocably. Settlement happens in central bank money, guaranteeing safety and stability. Client accounts at their respective banks are updated automatically to reflect the final settlement. 6

Retail vs Wholesale Money



TL;DR

Retail = money for citizens and businesses (like cash, cards, mobile wallets).

Wholesale = money used by banks and financial market infrastructures to settle large-value payments and securities.

How settlement works today in Europe (TARGET Services): T2 + T2S + TIPS

TARGET (**T**rans-European **A**utomated **R**eal-time **G**ross-settlement **E**xpress **T**ransfer system) is the backbone of high-value euro payments, providing real-time, risk-free settlement in central bank money.

Real-Time Gross Settlement (RTGS)

- Payments are settled one-by-one, in real time, with finality. No netting, no delays.

Dedicated Cash Accounts (DCAs)

- Banks hold DCAs, used specifically for settlement. Liquidity comes from the Main Cash Account (MCA) managed via the Central Liquidity Management (CLM) module.

T2 Settlement Flow (Cash Leg)

1. Bank A submits a payment instruction
2. T2 checks liquidity in Bank A's DCA
3. If needed, liquidity is pulled from the MCA
4. Payment is debited from Bank A's DCA and credited to Bank B's DCA
5. Settlement is final and irrevocable

All three TARGET Services (T2, T2S and TIPS) are operated by the four Eurosystem national central banks (4NCBs).

Eurosystem RTGSs' evolution

Pre-1999: national RTGS systems

1999 – TARGET: first cross-border RTGS for the euro (federated system)

2007–2008 – TARGET2: unified, modernized RTGS platform

2015 – T2S: integrated EU securities settlement

2018 – TIPS: instant payments in central bank money

2023 – T2: next-generation RTGS + central liquidity management

https://www.ecb.europa.eu/paym/target/html/index.it.html

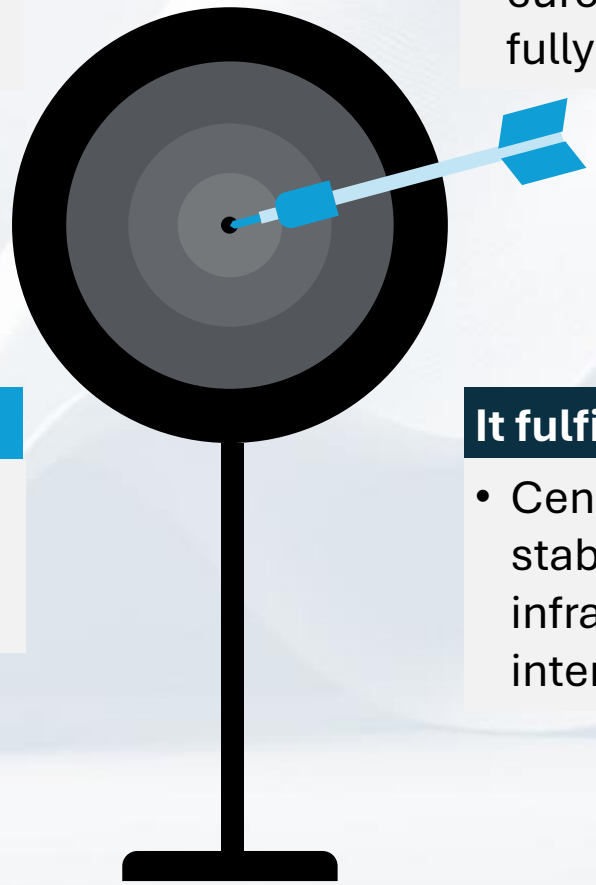
Why Central Bank Money (CeBM) settlement is important?

Central bank money is the only risk-free

- It eliminates credit risk entirely, ensuring that obligations are settled in the safest form of money.

It preserves the singleness of money

- It guarantees that "one euro is one euro," keeping all forms of money fully interchangeable at par.



It ensures legal certainty

- Settlement in central bank money benefits from strong legal protections and irrevocable finality.

It fulfils a public-policy mandate

- Central banks provide neutral, stable and resilient settlement infrastructures in the public interest.

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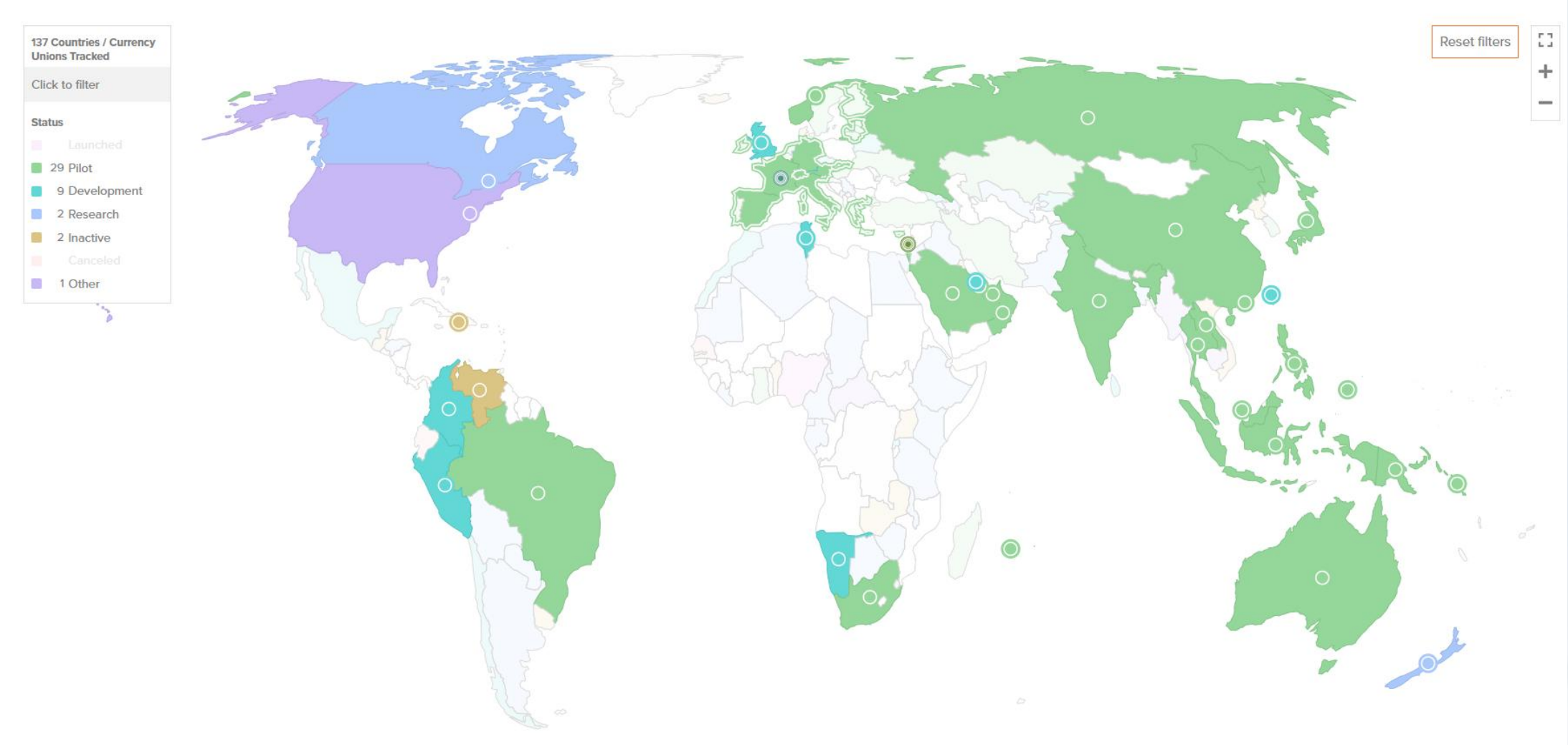
The global wave of wCBDC research



https://www.atlanticcouncil.org/cbdctracker/

Why Central Banks Are Exploring Wholesale CBDCs

Tokenisation

Financial markets are progressively moving toward tokenised assets, requiring new forms of cash settlement that can operate with DLT platforms.

Resilience

Central banks aim to preserve the safety and stability of settlement in a market landscape increasingly shaped by new technologies.

Efficiency

Wholesale CBDCs can streamline settlement, reduce delays, automate workflows and support new use cases such as programmable transactions.

Cross-Border Modernisation

Global payments remain slow, costly and fragmented; multi-CBDC platforms promise easier, faster and more transparent cross-border settlement.

When Settlement Meets DLT

DLT is gaining traction as financial markets experiment with tokenised assets and seek more automation, transparency, and cross-platform connectivity.

Opportunities

Atomic Settlement: DLT enables simultaneous exchange of cash and assets (DvP/PvP) on the same ledger, eliminating principal risk.

Programmability: Smart contracts automate workflows (e.g., collateral triggers, conditional payments), reducing operational steps and errors.

Interoperability with Tokenised Assets: A shared ledger reduces reconciliation needs and aligns the settlement asset (cash) with tokenised securities and FX.

Extended Availability: DLT platforms can support near-real-time or even 24/7 processing, increasing flexibility for market participants.

Challenges

Scalability & Performance: Many DLT networks still struggle with high transaction throughput and latency constraints.

Privacy & Confidentiality: Wholesale settlement requires strict data governance; some DLT models expose transaction visibility beyond acceptable thresholds.

Governance & Control: Who operates the nodes? Who controls the network? Central banks must ensure neutrality and prevent fragmentation.

Legal & Operational Complexity: Settlement finality on DLT must be fully recognized under law; coexistence with RTGS infrastructures creates complex hybrid models.

BIS Wholesale-CBDC Experiments: Global Benchmarks

BIS

PROJECT HELVETIA

- **Actors:** BIS Innovation Hub, Swiss National Bank (SNB), SIX (financial infrastructure operator)
- **Date:** Phase I 2020, Phase II 2021, Phase III 2023
- **Objectives:** Explore how to settle tokenised assets in central bank money on DLT platforms. Test both models: wholesale CBDC issued on DLT and synchronisation with the RTGS .
- **Key Feature / Contribution:** Demonstrated end-to-end settlement of tokenised assets using wholesale CBDC integrated with central bank and commercial bank systems. Phase III pilots real CHF wCBDC for settlement.

PROJECT JURA

- **Actors:** BIS Innovation Hub, Swiss National Bank (SNB), Banque de France (BDF), SIX, Accenture, Credit Suisse, Natixis, UBS
- **Date:** 2021
- **Objectives:** Test cross-border settlement using EUR and CHF wholesale CBDCs. Conduct PvP (FX) and DvP (tokenised assets) on a single third-party DLT platform.
- **Key Feature / Contribution:** First experiment enabling direct cross-border transfer of two wholesale CBDCs (EUR/CHF) between commercial banks on a shared DLT network.

PROJECT mBRIDGE

- **Actors:** BIS Innovation Hub, Bank of Thailand, Central Bank of the UAE, Digital Currency Institute of the PBoC, Hong Kong Monetary Authority, Saudi Central Bank
- **Date:** 2021-2022, MVP in 2024
- **Objectives:** Develop a multi-CBDC cross-border settlement platform using DLT. Address pain points of today's cross-border payments: cost, speed, transparency, correspondent banking inefficiencies
- **Key Feature / Contribution:** First multi-jurisdiction, multi-CBDC shared platform to reach MVP (Minimum Viable Product) stage with validating nodes operated by participating central banks.

These experiments show that central banks around the world are actively preparing for a future where tokenised assets and cross-border digital settlement become mainstream.

https://www.bis.org/about/bisih/about.htm

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Eurosystem and wCBDC (or CeBM)

What is a wCBDC? It is important to first answer this question, and in a 2022 speech ("Demystifying wholesale central bank digital currency"), Fabio Panetta provides some essential points to understand the current situation and the Eurosystem's objectives.

1. "With wholesale CBDCs, the focus is on settling interbank transfers and related wholesale transactions in central bank reserves."
2. "Central bank money has been available in digital form for decades for wholesale transactions between banks. […]In the euro area, the Eurosystem already offers banks the possibility to settle wholesale digital transactions through its TARGET services using a centralized account ledger."
3. "In the wholesale space, central banks provide the ultimate means of payment for financial institutions, helping to reduce risks within the financial system."

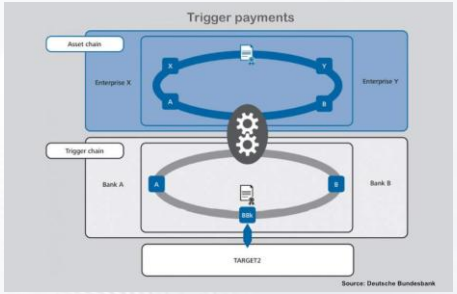
"In perspective, we are assessing how the user experience of our settlement services could change with the evolution of market infrastructures, technological innovation, and the growing demand for efficient and secure settlement of digital assets in central bank money. In particular, **we are evaluating the potential of DLT** and how it could complement our settlement services. […] We are analysing two options."

- "The first option consists in creating a bridge between market DLT platforms and central bank settlement infrastructures."
- "Another option would be to create a new settlement service that operates directly on market DLT platforms using central bank money."

The principle: interoperability first

As a part of the activities carried out by the Eurosystem regarding **wCBDC**, three main possible interoperability solutions have been identified, studied and designed by three different National Central Banks.

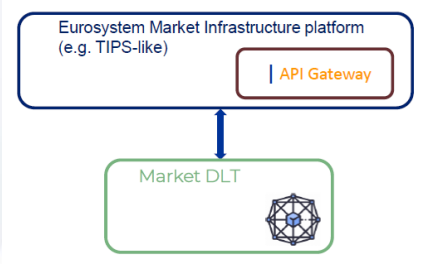
Trigger Solution



DEUTSCHE BUNDESBANK EUROSYSTEM

Asset leg: smart contract on a market DLT locks asset/payment and triggers the payment transaction via the Trigger Chain (Eurosystem DLT platform acting as "technical bridge")
Cash leg: settlement of the payment occurs in the current TARGET Services (i.e. RTGS component of T2)
DvP/PvP: confirmation of payment in CeBM in the TARGET Services is forwarded to the market DLT (via the Trigger Chain) for the delivery of the asset/payment on the market DLT

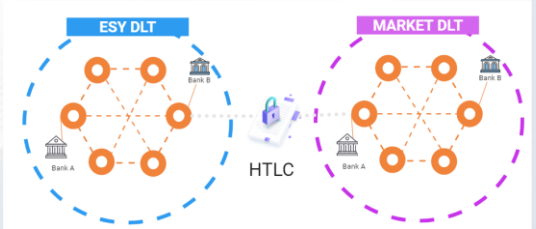
TIPS Hash-Link



BANCA D'ITALIA

Asset leg: smart contract on a market DLT locks asset/payment and forwards payment transaction via an API and an interoperability mechanism (hash link)
Cash leg: settlement of the payment takes place via TIPS-like platform (which could become part of the central bank-run infrastructure and services in the future)
DvP/PvP: confirmation of payment in CeBM in the TARGET Services results in the delivery of the asset/payment on the market DLT

Full DLT



BANQUE DE FRANCE EUROSYSTÈME

Asset leg: smart contract on a market DLT locks asset/payment and forwards payment transaction to the DL3S DLT (Eurosystem DLT platform for CeBM settlement) via an interoperability mechanism
Cash leg: settlement of the cash leg occurs in the DL3S DLT (which could become part of the central bank-run infrastructure and services in the future)
DvP/PvP: interoperability mechanism is responsible for finalising the delivery of cash leg (in form of cash token) on the DL3S DLT, which releases the asset/payment on the market DLT

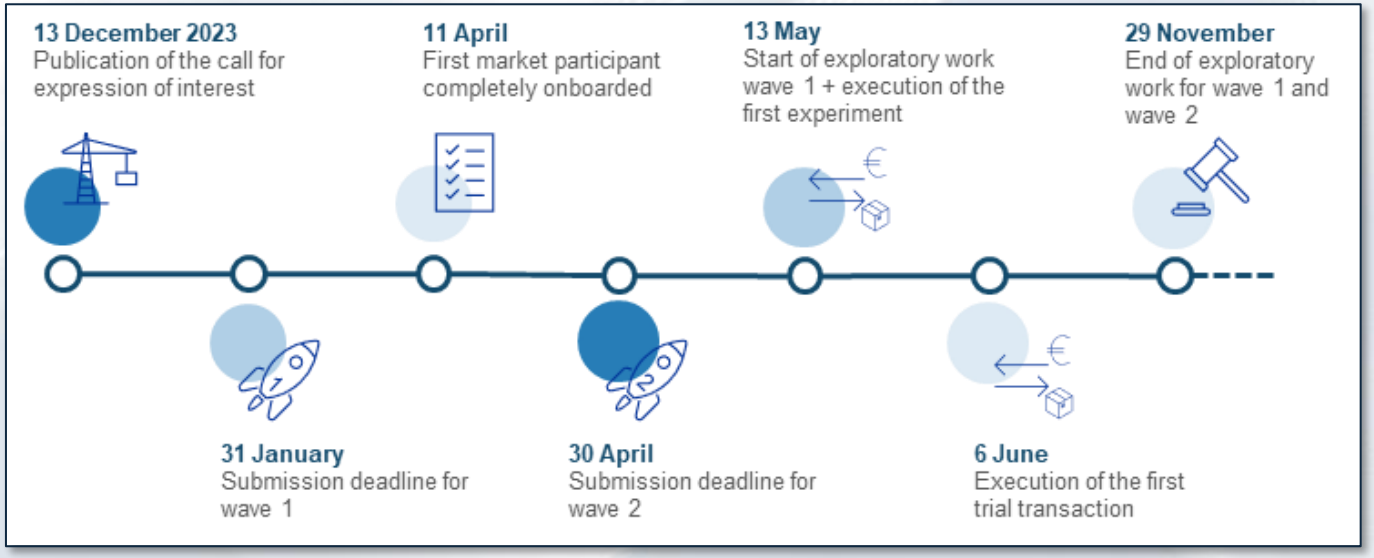
In order to support the exploratory activity, the Eurosystem created a **contact group (*New Technologies for Wholesale settlement Contact Group, NTW-CG*)** to nurture discussion on the topic and actively engage with the market, and planned a **window for testing and experimenting the interoperability solutions** conducted in 2024

The Eurosystem exploratory phase

Practical work with market stakeholders running from May to November 2024 focusing on interoperability solutions. Use cases implemented as:

Experiments: mock settlement of the cash and asset legs in test environments

Trials: actual settlement of transactions in central bank money in a limited setting for a limited period of time



https://www.ecb.europa.eu/press/intro/events/shared/pdf/20250715/Focus-Session-Findings-from-the-exploratory-work.pdf

ABI and ABI Lab's work on wCBDC: the Spunta use case

The key features of DLT, **immutability, security and transparency**, enable significant value added among several sectors. This drove us to identify a suitable and relatively **easy use case to test its effectiveness**. We thought that the interbank reconciliation process ("**Spunta**") was an excellent opportunity to embark upon this journey.

Key drivers

Small and niche process: the Spunta process is small, even in terms of business, with small benefits and, as an internal process, it doesn't involve final customers

The Italian Banking Association is the issuer of the **self-regulatory agreement** that rules the Spunta process (independency)

"Natural" ecosystem: all Italian banks already have a reconciliation process; we did not have to "create" the ecosystem from scratch

ABI and ABI Lab's work on wCBDC: Project LEONIDAS

Broaden the scope already covered by Spunta by adding the settlement of liquid balances

Valuing the work done by the Italian banks over past years

Putting the wCBDC concept "to the test" in an already scaled application and infrastructure context

LEONIDAS

Liquidation
Effective
ON cha**I**n
Dlt
Asset on
Spunta

https://www.ecb.europa.eu/pub/pdf/other/ecb.exploratoryworknewtechnologies202506_annex02.en.pdf

ABI and ABI Lab's work on wCBDC: Project LEONIDAS

Improving Spunta, adding the debt settlement of interbank balances through digital currency exchange on DLT.

The use case solves the "last-mile problem" by completing the end-to-end process up to the payment of debts between banks, providing a high level of automation, transparency and efficiency.

01 Explore the benefits of a **wCBDC DLT-based**, by testing the last mile of the interbank *Spunta* process in a distributed infrastructure, specifically the management of liquid balances **(Liquid Balance use case).**

02 Continue the **experimental work** initiated with the support of the Bank of Italy and Italian banks, to **enhance the knowledge in the field of wCBDC** within the sector in Italy and Europe.

03 Experimenting with an interoperability solution **currently under exploration by the Eurosystem** offers an opportunity to work with fewer assumptions and explore a **potential medium to long-term solution.**

https://www.ecb.europa.eu/pub/pdf/other/ecb.exploratoryworknewtechnologies202506_annex02.en.pdf

Eurosystem exploratory work: Lessons learned

EUROPEAN CENTRAL BANK

Largest initiative of such kind among central banks and **successful public-private** partnership

64 stakeholders (central banks, commercial banks, CSDs, DLT Pilot Regime applicants) from **9 countries**

Unprecedented number of 50+ experiments and trials with wide range of payments, securities **use cases covering full value chain beyond settlement**

See **Annex II** "Comprehensive overview of trials and experiments"

High-level bond issuances More than **200 real transactions, €1.6 bn** settled

11 meetings of **NTW*-Contact Group** and > 40 bilateral/multi-lateral meetings with market stakeholders

**New Technologies for Wholesale settlement*

https://www.ecb.europa.eu/press/intro/events/shared/pdf/20250715/Focus-Session-Findings-from-the-exploratory-work.pdf

Pontes & Appia: the two future tracks

EUROPEAN CENTRAL BANK

The Eurosystem has adopted a dual-track strategy: a short-term track (**Pontes**) to enable DLT settlement in central bank money by 2026, and a long-term track (**Appia**) to build a fully integrated, future-ready ecosystem for wholesale markets.

Findings

Pontes	Appia
Exploratory work confirmed **market demand and interest** for DLT, with an active ecosystem evidenced in Europe	DLT represents an **opportunity** to redesign processes and practices, including the distribution of roles, across the entire value chain
The **absence of provision of CeBM** is viewed as **major impediment** to the growth of the DLT ecosystem	A move to DLT has the potential to **address shortcomings in today's ecosystem**
Market participants expressed a preference for having a single Eurosystem offering within a **short time frame**	The active investigation and **adoption of DLT is accelerating worldwide**

https://www.ecb.europa.eu/press/intro/events/html/fs_20250715.en.html

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Drivers of Change