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Pontes Pilot:
Business Description Document (BDD)

DRAFT

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1 Introduction

1.1 Background

The Eurosystem's exploratory work on new technologies for wholesale central bank money (CeBM) conducted between May and November 2024, confirmed strong market demand and interest in Distributed Ledger Technology[1], with an active ecosystem already emerging across Europe. However, the lack of access to CeBM has been consistently identified as a major barrier to the growth and scalability of market DLT-based solutions[2].

Building on the outcomes of the exploratory work, the Eurosystem committed to a two-track approach. The first track "Pontes" provides a short-term offering to the market and the second track "Appia" focuses on a potential long-term solution. The decision is in line with the Eurosystem's commitment to:

- Maintaining central bank money as the anchor of a two-tier monetary system,
- Achieving strategic autonomy and increased resilience for European payments,
- Fostering an integrated, competitive and innovative payments ecosystem,
- Supporting the international role of the euro,
- Supporting innovation, without compromising on safety and efficiency in financial market infrastructures.

Pontes will offer a Eurosystem DLT-based solution, linking market DLT platforms and TARGET Services to settle wholesale transactions in CeBM. The project foresees a Pilot phase to reduce the time-to-market, in line with market's expectations. The Pontes project – including its Pilot phase – will deliver a Eurosystem's solution, designed to:

- Enable interoperability between market DLT platforms and TARGET Services,
- Support the settlement of DLT-based wholesale transactions in CeBM,
- Facilitate seamless interoperability across existing and emerging infrastructures.

[1] The term Distributed Ledger Technology (DLT) means a technology that enables the operation and use of distributed ledgers (as defined in Article 2(1) of the DLT Pilot Regime Regulation). The distributed ledger means an information repository that keeps records of transactions and is shared across, and synchronised between, a set of DLT network nodes using a consensus mechanism (as defined in Article 2(2) of the DLT Pilot Regime Regulation).

[2] Refer to the report "The Eurosystem's exploratory work on new technologies for wholesale central bank money settlement"

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1.2 High-level principles of the Pilot phase

The Pilot phase will lay the foundation for the Pontes project, integrating key features of the three interoperability solutions assessed during the exploratory work.

High-level principles of the Pilot solution include:

1. **Single Eurosystem solution**. A consolidated offering that combines the strengths of the three interoperability solutions previously explored.
2. **Dual settlement model**. Market participants can settle transactions on the Eurosystem DLT platform with cash tokens, or by using the direct T2 Real-Time Gross Settlement (RTGS) settlement mode, offering flexibility and continuity[3].
3. **Settlement finality in T2**. Final settlement in CeBM for the cash leg is achieved once the corresponding transaction is completed in T2, ensuring legal certainty and robustness.
4. **Reliable interoperability mechanism**. Delivery versus Payment (DvP), and other transactions requiring "all-or-none" settlement, are enabled via the Hash Link protocol, ensuring secure and synchronised settlement across platforms.
5. **Enhanced automation**. The Pilot supports end-to-end processing and seamless interaction with T2, improving operational efficiency and reducing manual intervention.

The solution operates outside the technical perimeter of the TARGET Services. It is designed to require no changes to the **legal, regulatory, functional, and operational framework** of the existing TARGET Services[4].

1.3 Purpose and structure of the document

This Business Description Document (BDD) introduces the functions and the features of the first iteration of the Eurosystem short-term offering for the settlement of Distributed Ledger Technology (DLT)-based wholesale transactions in central bank money, also known as Pilot phase of the Pontes project.

The BDD's aim is to support the market participants and market DLT operators in starting their internal preparation for the go-live of Pontes Pilot in the third quarter of 2026.

While this business-oriented document provides a high-level overview of the solution, additional information that is required by users for adapting their internal systems will be provided in a separate document, named Service Description. This complementary document will include:

- technical specifications for the Application Programming Interface (API),
- information regarding the Graphical User Interface (GUI),
- description of the flows and interactions with the solution,
- a connectivity guide, and
- the definition of the onboarding process.

[3] The functionalities available with the different settlement models are further detail as part Chapter 4 – Settlement.

[4] Contractual and operational frameworks for the Pilot solution will be defined.

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Once approved by the Pontes governance, the Business Description Document and the Service Description will be published on the ECB website.

The structure of the BDD is the following:

- **Chapter 1: Introduction** specifies the purpose and the structure of the document. In addition, this chapter provides an overview of the Pilot phase of the Pontes project, the motivations of the project and its objectives.
- **Chapter 2: High-level process description** provides a global overview of the technical components of the solution, including the definition of the actors and their role in the Pilot. It describes high-level the process flow and the interaction with the TARGET Services.
- **Chapter 3: Reference data** focuses on the configuration and management of reference data required for the Pilot phase. As part of this chapter, high-level information regarding the calendar and the settlement day schedule is provided.
- **Chapter 4: Settlement** presents the use cases for settlement operations in the Pilot phase, including Delivery versus Payment (DvP), Payment versus Payment (PvP) and other wholesale payments.
- **Chapter 5: Interfaces and technical connectivity** describes the interfaces and connectivity requirements for the solution, including Application-to-Application (A2A) and User-to-Application (U2A) interactions.
- **Chapter 6: Information management** explains the tools and functionalities for monitoring and querying, enabling efficient information management.
- **Chapter 7: Non-functional description** focuses on volumetric assumptions for the Pilot phase, reliability, availability, fault tolerance of the solution and its security requirements.

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2 High-level process description

This chapter gives a high-level overview of the various components of the Pilot solution and how they communicate, their roles and responsibilities. Then the chapter describes the entire process flow.

2.1 Overview of the solution

The Pilot solution consists of the following three interconnected modules, integrating the features of the interoperable solutions used during the exploratory phase[5]:

1. T2 interface.
2. Eurosystem Distributed Ledger Technology (ESY DLT) platform.
3. Extended Interoperability Interface (EII).

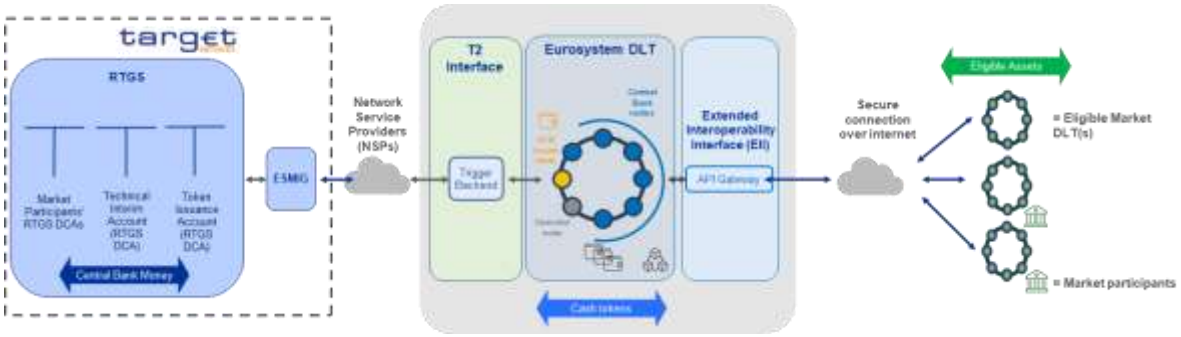

Figure 1 - Pontes Pilot infrastructural design

2.1.1 T2 Interface

T2 interface is the single-entry point to the TARGET Services via the existing Eurosystem Market Infrastructure Gateway (ESMIG).

The Trigger Backend component within the T2 interface enables smooth funding and defunding of intra-day tokenised liquidity[6] and direct T2 RTGS Settlement of transactions coming from the Eurosystem DLT platform. It relies on the existing functionalities of the TARGET Services.

The Trigger Backend requires two RTGS Dedicated Cash Accounts (RTGS DCAs) in T2 RTGS to act as:

[5] Exploratory work on new technologies for wholesale central bank money settlements.

[6] Including mandatory automated defunding at the end of each business day.

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Technical interim account

Instances	The solution requires a single technical interim account for the entire Eurosystem.
Responsibility	• Under the legal responsibility of the ECB, • Operated by the Service Providers[7].

Usage	It is used during the automated interaction with RTGS, Upon receiving a *payment instruction* on the Eurosystem DLT, the Trigger backend sends a direct debit message (pacs.010)[8] to T2 in order to debit the requested amount from a market participant's RTGS DCA.
	• The funds are then temporarily held in the *technical interim account*.
	• Finally, the funds are:
	  ○ credited on the *token issuance account*, in case of settlement in with cash tokens for the processing of funding requests[9], or
	  ○ credited to another market participant's RTGS DCA, in case of direct settlement in T2.

Balance	This account is designed to maintain a zero balance after each payment settlement throughout the day.

Token issuance account

Instances	The solution requires a single token issuance account for the entire Eurosystem.
Responsibility	• Under the legal responsibility of the ECB, • Operated by the Service Providers.
Usage	The account is involved in the funding and defunding process. It is used to escrow liquidity in RTGS during the process of issuing cash tokens on the Eurosystem DLT.
Balance	It will not have negative balances, and it will be fully cleared by the end of each business day, ensuring that no residual balances remain overnight

2.1.2 Eurosystem Distributed Ledger Technology (ESY DLT) platform

The ESY DLT platform refers to the Eurosystem infrastructure that manages the cash-leg of DLT-based transactions, providing either a settlement using cash tokens or directly in RTGS. The ESY DLT is a permissioned DLT-based platform.

The term "cash token" means a proxy of euro denominated CeBM, without any legal effect other than embodying a contractual claim against the token issuer to transfer CeBM in T2 RTGS to the holder market participant that owns such tokens in exchange for such tokens.

The ESY DLT infrastructure comprises a **set of nodes**:

[7] The term "Service Providers" refers to the National Central Banks that develop, host and operate the solution.

[8] The T2 interface (and the Trigger Backend) will rely on existing functionalities of T2 RTGS and existing ISO 20022 messages (pacs.010, pacs.009, pacs.004 and pacs.002).

[9] Furthermore, the *technical interim account* is also involved in the opposite flow in case of settlement in with cash tokens for the processing of defunding requests or automatically at the end of each business day ensuring no balances remain overnight.

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Central Bank nodes	Each node, one for each Eurosystem Central Bank, owned by the Central Bank and hosted by the Service Providers, technically signs transactions by which they are concerned (i.e. transactions instructed by one of its market participants), validates new blocks received and adds them to its local copy of the ledger. Each Central Bank via its node creates, revokes and stores the cryptographic material and manages data (e.g. static data[10] and transactions-related data) related to its market participants.
Operator node	The operator node is owned and hosted by the Service Providers and has the following responsibilities: **1)** Manage the list of participating NCBs, **2)** Manage the platform parameters (e.g. business day and country codes), ***3)*** Manage activity in the ESY DLT (e.g. wallets, transactions, key performance indicators).
(ECB) issuer node	The issuer node is owned by the ECB and hosted by the Service Providers. It issues and redeems cash tokens in the ESY DLT and hosts the token issuance wallet.

ESY DLT manages two types of wallets:

- **Dedicated Cash Wallet** (DCW): a DCW is a technical object that manages NCB and market participants' cash token balances, enables them to instruct transactions and allows them to access token balances and instructions history.
- **Token issuance wallet:** A technical DCW that allows to issue tokens after a funding operation and to redeem token before a defunding operation. It is owned by the ECB. The solution requires a single token issuance wallet for the entire Eurosystem. The balance of this wallet reflects the balance of the Token Issuance Account in T2 RTGS. It will only have a negative balance during the day or zero at the end of the day.

2.1.3 Extended Interoperability Interface (EII)

The **Extended Interoperability Interface** (EII) is the component that serves as the only entry point to the Eurosystem DLT, via Application Programming Interfaces (APIs) and via a Graphical User Interface (GUI). It is also responsible for routing requests to the correct node in the Eurosystem DLT. It exposes this set of functionalities:

- Operations requiring Hash Link Protocol. The **Hash Link protocol** is a cryptographic protocol that ensures the all-or-none settlement of Delivery versus Payment (DvP) transactions (and other transactions requiring all-or-none settlement), where the cash leg is on the Eurosystem DLT platform (or in T2/RTGS) and the other leg is on a market DLT platform[11]. The logic and the data related to these operations are managed by the API Gateway component[12].

[10] For the Pilot phase, each Central Bank node in the ESY DLT stores market participant data in a Local Reference Data Management (LRDM) component. The LRDM contains market participant information, wallet static data and node parameters that can be queried on demand.

[11] The minimum requirement for market DLT platform is the capability to conditionally lock an asset transfer to the provisioning of a secret. This capability acts as an escrow for the asset which is released in favor of ether the seller or the buyer involved in the transaction.

[12] Additional information related to the API Gateway is provided in 4.4 Settlement processing.

- Operations on the Eurosystem DLT platform, including queries, reference data management and settlement of transactions not covered in the previous bullet (e.g. wallet-to-wallet payments and payments free of delivery).

2.2 Roles and Actors

Access and operations on the solution are strictly managed via Role-Based Access Control (RBAC), restricting users to actions tied to their profile.

The **roles** defined in the solution are:

Cash Token Issuer:	It is granted to the ECB and every NCB; it allows the instruction of issuing operations of ESY DLT cash tokens from the token issuance wallet owned by the ECB.
DCW Manager	It is granted to the ECB and every NCB; it allows the creation of DCW for themselves and for their market participants. It allows the instruction of all the operations specific to managed DCW on behalf of their market participants in case of contingency, like cash token transfers, payments, redemptions, balances and transaction history consultation
DCW Owner	It is granted to the ECB, NCBs and market participants, it allows the instruction of all the operations specific to owned DCWs, like wallet-to-wallet cash token transfers, wallet-to-wallet payments, redemptions, balances and transaction history consultation[13].
Cash Token Supervisor	It is granted exclusively to ECB; it allows consultation of all activities related to cash tokens of all NCBs and visibility on the *token issuance wallet*.
National Cash Token Supervisor	It is granted to every NCB, it allows consultation of all activities related to cash tokens under its jurisdiction (DCW balances as well as transactions history (issuances, redemptions, cash token transfers and payments with cash tokens)
Operator	It is granted to the Service Providers, and it enables the central configuration of the platform, including managing nodes, the list of participating NCBs and roles definitions, network parameters and other general solution configuration. It also controls the Business Day processes (End of Day, Cash Sweep, Start of Day) and updates the time slots of the various windows (opening and closing times, etc.), and opening dates. The operator manages also public reference data (e.g. business date and list of market DLTs).

[13] The DWC Owner role will be used also to allow transactions with direct settlement in T2.

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The **actors** are:

European Central Bank (ECB)	○ **legally owns the Technical Interim Account** involved in the funding and defunding of tokens in the ESY DLT and the direct settlement in T2 RTGS, ○ **legally owns the Token Issuance Account and Token Issuance Wallet involved in the** funding and defunding operations between T2 RTGS and ESY DLT, ○ **owns the Issuer node** of the ESY DLT, whose goal is to issue and redeem ESY DLT tokens
National Central Banks (NCBs)	○ Each Eurosystem NCB is required to **own a node** on the ESY DLT, hosted in the Service Providers infrastructure, in case at least one of its market participants wants to participate in Pontes Pilot.
Market participants[14]	Entities entitled to access to TARGET, within the meaning of Article 4 of Annex 1 Part I of the TARGET Guideline, as amended from time to time.
Service providers	The technical providers and operators of the Pilot solution.

	Cash Token Issuer	DCW manager	National Cash Token supervisor	Cash Token Supervisor	Operator	DCW Owner
Service Providers					✓	
National Central Banks	✓	✓	✓			✓
ECB	✓	✓		✓		✓
Market Participants						✓

Table 1 – Eurosystem DLT actors' roles table

In the context of the Pilot, **market DLT operators**[15] are:

1. Central securities depositories (CSDs), authorised under the CSDR (Central Securities Depository Regulation) and NCB-run CSDs exempted from the CSDR authorisation procedure, operating a Securities Settlement System based on DLT (including T2S CSDs subject to a derogation of the contractual and regulatory framework of T2S[16]);
2. Operators of a DLT settlement system (DSS) or a DLT trading and settlement system (DTSS) as authorised under the DLT Pilot Regime Regulation;
3. Operators of a payment system, established in the European Union (EU) or the EEA (European Economic Area) that is subject to oversight by a competent authority;
4. Central counterparties (CCPs) authorised under EMIR (European Market Infrastructure regulation);
5. Credit institutions, investment firms, market operators, and other licensed financial institutions, authorised under CRD, MiFID II and/or other relevant national legal frameworks in the EEA (European Economic Area), which is (i) subject to supervision or oversight specific for financial market infrastructures by a competent authority or (ii) following a case-by-case assessment conducted by the applicant's NCB based on agreed Eurosystem criteria to ensure proper risk management.

[14] Eligibility criteria subject to formal approval by the ECB's Decision Making Bodies. The technical feasibility to enable a market participant to give (indirect) access to its Dedicated Cash Wallets to one or more entities it designates, in line with Article 7 of Annex 1 Part I of the TARGET Guideline, is currently under assessment for the go-live of Pontes Pilot.

[15] Eligibility criteria subject to formal approval by the ECB's Decision Making Bodies.

[16] A derogation to the T2S Framework Agreement would be required to enable T2S CSDs to settle DvP transactions via the Pilot.

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3 Reference data

After presenting the actors, this chapter describes:

- the static data configuration needed in the TARGET Services Common Reference Data Management (CRDM) component, relying on the existing functionalities of the TARGET Services.
- the static data stored in a Local Reference Data Management component (LRDM), which stores static data related to the objects on the Eurosystem DLT.
- finally, the wallet structure, the restrictions that can be applied to them and the account roles and privileges.

3.1 Common Reference Data Management (CRDM) configuration

For the Pilot phase, the following configuration in the Common Reference Data Management (CRDM) component requires no changes to the current functionalities of the TARGET Services. CRDM is the common component of the TARGET Services that provides users with interfaces allowing the creation, updating and deletion of common reference data related to parties, cash accounts and configuration rules and parameters.

Id	PILOT.CRDM.ACT.010
Name	Technical Interim Account

The Technical Interim Account (a T2 RTGS DCA) will be used to orchestrate direct settlement in T2 and funding/defunding requests by issuing direct debit (pacs.010), payment return (pacs.004) and credit transfer (pacs.009) instructions. The ECB is the legal owner of the Technical interim Account, but the account is technically managed and operated by Service Providers.

Id	PILOT.CRDM.ACT.020
Name	Technical Interim Account direct debit

Market participants will set-up a direct debit mandate on the RTGS DCA they intend to use in favour of the *technical interim account,* to enable its correct operations[17].

Id	PILOT.CRDM.ACT.030
Name	Token Issuance Account

The *Token Issuance Account* (a T2 RTGS DCA) will be involved in the funding and defunding operations initiated from the ESY DLT. It functions as an escrow account held by the ECB, credited for funding operations from the market participant RTGS DCA and debited for defunding operations toward market participant RTGS DCA. Its balance will only be positive or zero and should mirror the *Token Issuance Wallet*'s balance, with negative sign. The ECB is the legal owner of the Token Issuance Account, but the account is technically managed and operated by Service Providers.

Id	PILOT.CRDM.ACT.040
Name	No interest bearing

No liquidity will be held overnight on the *Token Issuance Account* and in the *Technical Interim Account*. Liquidity exceptionally held overnight on *Token Issuance Account* and *Technical Interim Account* will bear no interest and will not count toward compliance with minimum reserve requirements.

[17] As detailed in the User Detailed Functional Specifications (UDFS) of the Common Reference Data Management (CRDM), the configuration is done in CRDM by the market participant's National Central Bank – see Table 81.

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3.2 Local Reference Data Management (LRDM) configuration

Id	PILOT.RDM.LRDM.010
Name	Local Reference Data Management (LRDM)

Each NCB node will securely store data in a Local Reference Data Management (LRDM) component to allow for the setup of its market participants and related wallets.

For example, the LRDM will cater for:

- Market participants' access rights management information.
- Market participants' cryptographic materials related to settlement on DLT in with cash tokens.
- Dedicated Cash Wallet (DCW)-related information.
- Market participants' related information.
- Market DLT related information.

	U2A			A2A			
Reference data configuration	**Available in U2A**	**2-eyes**	**4-eyes**	**Available in A2A**	**2-eyes**	**4-eyes**	**NCB only**
Dedicated Cash Wallet - Edit reference data	Yes	No	Yes	Yes	No	Yes	Yes
Participant (NCB and market participants) - Edit reference data	Yes	No	Yes	Yes	No	Yes	Yes
User - Edit reference data	Yes	Yes	No	Yes	Yes	No	No
Participant - Block	Yes	Yes	No	Yes	Yes	No	Yes
Participant - Unblock	Yes	Yes	No	Yes	Yes	No	Yes
Instruct on behalf - Configuration	Yes	No	Yes	Yes	No	Yes	Yes

Non-exhaustive list, to be further detailed in the Service Description

3.3 Wallets

Id	PILOT.RDM.WAL.010
Name	Dedicated Cash Wallet (DCW)

Each actor, acting as DCW Owner, can hold a DCW to hold cash tokens, settle DLT-based transactions in with cash tokens, access transaction history, and query balances.

Id	PILOT.RDM.WAL.020
Name	Token Issuance Wallet

A technical DCW in the Eurosystem DLT involved in funding and defunding operations. It is debited for funding operations toward the market participant DCW and credited for defunding operation from market participant DCW. Its balance will only be negative (during the day) or zero (at the end of the day) and should mirror the balance of the Token Issuance Account, with negative sign.

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Id	PILOT.RDM.WAL.030
Name	Account mapping

The solution will enable the configuration of a strict mapping between RTGS DCAs and ESY DLT DCWs[18]. The mapping will permit correct and automated execution of funding and defunding operations between the ESY DLT and T2 RTGS. The configuration is performed by National Central Banks for their market participants.

Id	PILOT.RDM.WAL.040
Name	Token Issuance Wallet monitoring

The solution will give the Service Providers the possibility to monitor the Token Issuance Wallet[19].

3.4 Calendar and settlement day schedule

Id	PILOT.RDM.DAY.010
Name	Operating days

The solution will be open for settlement in line with the calendar of T2 RTGS for the euro currency.

Id	PILOT.RDM.DAY.020
Name	Operating schedule

The solution will be open for settlement in a window within RTS II[20] of the T2 RTGS component of TARGET Services, from 09:00 CET until 16:00 CET[21]. Further details on the operating schedule will be provided in the Service Description.

3.5 Restriction types

Id	PILOT.RDM.RST.010
Name	Blocking of market participant

The solution will enable the blocking of a specific market participant, which means blocking all the DCWs it owns and the possibility to instruct new transactions for direct settlement in T2[22]. The blocking of a market participant has immediate effect.

Id	PILOT.RDM.RST.020
Name	Unblocking of market participant

The solution will enable the unblocking of a specific market participant, which means unblocking all the DCWs it owns and the possibility to instruct new transactions for direct settlement in T2[23]. The unblocking of a market participant has immediate effect.

[18] A Dedicated Cash Wallet can be mapped to only one (i) RTGS DCA of the market participant (or the NCB) or (ii) RTGS CB Account of the NCB. It's not possible to map a Dedicated Cash Wallet to more than one RTGS DCA.

[19] Monitoring of the token issuance account and technical interim account will be possible via T2 RTGS, using existing functionalities.

[20] See TARGET Systems operating schedule - euro.

[21] This window will allow for contingency procedures in case of issues before the EOD of T2 RTGS.

[22] The ability to block a specific DCW is outside the scope for the Pilot solution. In case of in progress transactions with direct settlement in T2, the existing TARGET Services blocking functionalities shall be used.

[23] The ability to unblock a specific DCW is outside the scope for the Pilot solution.

3.6 Roles and privileges

Id	PILOT.RDM.ROL.010
Name	Role and privileges configuration

The solution will allow the configuration of roles and privileges for the market participants or users to access the necessary functionalities.

Id	PILOT.RDM.ROL.020
Name	Role and privileges enforcement

The solution will enforce the configuration, preventing market participants or users from using functionalities for which they are not authorised.

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4 Settlement

The Chapter presents the various use-cases and types of **transactions** available for the users in the Pilot phase.

	U2A			A2A		
Settlement operations	**Available in U2A**	**2-eyes**	**4-eyes**	**Available in A2A**	**2-eyes**	**4-eyes**
Funding Dedicated Cash Wallet - Instruct	Yes	No	Yes	Yes	No	Yes
Defunding Dedicated Cash Wallet - Instruct	Yes	No	Yes	Yes	No	Yes
Wallet to Wallet Cash Token Transfer - Instruct	Yes	No	Yes	Yes	No	Yes
Wallet to Wallet Payment - Instruct	Yes	No	Yes	Yes	No	Yes
Payment Free of Delivery (PFoD) - Initialisation	No	No	No	Yes	Yes	No
Payment Free of Delivery (PFoD) - Settlement	No	No	No	Yes	Yes	No
DvP and PvP transaction - Initialisation	No	No	No	Yes	Yes	No
DvP and PvP transaction - Payment on Eurosystem DLT	No	No	No	Yes	Yes	No
DvP and PvP transaction - Get Key and payment info (Execution or Cancellation)	No	No	No	Yes	Yes	No
DvP and PvP transaction (direct settlement in T2) - Initialisation	No	No	No	Yes	Yes	No
DvP and PvP transaction (direct settlement in T2) - Payment in T2	No	No	No	Yes	Yes	No
DvP and PvP transaction (direct settlement in T2) - Get Key and payment info (Execution or Cancellation)	No	No	No	Yes	Yes	No
Payment (direct settlement in T2) - Instruct	Yes	No	Yes	Yes	No	Yes

Non-exhaustive list, to be further detailed in the Service Description

4.1 Funding and defunding dedicated cash wallets for settlement with cash tokens

Id	PILOT.SET.FDW.010
Name	Funding

The solution will cater for funding of DCW upon specific request originated in ESY DLT by eligible market participants. The request to fund a DCW with a given amount of cash tokens (e.g. 123.45 cash tokens)[24] will automatically result in:

- moving the correspondent amount of central bank money (e.g. 123.45 euro) from the market participant's RTGS DCA, via the *technical interim account*, to the *token issuance account*,
- issuing the requested amount of cash tokens in the *token issuance wallet*,
- moving the requested amount of cash tokens from the *token issuance wallet* to the market participant's DCW.

Funding requests can be instructed anytime during the opening hours of the solution.

[24] The DCW and the amount will be provided as input in the request, while the correspondent RTGS DCA is configured in the solution – see PILOT.RDM.WAL.030.

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Id	PILOT.SET.FDW.020
Name	Defunding

The solution will cater for defunding of DCW upon specific request originated in ESY DLT by market participants. The request to defund a DCW with a given amount of cash tokens (e.g. 123.45 cash tokens)[25] will automatically result in:

- moving the requested amount of cash tokens from the market participant's DCW to the *token issuance wallet*,
- redeeming the requested amount of cash tokens,
- moving the correspondent amount of central bank money (e.g. 123.45euro) from the *token issuance account*, via the *technical interim account*, to the market participant's RTGS DCA.

Defunding requests can be instructed anytime during the opening hours of the solution. Furthermore, the solution will automatically repatriate all the cash tokens from all DCWs at the end of each business day (see also PILOT.SET.DLT.80).

4.2 Settlement with cash tokens[26]

Id	PILOT.SET.TXS.010
Name	Delivery versus Payment (DvP) and Payment versus Payment (PvP)

The solution will cater for Delivery versus Payment (DvP) and Payment versus Payment (PvP) use case by providing all-or-none settlement via the Hash Link protocol for eligible assets. While the cash leg will be settled in the ESY DLT, the other leg will be settled on an eligible market DLT platform.

Id	PILOT.SET.TXS.020
Name	Wallet-to-wallet cash token transfers

The solution will enable Wallet-to-wallet cash token transfers. A wallet-to-wallet cash token transfer refers specifically to the movement of cash tokens between wallets of the same market participant, without a direct exchange of goods or services for the purpose of liquidity management.

Id	PILOT.SET.TXS.030
Name	Wallet-to-wallet payments

The solution will enable Wallet-to-wallet payments. A Wallet-to-wallet payment refers specifically to financial transactions arising in the context of eligible assets transactions (e.g. coupon payments, margin calls, etc.) or originate from automated wholesale payments[27]. Wallet-to-wallet payments are possible between wallets of the same market participant or wallets of different market participants.

[25] The DCW and the amount will be provided as input in the request, while the correspondent RTGS DCA is configured in the solution – see PILOT.RDM.WAL.030.

[26] The precondition for settlement with cash tokens is that both counterparties of the transactions described in this section must have a DCW.

[27] Automated wholesale payment refers to a payment use cases in the wholesale space, e.g. between credit institutions, using automation features such as programmed in smart contracts on the market DLTs to execute the payment instruction.

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Id	PILOT.SET.TXS.040
Name	Payment Free of Delivery

The solution will allow for Payment Free of Delivery (PFoD). PFoD refers to a payment with cash tokens without asset exchange. The solution will manage a PFoD as a two-legs transaction, where both DELI (Delivery) and RECE (Receive) legs originate from market DLTs and are processed by the ESY DLT.

Id	PILOT.SET.TXS.050
Name	Instruct on behalf – settlement with cash tokens

The solution will enable a market participant A to instruct wallet-to-wallet payments on behalf of a market participant B[28], by means of granting the relevant privilege. The solution will require the NCB of the market participant B to grant this privilege.

4.3 Direct settlement in T2 RTGS

Id	PILOT.SET.TXS.060
Name	Delivery-Versus-Payment (PvP) and Payment versus Payment (PvP) with direct settlement in T2

The solution will cater for Delivery versus Payment (DvP) and Payment versus Payment (PvP) use case by providing all-or-none settlement via the Hash Link protocol for eligible assets. While the cash leg will be settled in T2 RTGS (with a payment triggered from the ESY DLT), the other leg will be settled on an eligible market DLT platform.

Id	PILOT.SET.TXS.070
Name	Payments with direct settlement in T2

The solution will allow for payments with direct settlement in T2/RTGS. Those payments should refer to financial transactions arising in the context of eligible assets transactions (e.g. coupon payments, margin calls, etc.) or originate from automated wholesale payments.

Id	PILOT.SET.TXS.080
Name	Instruct on behalf – direct settlement in T2

The solution will enable a market participant A to instruct payments with direct settlement in T2 on behalf of a market participant B[29], by means of granting the relevant privilege. The solution will require the NCB of the market participant B to grant this privilege.

4.4 Settlement processing

Id	PILOT.SET.PRC.010
Name	Delivery versus Payment (DvP) and Payment versus Payment (PvP) - Timeframe

The solution will have a configurable system parameter for defining the minimum timeframe within which the cash leg on the Eurosystem DLT (or in T2 RTGS in case of direct settlement in T2) of DvP and PvP transactions must be settled. This parameter will be adjustable by the Service Providers and enforceable by the solution for all the DvP and PvP transactions[30].

[28] This requires a previous legal arrangement between the two market participants, which is managed outside the solution.

[29] This requires a previous legal arrangement between the two market participants, which is managed outside the solution.

[30] The same parameter will be used for DvP and PvP with (i) settlement with cash tokens and (ii) direct settlement in T2.

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Id	PILOT.SET.PRC.020
Name	Delivery versus Payment (DvP) and Payment versus Payment (PvP) – Hash link oracle

The API Gateway component will act as a trusted oracle in the context of the Hash Link protocol.

Id	PILOT.SET.PRC.030
Name	Delivery versus Payment (DvP) and Payment versus Payment (PvP) – Role of the oracle

The trusted oracle will act as the generator and the keeper of secrets used to manage the DvP (and PvP) transaction lifecycle and will verify the settlement of payments within the agreed timeframe parameter.

Id	PILOT.SET.PRC.040
Name	Delivery versus Payment (DvP) and Payment versus Payment (PvP) – Secrets managed by the oracle

The oracle will be able to solve disputes (i.e. in case the asset transfer is not started after the settlement of the cash leg, or in case the cash leg is not started at all). All the secrets needed for dispute management will be managed only by the trusted oracle and will be securely stored to prevent unauthorised access. The oracle will, upon request, disclose the secrets to whom is entitled to request them.

Id	PILOT.SET.PRC.050
Name	Market DLT operators

Market DLT operators, authorised to interact with the Pilot solution, will be given a specific access in order to use a subset of functionalities (only available via A2A).

	A2A
Market DLT operators functionalities	**Available in A2A (2-eyes only)**
Wallet to Wallet Payment - Instruct	Yes
Payment Free of Delivery (PFoD) - Initialisation	Yes
Payment Free of Delivery (PFoD) - Settlement	Yes
DvP and PvP transaction - Initialisation	Yes
DvP and PvP transaction - Payment on Eurosystem DLT	Yes
DvP and PvP transaction - Get Key and payment info(Execution or Cancellation)	Yes
DvP and PvP transaction (direct settlement in T2) - Initialisation	Yes
DvP and PvP transaction (direct settlement in T2) - Payment in T2	Yes
DvP and PvP transaction (direct settlement in T2) - Get Key and payment info (Execution or Cancellation)	Yes
Payment (direct settlement in T2) - Instruct	Yes

Non-exhaustive list, to be further detailed in the Service Description

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Id	PILOT.SET.PRC.060
Name	National Central Banks in contingency scenarios

National Central Banks will have the possibility to act on behalf of their market participants in contingency scenarios

	U2A			A2A		
National Central Bank operations (on behalf of their market participants in contingency scenarios)	Available in U2A	2-eyes	4-eyes	Available in A2A	2-eyes	4-eyes
Funding Dedicated Cash Wallet - Instruct	Yes	No	Yes	Yes	No	Yes
Defunding Dedicated Cash Wallet - Instruct	Yes	No	Yes	Yes	No	Yes
Wallet to Wallet Cash Token Transfer - Instruct	Yes	No	Yes	Yes	No	Yes
Wallet to Wallet Payment - Instruct	Yes	No	Yes	Yes	No	Yes
Payment (direct settlement in T2) - Instruct	Yes	No	Yes	Yes	No	Yes

Non-exhaustive list, to be further detailed in the Service Description

4.5 Finality and irrevocability of settlements

Id	PILOT.SET.FIN.010
Name	Settlement finality and irrevocability

The rules on entry of cash transfer orders in TARGET and their irrevocability will apply as specified in the TARGET Guideline as implemented by the NCB of the home jurisdiction. In particular, as regards the euro cash leg, settlement of the euro CeBM related financial transactions using the solution will occur in T2 in line with the existing rules on entry of cash transfer orders in T2 and their irrevocability. In particular:

- In case of settlement with cash tokens, the settlement will occur in T2 at the moment of the defunding (upon request of the market participants or, mandatorily, at the end of each business day);
- In case of direct settlement in T2, the settlement will occur in T2 on a gross basis for each transaction.

The settlement finality will apply as specified in Article 18 Annex 1 Part I of the TARGET Guideline[31]. The settlement finality of the asset leg will be dependent on the rules applicable to the eligible market DLT operator.

4.6 Euro currency

Id	PILOT.SET.CCY.010
Name	Euro denominated payments only

The solution will provide settlement of euro denominated payments only.

[31] Guideline (EU) 2022/912 of the European Central Bank of 24 February 2022 on a new-generation Trans-European Automated Realtime Gross Settlement Express Transfer system (TARGET) and repealing Guideline ECB/2012/27 (ECB/2022/8).

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4.7 Eurosystem DLT and its settlement models

Id	PILOT.SET.DLT.010
Name	Dual settlement model

The solution will provide two settlement models: settlement with cash tokens, and direct settlement in T2/RTGS, without cash tokens, in the modalities described in this document. A market participant can leverage on both the settlement models and select one or the other on a transaction-by-transaction basis.

Id	PILOT.SET.DLT.020
Name	Eurosystem Distributed Ledger technology - ledger

The solution will rely on a shared ledger, which will be updated in a consistent manner via a consensus protocol running on the nodes participating to the Eurosystem DLT.

Id	PILOT.SET.DLT.030
Name	Common Graphical User Interface (GUI)

The solution will have a common GUI for the functionalities exposed by the Extended Interoperability Interface, in the modalities described in this document. The GUI will expose functionalities relevant for both the settlement models.

Id	PILOT.SET.DLT.040
Name	Eurosystem Distributed Ledger technology - T2/RTGS Interface

The solution will have an automated interface to the T2/RTGS (the “trigger backend”) which will fulfil on-chain direct payments and funding/defunding requests by translating them into ISO 20022 messages.

Id	PILOT.SET.DLT.050
Name	Eurosystem Distributed Ledger technology - T2/RTGS access

All requests directed to T2/RTGS will be channelled via the Network Service Providers (NSPs) leveraging the current trigger backend access to TARGET services.

Id	PILOT.SET.DLT.060
Name	Eurosystem Distributed Ledger technology – issuance node

ECB will own the ECB Issuer node to carry out the issuance of cash tokens.

Id	PILOT.SET.DLT.070
Name	Eurosystem Distributed Ledger technology – issuance node role

The ECB issuance node will monitor for tokenised money issuance requests and, upon successful verification of a (i) T2/RTGS funding operation, will credit the specific DCW, or (ii) defunding operation, will debit the specific DCW. The entire process will be automated.

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Id	PILOT.SET.DLT.80
Name	Eurosystem Distributed Ledger technology – Redemption and repatriation

At the end of each business day, the solution will execute a mandatory automated cash sweep which will redeem cash tokens in each DCW and repatriate the corresponding amount into RTGS DCAs via the single RTGS interface.

Id	PILOT.SET.DLT.90
Name	Overnight balance prevention

The solution will ensure that the balances on DCWs, Technical Interim Account, and Token Issuance Account and wallet are cleared or transferred out by the end of each business day, preventing any funds from remaining in these accounts and wallets overnight.

Id	PILOT.SET.DLT.100
Name	Debtor liquidity checks – rejection coming from T2

The solution will handle rejections coming from T2/RTGS in an automatic way:

- E.g.,, in case of a funding request, if the balance on the RTGS DCA is lower than the amount requested, the error will be handled by the solution accordingly and it will result in a rejection (partial funding will not be possible in the Pilot),
- E.g., in case of a direct settlement in T2, if the balance on the RTGS DCA is lower than the amount requested, the error will be handled by the solution accordingly and it will result in a rejection (partial direct settlement in T2 will not be possible in the Pilot).

Id	PILOT.SET.DLT.110
Name	Debtor liquidity checks – rejection coming from ESY DLT

The solution will handle rejections coming from the Eurosystem DLT in an automatic way:

- E.g., in case of a defunding request, if the balance on the DCW is lower than the amount requested, the error will be handled by the solution accordingly and it will result in a rejection (partial defunding will not be possible in the Pilot),
- E.g., in case of a wallet-to-wallet payment, if the balance on the DCW is lower than the amount requested, the error will be handled by the solution accordingly and it will result in a rejection (partial wallet-to-wallet payment will not be possible in the Pilot).

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5 Interfaces and technical connectivity

This chapter focuses on the solution internal and external connectivity, as well as providing a business description of the EII interface, especially about its Application Programming Interface (API) layer.

5.1 Requirements for communication between the solution and market DLT platforms

Id	PILOT.INT.COM.010
Name	External Connectivity

Market participants will connect to the solution leveraging secure communication channels over the public internet. The solution will be deployed outside the perimeter of ESMIG. The market participants will apply a well-defined network configuration to enable external connectivity.

Id	PILOT.INT.COM.020
Name	Internal Connectivity

ESY DLT nodes will connect among each other to form a permissioned DLT network leveraging secure channels over the public internet. For the Pilot phase, the solution internal connectivity will be outside the perimeter of ESMIG.

Id	PILOT.INT.COM.030
Name	Delivery versus Payment (DvP) and Payment versus Payment (PvP) – interface

The solution will expose the DvP and PvP services via REST-like web services. The body of each request will consist of messages with the appropriate information required by the Hash Link protocol.

Id	PILOT.INT.COM.040
Name	Unified Application Programming Interface (API) layer

The Extended Interoperability Interface (EII) will offer access to a harmonised REST API layer for exposing the functionalities available via A2A. Each API will be documented using the Open API Specification (OAS) and the specification will include:

- Defined paths and methods.
- Request and response schemas.
- Authentication mechanisms.
- Error responses.
- Examples of usage.

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Id	PILOT.INT.COM.050
Name	Extended Interoperability Interface (EII) single point of access

All participants — NCBs and their market participants — will:

- connect to the solution exclusively via User-to-Application (U2A) and/or Application-to-Application (A2A) interfaces.
- connect through the Extended Interoperability Interface (EII), which will serve as the sole gateway to the ESY DLT.[32]

Market DLT operators will be able to connect to the solution via A2A only.

Id	PILOT.INT.COM.060
Name	Extended Interoperability Interface (EII) exposed services

The EII will provide access to the functionalities described in this document.

Id	PILOT.INT.COM.070
Name	EII authentication and authorisation

The EII will authenticate, authorise and route incoming API calls to the correct ESY DLT node, which will be univocally determined.

5.2 Integration with existing TARGET Interfaces

Id	PILOT.INT.TRG.010
Name	Interaction with TARGET components

ESY DLT will interact only with T2 RTGS component via the T2 interface (and the Trigger backend).

5.3 Interaction with T2 RTGS

Id	PILOT.INT.ISO.010
Name	Trigger Backend communication with T2/RTGS based on ISO 20022

Trigger Backend will be capable of establishing communication with T2/RTGS using ISO 20022 messages, relying on standardised XML formatting for message transmission.

[32] Direct access to the underlying DLT nodes is out of the scope.

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6 Information management

This chapter reports the requirement relevant to information monitoring and notification, the collection of statistics to enhance business analysis, concluding with billing and reports.

6.1 Liquidity monitoring

Id	PILOT.INF.MON.010
Name	Overnight retention of liquidity Monitoring

The solution will enable the Service Providers to monitor if any liquidity remains after the designated End of Day cut-off (in the DCWs and in the Token Issuance Wallet[33]). In addition, the Service Providers will be provided with tools to manage contingency scenarios, identify remaining liquidity on DCWs and ensure the repatriation of funds to T2 RTGS.

6.2 Real-time queries

	U2A			A2A		
Queries	**Available in U2A**	**2-eyes**	**4-eyes**	**Available in A2A**	**2-eyes**	**4-eyes**
Dedicated Cash Wallet - Query reference data	Yes	Yes	-	Yes	Yes	-
Dedicated Cash Wallet - Query balance	Yes	Yes	-	Yes	Yes	-
Dedicated Cash Wallet - Query Statement of Wallet report	Yes	Yes	-	Yes	Yes	-
Participant (NCB and market participants) - Query reference data	Yes	Yes	-	Yes	Yes	-
User - Query	Yes	Yes	-	Yes	Yes	-
All transactions - Query	Yes	Yes	-	Yes	Yes	-
DvP and PvP transaction - Initialisation Query	No	No	-	Yes	Yes	-
DvP and PvP transaction (direct settlement in T2) - Initialisation Query	No	No	-	Yes	Yes	-
Business day - Query	Yes	Yes	-	Yes	Yes	-
Market DLT - Query	Yes	Yes	-	Yes	Yes	-

Non-exhaustive list, to be further detailed in the Service Description

Id	PILOT.INF.QRY.010
Name	Dedicated Cash Wallet reference data query

The solution will allow to search and edit a DCW reference data. Once connected, each user has access to the full list of DCWs in its scope only. The user can filter by specific criteria to see only details of specific wallets. The solution will also support to record and query the list of updates to DCW's static data, but it is outside the scope to rollback data to a previous version.

Id	PILOT.INF.QRY.020
Name	Dedicated Cash Wallet current balance query

The solution will allow to query the current balance of a DCW of the current Business Date.

[33] Monitoring of the token issuance account and technical interim account will be possible via T2 RTGS, using existing functionalities.

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Id	PILOT.INF.QRY.030
Name	Transaction query

The solution will allow to query details about a specific transaction involving DCW. The query can return one or more transactions on DCWs that are in the user's scope. The users can then filter by search criteria to see details only for specific transactions. Multiple transactions can be listed using filters, and a specific transaction can be queried providing its identifier. All transactions are displayed not only the ones of the current Business Date unless filtered on a specific Business date.

Id	PILOT.INF.QRY.040
Name	Statement of Wallet query

The solution will allow to request a Statement of Wallet, updated to the moment of the request, for a given DCW. The solution will allow to retrieve Statement of Wallet for a given DCW from previous business dates.

Id	PILOT.INF.QRY.050
Name	Participant reference data query

The Operator node in the ESY DLT will enable to query informational participant reference data.

Id	PILOT.INF.QRY.060
Name	Delivery versus Payment (DvP) and Payment versus Payment (PvP) related queries

As part of the steps of the Hash Link protocol, after the initialisation of a DvP (or PvP), the solution will allow to:

- Query DvP (or PvP) initialisation information, like hashes and DvP (or PvP) identifier (used by the buyer to retrieve necessary data to consequently instruct the payment request).
- Query DvP (or PvP) payment status information and execution/cancellation keys.

Id	PILOT.INF.QRY.070
Name	Local Reference Data Management (LRDM) related queries

The solution will allow to execute the following operations from the NCB node's LRDM:

- Query users.
- Query participants (NCBs and market participants).

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7 Non-functional description

The chapter focuses on the non-functional description of the Pilot phase solution, including for example its volumetric assumptions, the privacy of data, the availability of the solution, the security requirements (e.g. integrity, confidentiality, cyber resilience).

7.1 Volumetric assumptions

The following table summarises the volumetric assumptions for the Pilot phase of Pontes[34]:

Capacity	A2A	Up to 500 different users per day
	U2A	Up to 500 different users per day
Cash leg processing throughput	Average	10 transactions per second
	Peak	20% increment of the average
Cash leg execution time	95th percentile	Within 5 seconds
Query response time	95th percentile - A2A	Within 30 seconds
	95th percentile - U2A	Within 30 seconds

Table 2 - Volumetric assumption for the Pilot phase

7.1.1 Capacity

Id	PILOT.NFR.CAP.010
Name	Solution capacity – A2A

The solution and its components will provide services to support 500 different users connected per day via A2A.

Id	PILOT.NFR.CAP.020
Name	Solution capacity – U2A

The solution and its components will provide services to support 500 different users connected per day via U2A.

7.1.2 Cash leg processing throughput

Id	PILOT.NFR.THR.010
Name	Cash leg processing throughput average

The solution will enable to process an average of 10 incoming A2A transactions per second. In this context, *transaction* means the processing of the cash leg on the Eurosystem DLT in with cash tokens:

- independently of the underlying use case.
- independently of the outcome of the transaction (e.g. settled or rejected).
- independently of the location of the NCB nodes involved.
- excluding the initialisation step, where relevant.

[34] The volumetric assumptions are intended to serve as target performance indicators for the solution. As such, they are not legally binding and could be subject to further review, following the Service Provider's performance testing prior to the go live.

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Id	PILOT.NFR.THR.020
Name	Cash leg processing throughput peak

The solution will enable to process an increase of workload up to 20% higher than the cash leg processing throughput average, as defined in this document.

7.1.3 Cash leg execution time

Id	PILOT.NFR.EXE.010
Name	Cash leg execution time

The solution and its components will process 95% of the A2A transactions within 5 seconds and 100% of the A2A transactions within 2 minutes. In this context, *transaction* means the processing of the cash leg on the Eurosystem DLT in with cash tokens:

- independently of the underlying use case.
- independently of the outcome of the transaction (e.g. settled or rejected).
- independently of the location of the NCB nodes involved.
- excluding the initialisation step, where relevant.

7.1.4 Query response time

Id	PILOT.NFR.QRY.010
Name	Real-time query response time – A2A

The solution and its components will process 95% of the A2A real-time queries within 30 seconds and 100% of the A2A real-time queries within 5 minutes. Whereby the response time is measured as the elapsed time between the moment an A2A query request is received by the Extended Interoperability Interface and the moment the query result is returned to the requestor.

Id	PILOT.NFR.QRY.020
Name	Real-time query response time – U2A

The solution and its components will process 95% of the U2A real-time queries within 30 seconds and 100% of the U2A real-time queries within 5 minutes. Whereby the response time is measured as the elapsed time between the moment an U2A query request is received by the Extended Interoperability Interface and the moment the query result is returned to the requestor.

7.2 Volumetric limits

Id	PILOT.NFR.LIM.010
Name	Possibility of volumetric limits

In line with the nature of the Pilot phase, the Eurosystem reserves the right to impose limits on the number of transactions settled with the solution. These limits will be enforced contractually, and not technically by the solution.

Id	PILOT.NFR.LIM.020
Name	Possibility of value limits

In line with the nature of the Pilot phase, the Eurosystem reserves the right to impose limits on the maximum value of transactions settled with the solution. These limits will be enforced contractually, and not technically by the solution.

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7.3 Privacy and data protection

Id	PILOT.NFR.PRV.010
Name	Real-time query scoping

The solution and its components will allow real-time queries on a "need-to-know" basis only, in line with the visibility described in the section of this document related to the Actors.

Id	PILOT.NFR.PRV.020
Name	Data protection regulation compliance

The solution and its components will comply with data protection rules set out in Regulation (EU) 2016/679 (GDPR), in Regulation 2018/1725 (EUDPR) and in national laws of states enabling cross-border data processing.

Id	PILOT.NFR.PRV.030
Name	Data processing and storage

The solution and its components will process, store and archive all data in line with the below principles:

1. Data is never stored in cleartext,
2. Data is pseudonymised or anonymised by default in transactional flows,
3. Data remains accessible only to authorised parties, in line with the principle of least privilege.

7.4 Reliability

7.4.1 Availability

Id	PILOT.NFR.REL.010
Name	Availability

The solution and its components will be available for processing of transactions in line with the operating days and operating schedule defined in this document.

Id	PILOT.NFR.REL.020
Name	Technical availability

The solution's unplanned downtime, calculated on a monthly basis, will correspond to an availability of 99.7%. In this context, the solution is intended as *down*, when no participant can access its functionalities.

7.4.2 Fault tolerance

Id	PILOT.NFR.TOL.010
Name	Component fault tolerance

The different components of the solution will rely on infrastructure-based resiliency, implemented across the different hosting regions. Each region foresees different sites and leverages distributed storage (and data replication[35]), ensuring intra-region high availability.

[35] Cross-region redundancy is not implemented in the Pilot phase.

Id	PILOT.NFR.TOL.020
Name	Operational site location

The solution and its components will be hosted in multiple operational sites at locations that enable the defined availability and performance.

Id	PILOT.NFR.TOL.030
Name	Local disaster fault tolerance

The solution and its components will tolerate hardware or software failures caused by local disasters so that overall performance and availability is still provided as intended. Local disasters refer to damaging events occurring in specific limited area, like fires, flooding, or power outages.

7.4.3 Recoverability

Id	PILOT.NFR.REC.010
Name	Recovery Point Objective (RPO)

At infrastructure level, the solution and its components will ensure a recovery point objective value of zero minutes in the event of a site failure.

The RPO is a point of consistency to which a user wants to recover or restart the service. It is measured as the amount of time between the moment when the point of consistency was created and the moment when the failure occurred.

Id	PILOT.NFR.REC.020
Name	Recovery Time Objective (RTO)

At infrastructure level, the solution and its components will ensure a Recovery Time Objective (RTO) value of one hour in the event of site failure.

The Recovery Time Objective (RTO) is the maximum amount of time required for recovery or restart of the service to a specified point of consistency. Where there is a site failure, the solution will ensure maximum time of unavailability of one hour starting from the moment when the decision to restart the component is made until the moment the component is restored.

7.4.4 Operational procedures

Id	PILOT.NFR.CON.010
Name	Operational procedures in case of incidents

The solution will rely on an operational framework that describes information and procedures to respond to an incident, and to recover business operations to a predefined level.

Id	PILOT.NFR.CON.020
Name	Restart without human interaction

The solution will automatically restart any failed component without human interaction.

Id	PILOT.NFR.CON.030
Name	Preservation of data integrity

The solution and its components will handle errors in a way that data integrity is preserved.

Id	PILOT.NFR.CON.040
Name	Crisis management process

The solution and its components will have defined crisis management procedures and crisis management structures in place. A structured approach that puts structure and procedures in place to manage unforeseen situations that exceed the scope of defined incident or problem management processes. The crisis management process will cover at least coordination of crises, communication of crises, decision making procedures, escalation procedures and reliable communication tools.

7.4.5 Clock synchronisation

Id	PILOT.NFR.CON.050
Name	Clock reference

The solution and its components will use an atomic clock time (in UTC, Coordinated Universal Time) as a reference – with a maximum deviation of 100 milliseconds.

7.5 Security

7.5.1 General security functions

Id	PILOT.NFR.SEC.010
Name	Security compliance

The solution and its components will comply with the TARGET Services Security Requirements and Controls.

Id	PILOT.NFR.SEC.020
Name	Secure connection and user authentication

The solution will provide a secure connection over the public internet. Users connecting to the solution (via A2A or U2A) will be authenticated using strong authentication measures.

7.5.2 Cyber resilience

Id	PILOT.NFR.SEC.030
Name	Cyber resilience proof

The solution and its components will comply with the TARGET Services Cyber Resilience and Information Security (CRIS) Framework and Policy.

7.5.3 Integrity

Id	PILOT.NFR.SEC.040
Name	Integrity

The solution and its components will guarantee and maintain the integrity of managed data. The solution and its components will guarantee the integrity, i.e. consistency, accuracy and trustworthiness, of (i) saved data; and (ii) data transferred in incoming and outgoing communications, using solutions as:

- data encryption.
- control information (e.g. hash, checksum).
- digital signature.

7.5.4 Confidentiality

Id	PILOT.NFR.SEC.050
Name	Confidentiality

The solution and its components will guarantee and maintain the confidentiality of managed data and provided services.

The solution and its components will guarantee the confidentiality by protecting (i) saved data, (ii) data transferred in incoming and outgoing communications; and (iii) provided services against unauthorised access attempts, using solutions as:

- data encryption.
- authentication and authorisation mechanisms.
- physical safety measures.

7.5.5 Audit trail

Id	PILOT.NFR.SEC.060
Name	Audit trail

The solution and its components will ensure a secure audit trail for actions (including manual entry(-ies), data consultations, etc.) initiated by a user or by a component.

The solution and its components will collect and store audit logs recording user activities, exceptions and information security events to assist in the access control monitoring performed by the Service Providers. Logging facilities and log information will be protected against tampering and unauthorised access. Activities performed by privileged users (administrators, service desk operators, auditors, etc.) will also be logged.

Audit trail information to be collected and stored includes the following data:

- transaction records.
- authentication successes and failures of all users.
- security related messages (e.g. changes of access rights, alerts and exceptional events).

Audit trail records must contain registration timestamps and, when relevant, the identifier of the user who performed the recorded action.

7.5.6 Archiving for legal purposes

Id	PILOT.NFR.SEC.070
Name	Archiving for legal purposes

The solution and its components will ensure the archiving of its data (transactions, their identification and reference data management operations) for legal purposes. The solution will archive data for a period of 10 years to guarantee non-repudiation of emission and non-repudiation of reception in a later dispute.

Id	PILOT.NFR.SEC.080
Name	Archiving of audit trail

The solution and its components will ensure the archiving of the audit trail in a secure archive storage.

Id	PILOT.NFR.SEC.090
Name	Retrieval of archived payment system relevant data

The solution and its components will enable the retrieval of the archived payment system relevant data within the archived data retention period.

7.6 Risk management

Id	PILOT.NFR.MTN.010
Name	Risk management system

The organisation requires an information security management system aligned with TARGET Services Risk Management Framework to ensure risk-based protection of information assets, including risk assessment, treatment, and continuous improvement.

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Annex 1: List of abbreviations

Abbreviation	Meaning
A2A	Application to application
API	Application Programming interface
CSD	Central Securities Depositories
CSDR	Central Securities Depositories Regulation
CCPs	Central Counter Parties
DCA	Dedicated Cash Account
DCW	Dedicated Cash Wallet
DLT	Distributed Ledger Technology
DSS	DLT settlement system
DTSS	DLT Trading and Settlement System
EMIR	European Market Infrastructure Regulation
PFoD	Payment Free of Delivery
DvP	Delivery vs Payment
EEA	European Economic Area
EII	Extended Interoperability Interface
EoD	End of Day
ESMIG	European Single Market Infrastructure Gateway
ESY	Eurosystem
HLC	Hash Link Contract
HTTP	Hypertext Transfer Protocol

NSP	Network Service Provider
NTW	New Technologies for Wholesale settlement
MiFID	Markets in Financial Instruments Directive
OAS	Open API Specification
PDC	Private Data Collection
PvP	Payment vs Payment
RBAC	Role-Based Access Control
REST	Representational State Transfer
RPO	Recovery Point Objective
RTGS	Real Time Gross Settlement system
RTO	Recovery Time Objective
U2A	User to Application
UTC	Universal Time Coordinated
VPN	Virtual Private Network
XML	Extensible Markup Language

Annex 2: List of Tables

Annex 3: List of Images

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Annex 4: List of External Documents

- Central Security Depository Regulation
- DLT Pilot Regime Regulation
- European Market Infrastructure Regulation - 648/2012
- Markets in Financial Instruments Directive (MiFID)
- Open API Specification
- Technology Readiness Levels
- TARGET Guideline

Annex 5: Glossary

Automated Wholesale Payment: A payment use cases (see **use case**) in the wholesale space, e.g. between credit institutions, using automation features such as programmed in smart contracts (see **smart contract**) on the market DLTs to execute the payment instruction.

Cash tokens: Proxy of euro denominated CeBM, without any legal effect other than embodying a contractual claim against the token issuer to transfer CeBM in T2 RTGS to the holder market participant that owns such tokens in exchange for such tokens.

Central bank money (CeBM): Liabilities of a central bank, in the form of either banknotes or bank deposits held at a central bank, which can be used for settlement purposes. In the context of this framework document, CeBM refers to bank deposits held at Eurosystem central banks in TARGET Services.

Commercial bank money tokens (CoBM tokens or tokenised deposits): Liabilities of commercial banks made available in the form of native digital assets on the market DLTs for settling payments.

Dedicated Cash Wallet: technical object that manages central banks and eligible market participants' cash token balances (see **eligible market participants** and **cash tokens**), enables them to instruct transactions and allows them to access token balances and instructions history.

Delivery versus Payment (DvP): A securities settlement mechanism which links a securities transfer and a funds transfer in such a way as to ensure that delivery occurs if – and only if – the corresponding payment occurs.

Digital asset: A digital asset that is issued, recorded and kept in a DLT-based system.

Digital tokens: Entries in a DLT-based system and that can contain information and functionality within the token themselves. Digital tokens can represent financial or real assets.[36]

Distributed ledger: An information repository that keeps records of transactions and that is shared across, and synchronised between, a set of DLT network nodes using a consensus mechanism (the meaning ascribed to it in Article 2(2) of the DLT Pilot Regime Regulation).[37]

Distributed Ledger Technology (DLT): A technology that enables the operation and use of distributed ledgers, (**the meaning ascribed to it in Article 2(1) of the DLT Pilot Regime Regulation)**.[38]

[36] See joint BIS / CPMI report to G20 on tokenization in the context of money and other assets: concepts and implications for central banks
[37] Definition from DLT Pilot Regime Regulation
[38] Definition from DLT Pilot Regime Regulation

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DLT Pilot Regime Regulation (PRR): Regulation of the European Parliament and of the Council on a pilot regime for market infrastructures based on distributed ledger technology.

Eligible Market DLT Operator:

1. Central securities depositories (CSDs) authorised under the CSDR[39] and NCB-run CSDs exempted from the CSDR authorisation procedure operating a Securities Settlement System based on DLT (including T2S CSDs subject to a derogation of the contractual and regulatory framework of T2S[40]);
2. Operators of a DLT settlement system (DSS) or a DLT trading and settlement system (DTSS) as authorised under the DLT Pilot Regime Regulation[41];
3. Operators of a payment system established in the EU or the EEA that is subject to oversight by a competent authority;
4. Central counterparties (CCPs) authorised under EMIR[42];
5. Credit institutions, investment firms, market operators, and other licensed financial institutions, authorised under CRD, MiFID II and/or other relevant national legal frameworks in the EEA which is (i) subject to supervision or oversight specific for financial market infrastructures by a competent authority or (ii) following a case-by-case assessment conducted by the applicant's NCB based on agreed Eurosystem criteria to ensure proper risk management.

Eligible market participant: Any entity with access to TARGET, within the meaning of Article 4 of Annex 1 Part I of the TARGET Guideline,[43] as amended from time to time.

Eurosystem DLT: The DLT-based platform refers to the Eurosystem infrastructure that manages the cash-leg of DLT-based transactions, providing either a settlement using cash tokens (see **cash tokens**) or directly in RTGS. The Eurosystem DLT is a permissioned DLT-based platform.

Extended Interoperability Interface (EII): Component that serves as the only entry point to the Solution (see **Solution**), via Application Programming Interfaces (APIs) and via a Graphical User Interface (GUI). It is also responsible for routing requests to the correct node in the Eurosystem DLT (see **Eurosystem DLT**).

Interoperability: Describes the ability to technically synchronise multiple ledgers and/or legacy systems. This approach is necessary to enable the flow of data across different networks.

Interoperability mechanism: The technical or legal compatibility that enables the Solution (see **Solution**) to be used in conjunction with a market DLT to coordinate the DVP (and/or PVP) settlement across the two platforms.[44]

Market DLT platform: DLT service platform provided by an Eligible Market DLT Operator where eligible assets or financial instruments are cleared and/or settled and/or delivered.

Payment versus payment (PvP): A mechanism which ensures that the final transfer of a payment in one currency occurs if – and only if – the final transfer of a payment in another currency or currencies takes place.

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[39] Regulation (EU) No 909/2014 of the European Parliament and of the Council of 23 July 2014 on improving securities settlement in the European union and on central securities depositories

[40] A derogation to the T2S Framework Agreement would be required to enable T2S CSDs to settle DvP transactions in CeBM via the Pilot.

[41] Regulation (EU) 2022/858 of the European Parliament and of the Council of 30 May 2022 on a pilot regime for market infrastructures based on distributed ledger technology, and amending Regulations (EU) No 600/2014 and (EU) No 909/2014 and Directive 2014/65/EU

[42] Regulation (EU) No 648/2012 of the European Parliament and of the Council of 4 July 2012 on OTC derivatives, central counterparties and trade repositories

[43] The technical feasibility to enable a market participant to give (indirect) access to its Dedicated Cash Wallets to one or more entities it designates, in line with Article 7 of Annex 1 Part I of the TARGET Guideline, is currently under assessment for the go-live of Pontes Pilot.

[44] Adapted from BIS glossary: https://www.bis.org/cpmi/publ/d00b.htm

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Programmability: The ability to automate processes by pre-programming actions to be taken if a specific event occurs.[45]

Smart contract: Automatable, 'contractual-type' arrangements embedded in computer software, which the latter can validate, execute and record automatically, on a DLT platform, as soon as certain pre-programmed/pre-defined conditions have been met, based on information fed into the distributed ledger itself or received from a pre-defined (external) source.[46]

Service Providers: The Deutsche Bundesbank (BBk), the Banco de España (BdE), the Banque de France (BdF) and the Banca d'Italia (BdI), collectively, in their capacity as the national CBs responsible for develop, host and operate the Solution (see **Solution**) in accordance with the relevant contractual arrangements and with decisions of the ECB's Governing Council.

Solution: The solution provided by the Eurosystem for the Pilot phase of Pontes. It is mainly based on three technical components: Extended Interoperability Interface (EII) (see **Extended Interoperability Interface**), Eurosystem DLT (see **Eurosystem DLT**) and T2 interface (see **T2 interface**).

T2 interface: The component that serves as the single-entry point to the TARGET Services via the existing Eurosystem Market Infrastructure Gateway (ESMIG). It enables smooth funding and defunding of intra-day cash tokens (see **cash tokens**) and direct T2 RTGS Settlement of transactions coming from the Eurosystem DLT platform. It relies on the existing functionalities of the TARGET Services.

Technical interim account: One RTGS DCA, used for the benefit of the entire Eurosystem, used during the automated interaction with RTGS to temporary hold funds (i) then credited on the token issuance account (see **token issuance account**) in case of settlement in with cash tokens for the processing of funding requests , or (ii) then credited to another market participant's RTGS DCA, in case of direct settlement in T2.

Token: A representation of an asset on a distributed ledger.

Token issuance account: One RTGS DCA, used for the benefit of the entire Eurosystem, to escrow liquidity in RTGS during the process of issuing cash tokens (see **cash tokens**) on the Eurosystem DLT (see **Eurosystem DLT**).

Token issuance wallet: technical Dedicated Cash Wallet (see **Dedicated Cash Wallet**) that allows to issue cash tokens (see **cash tokens**) after a funding operation and to redeem cash tokens (see **cash tokens**) before a defunding operation. The Solution (see **Solution**) requires a single token issuance wallet for the entire Eurosystem, owned by the ECB. The balance of this wallet reflects the balance of the token issuance account (see **token issuance account**) in T2 RTGS.

Tokenised asset: a representation in a DLT-based system of an asset not native to that system.[47]

Use case: for the purpose of this document, a use case is a business scenario implemented technically and operationally during the Pontes Pilot phase with the Solution (see **Solution**).

[45] See: CPMI, 'Wholesale digital tokens', December 2019 (https://www.bis.org/cpmi/publ/d190.pdf).

[46] See: Advisory Groups on Market Infrastructures for Securities and Collateral and for Payments, 'The use of DLT in post-trade processes', April 2021 (https://www.ecb.europa.eu/pub/pdf/other/ecb.20210412_useofdltposttradeprocesses~958e3af1c8.en.pdf); D. Bullmann, J. Klemm and A. Pinna, 'In search for stability in crypto-assets: are stablecoins the solution?', ECB Occasional Paper no. 230, August 2019; M. Bech, J. Hancock, 'On the future of securities settlement', BIS Quarterly Review March 2020 (https://www.bis.org/publ/qtrpdf/r_qt2003i.pdf)

[47] Adapted from: Advisory Groups on Market Infrastructures for Securities and Collateral and for Payments, 'The use of DLT in post trade processes', April 2021 (https://www.ecb.europa.eu/pub/pdf/other/ecb.20210412_useofdltposttradeprocesses~958e3af1c8.en.pdf)