

BANCA D'ITALIA
EUROSISTEMA

“EMMEC meeting” • 10 Jun 2026

WCBDC

a “Ponte(s)” to the
“Appia” future road

Paolo Bramini

Payment Systems Directorate
Banca d'Italia



Why DLT matters now?

Tokenisation is changing the settlement layer of finance:



DLT and smart contracts are **reshaping** payments, settlement and post-trade infrastructures



Tokenised assets **embed execution logic** and **programmability** directly into the asset.



DLT initiatives are **multiplying**, but their development remains largely uncoordinated



The key question is no longer whether tokenisation matters, but **who anchors settlement** in the new environment.





Why wCBDC matters

Defending public money in a tokenised environment:



Without central bank money “on-chain”, markets tend to move toward **private settlement solutions**.



A wCBDC helps preserve **singleness of money**, financial stability and monetary policy transmission in tokenised markets



It also reduces **future dependence** on non-EU platforms and standards



In a tokenised world, defending the currency also means **defending its settlement infrastructure**.





The emerging architecture

Public money as anchor, private innovation around it:



The policy vision is **CeBM-centric**: central bank money remains at the top of the settlement hierarchy.



Private tokens — including tokenised deposits and stablecoins — may develop, but **around the public anchor**, not instead of it.



A shared or unified ledger is increasingly seen as a way to **host both tokenised assets and tokenised settlement assets** on a common infrastructure.



The more open the infrastructure, the more important central bank money becomes as the **stabilising anchor** of the system.





The role of Central Banks

Not only regulators, but architects of the tokenised ecosystem:



Central banks must keep central bank money as the anchor of trust and finality in the digital domain.



They must define standards, avoid fragmentation and reduce lock-in and strategic dependency risks.



Their role is not to crowd out private innovation, but to provide the common foundation on which it can scale safely.



In a tokenised world, defending the currency means preserving control over settlement, interoperability and trust.

.



What is visible today?



From experiments to policy roadmaps:



In 2025, the Eurosystem adopted a two-track strategy: **Pontes** and **Appia**.



Pontes is the short- to medium-term track: connecting market DLT platforms to TARGET for settlement in central bank money.



Appia is the medium- to long-term track: designing a flexible, interoperable European ecosystem for tokenised finance.



Other visible initiatives include Project Ensemble in Hong Kong and the BoE sandbox / Meridian FX approach in the UK. Globally, the picture remains heterogeneous, especially across CBDC projects.





Eurosystem work programme: Pontes and Appia



Pontes to provide the bridge between DLT platforms and TARGET Services



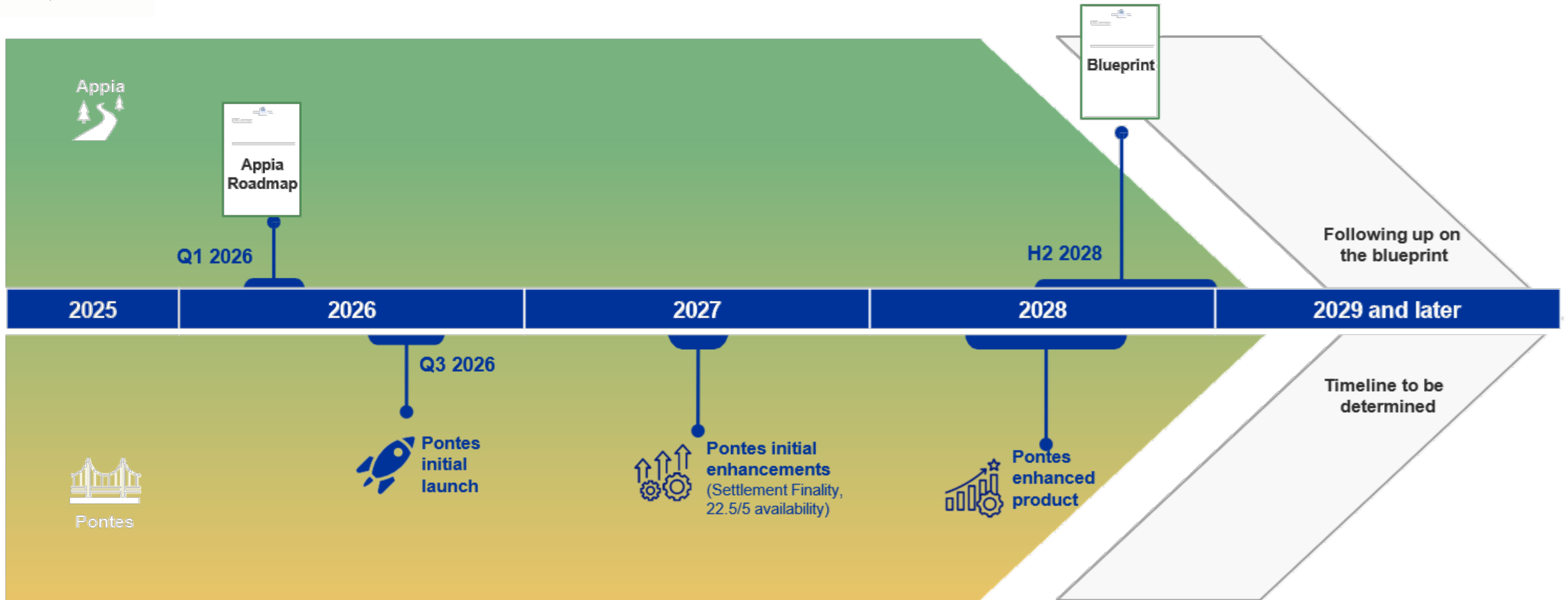
Work programme will deliver on Eurosystem's continuing commitment to safe, efficient settlement in central bank money



Appia to shape future-ready, innovative, integrated financial ecosystem



Appia and Pontes: towards a single work programme





From the Exploratory Work to Pontes

Findings



Exploratory work **confirmed market demand** and interest for DLT, with an active ecosystem evidenced in Europe



The **absence** of provision of Central Bank Money is viewed as **major impediment** to the growth of the DLT ecosystem



Market participants expressed a preference for having a **single Eurosystem offering** within a **short time frame**

target | Pontes
services

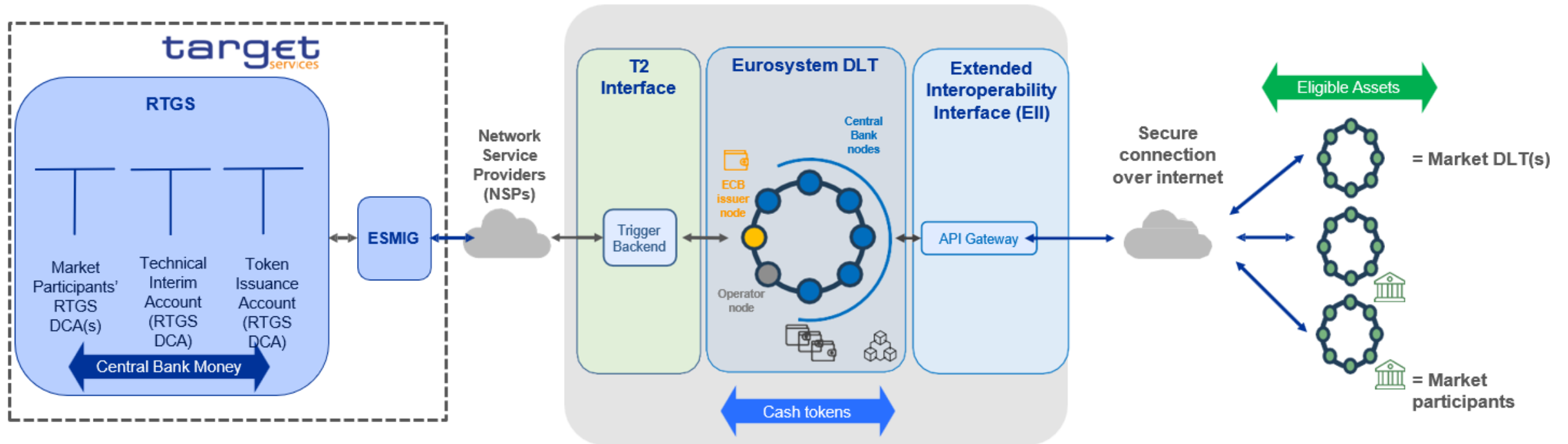
Pontes will offer a Eurosystem DLT-based solution, providing interoperability with market DLT platforms and TARGET Services for the settlement of transactions in Central Bank Money.

The Eurosystem will launch a pilot for Pontes by the third quarter of 2026.





Pontes Pilot: design overview





Use cases

Delivery-versus-Payments (DvPs) and Payment-versus-Payments (PvPs) - jointly referred as **XvPs**

instructed by

Market participant

- DvP and PvP transaction
- DvP and PvP transaction (direct settlement in T2)

Market DLT operator

- DvP and PvP transaction
- DvP and PvP transaction (direct settlement in T2)

Wholesale payments

instructed by

Market participant

- Wallet-to-wallet payment
- Payment Free of Delivery (PFoD)
- Payment (direct settlement in T2)

Market DLT operator

- Wallet-to-wallet payment
- Payment Free of Delivery (PFoD)
- Payment (direct settlement in T2)





Pontes Pilot: model description (1/6)

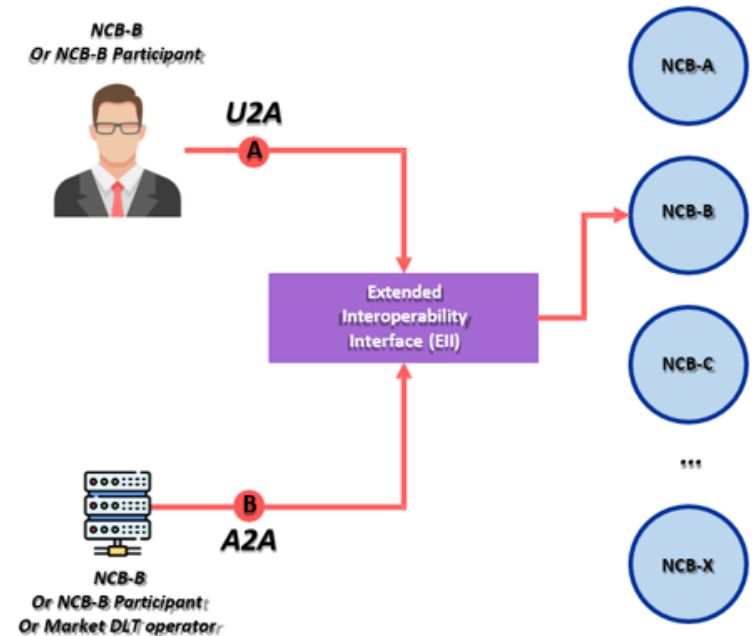


Single Eurosystem offering

While the exploratory work offered three different interoperability solutions, with solution specific connectivity to three exploratory environments, the pilot will be a single Eurosystem offering to the market

The solution will offer, via the Extended Interoperability Interface (EII), a unique entry point with a secure connection over internet:

- **User-to-Application (U2A)** via the Graphical User Interface (GUI)
- **Application-to-Application (A2A)** via the Application Programming Interfaces (APIs)
- Participants connect to their managing National Central Bank (NCB) node, which acts as their entry point to the DLT
- The EII will route the request to the corresponding managing NCB node
- Each NCB node manages for their participants (i) DLT internal cryptographic material, (ii) reference data and (iii) transaction data





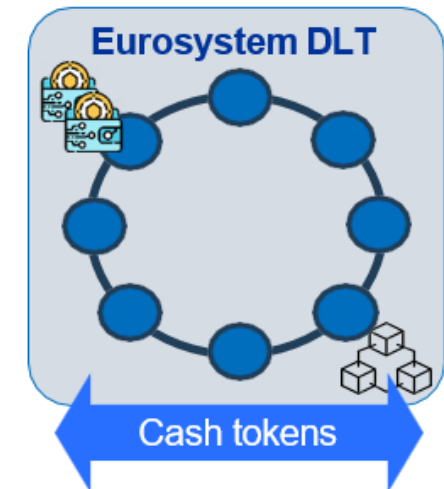
Pontes Pilot: model description (2/6)



Eurosystem DLT

The Eurosystem DLT will manage the **cash-leg** of DLT-based transactions

- **Permissioned DLT-based platform** with Central Bank nodes
- (intra-day only) **cash tokens** on Eurosystem DLT
- Two types of **wallet**:
 - **Dedicated Cash Wallets (DCWs)** - managed by the market participants
 - **Token Issuance Wallet** - managed by the ECB (total amount of cash tokens)





Pontes Pilot: model description (3/6)



Dual settlement model

The solution will support dual settlement model as defined below

Settlement in tokenised form

- 1 Funding of Dedicated Cash Wallet(s)
- 2 Settlement of cash tokens on Dedicated Cash Wallet(s) in the Eurosystem DLT
- 3 Defunding of Dedicated Cash Wallet(s)

Direct settlement in T2 RTGS

Settlement in T2 RTGS DCAs triggered via the Eurosystem DLT





Pontes Pilot: model description (4/6)



Settlement finality

The solution will support final CeBM settlement in T2 RTGS

- As regards the euro cash leg, settlement of the euro CeBM related financial transactions using the Pilot will occur in T2, in line with the existing rules on entry of cash transfer orders in T2 and their irrevocability. The settlement finality will apply as specified in Article 18 Annex 1 Part I of the TARGET Guideline.
- **When?** Every time the defunding is requested by the participants or with direct settlement in T2.
- The settlement finality of the asset leg will be dependent on the rules applicable to the eligible market DLT operator.





Pontes Pilot: model description (5/6)

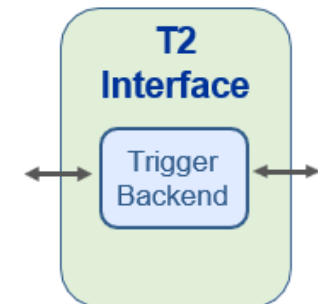


Enhanced automation

The solution will enable end-to-end **automated processing of transactions**, relying on manual operations only in case of contingency

- The **T2 interface**, based on the Trigger backend, will support automated processing using existing functionalities of T2

Technically, the process relies on two RTGS DCAs (named in the context of the pilot *Technical Interim Account* and *Token Issuance Account*) under the legal responsibility of the ECB and operated by the Service Providers





Pontes Pilot: model description (6/6)



Reliable interoperability mechanism for all-or-none settlement

The solution will rely on the Hash-Link protocol for the use cases requiring *all-or-none* settlement

- No specific technical requirements for the market DLT platforms, except for the capability to conditionally lock an asset transfer to either a signature or to the provisioning of a secret (i.e. the pre-image of a hashed value, using the widely diffused SHA-256 standard).





API-based communication channel

The **OpenAPI Specification (OAS)** defines a standard, language-agnostic interface to HTTP Application Programming Interface (API) which allows both humans and applications to discover and understand the capabilities of the service.

OpenAPI Document is a human-readable file (in YAML) that describes the API of Pontes Pilot, including:

- **Endpoints:** The URL of the available APIs (e.g. /v1/xvps/...)
- **(HTTP) methods:** What action(s) the API makes available to the user (e.g. GET)
- **Parameters:** What information the API needs from the user (e.g. DvP ID)
- **Responses:** What the API will return to the user in case of success or error (e.g. the details of the DvP)

```
1 components:
2   schemas:
3     BIC11:
4       type: string
5       description: >
6         Bank Identifier Code (SWIFT). 11 characters:
7         4-letter bank code, 2-letter ISO country code,
8         2 alphanumeric location, 3 alphanumeric branch.
9         Example: BEUTDEFF500.
10      minLength: 11
11      maxLength: 11
12      pattern: '^[A-Z]{4}[A-Z]{2}[A-Z0-9]{5}$'
13      example: BELMFXB1XXX
14      BusinessError:
15        type: object
16        additionalProperties: false
17        properties:
18          errorCode:
19            $ref: '#/components/schemas/Type'
20          errorDescription:
21            type: string
22      Type:
23        type: string
24        enum:
25          - INTERNAL_ERROR
26          - UNAUTHORIZED
27          - PROFILE_NOT_VALID
28          - MISSING_MANDATORY_FIELDS
29          - BADLY_FORMATTED_FIELDS
30          - SELLER_BIC_NOT_VALID
31          - BUYER_BIC_NOT_VALID
32          - MARKET_DLT_OPERATOR_NOT_VALID
33          - PAYMENT_FIELDS_NOT_VALID
34          - XVP_NOT_FOUND
35          - BUYER_NOT_ALLOWED
36          - SELLER_NOT_ALLOWED
37          - PAYMENT_TIMEOUT_EXPIRED
38          - INVALID_XVP_STATUS_FOR_PAYMENT
39          - PAYMENT_ALREADY_EXISTS
40          - PAYMENT_NOT_FOUND
41      Currency:
42        type: string
43        enum:
44          - EUR
45      HealthStatus:
46        type: string
```

EII API 0.0.2-SP1B OAS 3.0

All protected endpoints require a valid JWT token in the Authorization header. Use the [/auth/login](#) or [/auth/basicaccess](#) endpoint to obtain a token first.

Here the decomposition of services of the API:

- The XVP service is used to execute atomic DvPs and PVPs by using Hash-Link protocol and token settlement.
- The Identity Provider Gateway Service is used to login and create users (interacts with an Identity Provider).
- The Bridge Service is used in interop projects to share settlement instructions and details with other platforms.
- The Wallet management service provides all features for wallet managers to do wallet keeping for their clients. It also handles the atomic settlement of instructions.
- The Octopus Service is mainly used as a routing service, however it has 2 available endpoints to handle end of day operations (business day closure and business day ending).
- The Global Registry Service (GRS) is used to store all public necessary information for the network to operate, e.g. list of currencies, participants, etc.
- The Request Validation Service is used to raise settlement requests as well as CBDC operations requests. Once raised, these requests are then validated against a set of business rules, accessing data and services from the Global Registry service.
- The Instruction Management Service is used to manage the validated Settlement requests and validated CBDC Operations requests. Instruction Management handles the matching of counterpart settlement instructions and trigger the actual settlement that is done in the Wallet Management Service.
- The Trigger Management Service is used to handle Trigger solution communications via A2A and U2A.

XvP

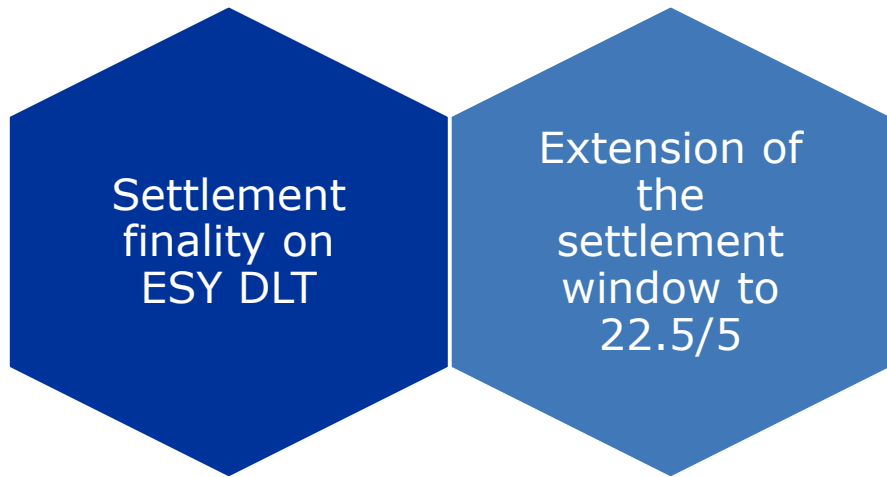
- POST** /igw/{ncb}/v1/direct-rtgs/xvps Create a XvP instance
- GET** /igw/{ncb}/v1/direct-rtgs/xvps/{xvpTransactionId} Retrieve a XvP instance
- POST** /igw/{ncb}/v1/direct-rtgs/xvps/{xvpTransactionId}/payment Execute payment for a given XvP
- GET** /igw/{ncb}/v1/direct-rtgs/xvps/{xvpTransactionId}/payment API for querying the payment paymentStatus
- POST** /igw/{ncb}/v1/xvps Create a XvP instance
- GET** /igw/{ncb}/v1/xvps/{xvpTransactionId} Retrieve a XvP instance





Pontes initial enhancements

- The roadmap of the Pontes project foresees initial enhancements beyond the Pilot phase **by mid-2027**



- **Settlement finality on ESY DLT**

Irrevocable settlement finality in tokenised CeBM

- **Extension of the settlement window**

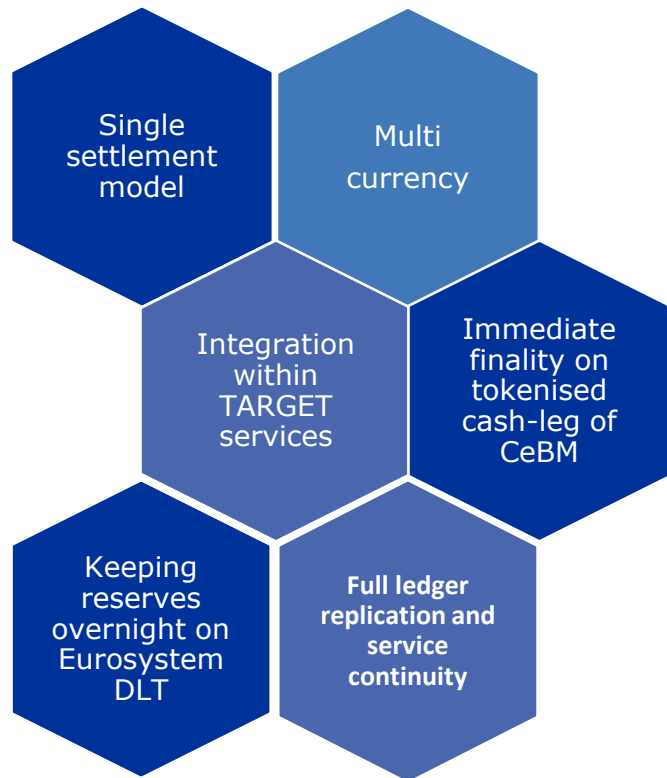
The Pontes settlement window will be aligned to the T2 settlement window (from 19:30 to 18:00)





Pontes enhanced product

The **Pontes enhanced product** will go-live **by Q2-2028**, with the aim of aligning with the operational, legal and technical standards in accordance with TARGET Services



- **Single Settlement model**

Single settlement model with settlement in tokenised form

- **Integration within TARGET services**

Integration in the technical and legal perimeter of TARGET Services

- **Immediate finality of tokenised cash-leg of CeBM**

Irrevocable settlement finality in tokenised CeBM

- **Keeping reserves overnight on Eurosystem DLT**

Participants may hold their tokenised CeBM balances overnight on Eurosystem DLT without having to repatriate them back to T2

- **Multicurrency**

Availability for all currencies available in T2

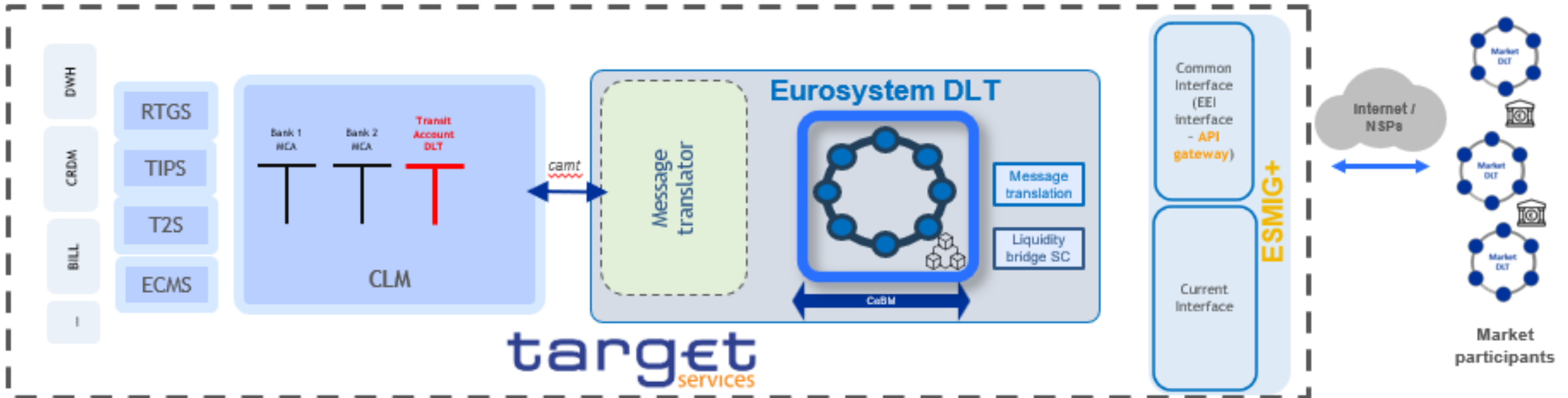
- **Full ledger replication and service continuity**

Pontes will maintain a fully replicated, consistent ledger across all Eurosystem nodes with simultaneous active redundancy, ensuring uninterrupted data access and functionality despite any individual node outage





Pontes enhanced: design overview





Why Appia?

In 2025, the Eurosystem launched Appia, a forward-looking initiative to shape the development of a European tokenised financial ecosystem. Appia builds on the successful results of the exploratory work on new technologies for wholesale central bank money settlement.

With Appia, the Eurosystem aims to leverage the unique capabilities of distributed ledger technology (DLT) and tokenisation to foster a harmonised, efficient European financial market.



Ensure the effectiveness of monetary policy and the smooth functioning of payment systems by preserving the role of central bank money as an anchor of trust, safety and financial stability in European financial markets.



Foster a more integrated, safe, competitive and innovative European payments and securities **ecosystem** by providing efficient infrastructures for financial markets.



Support Europe's strategic autonomy and increase its resilience.



Ensure the continued relevance of the euro as an international currency.





The Appia roadmap

The [Appia roadmap](#) published in March 2026 sets out how the initiative will shape the development of a European tokenised financial ecosystem. It serves to:

Inform stakeholders about...



Appia objectives



Appia activities and timeline



Scenarios considered



Pontes & Appia as a single programme

Invite stakeholders to provide...



Feedback



Contributions



Conceptual framework



The **asset and services layer** can accommodate a **multiplicity of** settlement and investment **assets** and related **services**, each with its **own governance**

Network infrastructure

The **network layer** is responsible for the **technical processing** of transactions, the objective being to ensure the **integrity of the ledger**





Work programme and stakeholder involvement

ABB1 - Asset interoperability and standards

ABB3 - European tokenised CeBM infrastructure(s)

ABB5 - Innovative, safe and resilient new ecosystem

ABB2 - Monetary Policy and collateral management on DLT

ABB4 - International dimension and cross-border links

ABB6 - Implementation strategy and impact on existing infrastructures

Public-private partnership...

Joint experiments, contribution to the analysis, standardisation workstream, etc.



... with all relevant stakeholders

Market players, academics, public sector, other central banks



A single work programme: Appia shapes Pontes enhancements

Appia



Market developments

- Analysis and monitoring
- Stakeholder engagement



Inform enhancements to prioritise in line with market needs

Technology & Standards

- Assessment and test of technological choices
- DLT standardisation



Inform standards and technology to adopt



Pontes

Central bank operations & services

- Test tokenised collateral
- Test tokenised CeBM provision on different networks
- Test shared network(s)



Inform new functionalities, services and/or infrastructures to implement





Appia as part of the Eurosystem comprehensive payments strategy

The Eurosystem has set out its vision for a [comprehensive payments strategy](#). This new strategy takes a cohesive and forward-looking approach to further developing an innovative and competitive European payments market across wholesale, business-to-business, retail and cross-border payments



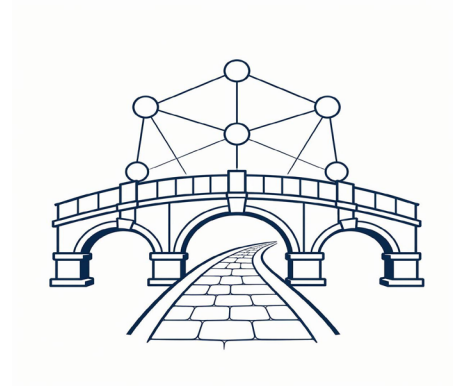
- **Improving the existing infrastructure and investing in DLT-based solutions for wholesale payments (3.2):** by providing settlement of financial instruments in central bank money as the foundational anchor, (Pontes and) Appia seek to support the development of a robust, integrated European digital asset ecosystem.

It also connects otherwise siloed private tokenisation initiatives – including stablecoins and tokenised deposits – thereby enabling them to serve as a complement to central bank money, if they are euro denominated, properly designed and regulated.

- **Improving cross-border payments (6.2):** the Eurosystem will investigate how the European ecosystem can be interconnected and made interoperable with the rest of the world. This may involve shared ledgers (as explored in, for example, the BIS Innovation Hub project Agorá) and/or interoperable approaches.

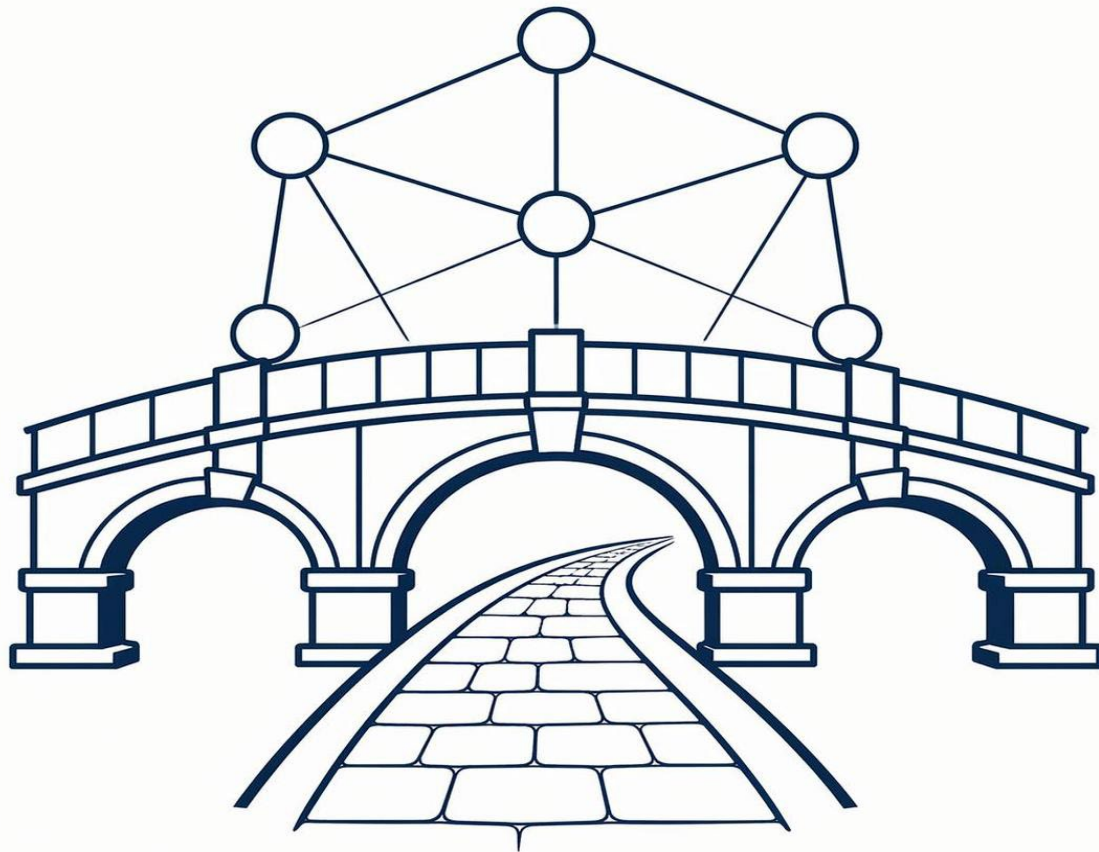


Any questions?





BANCA D'ITALIA
EUROSISTEMA



Thank you for your attention!

Paolo Bramini