Update on the work of the digital euro scheme's Rulebook Development Group

3 January 2024

1 Executive summary

A digital euro would be the first public European digital means of payment providing pan-European reach. To ensure a harmonious implementation, the Eurosystem is designing a digital euro payment scheme, consisting of a single set of rules, standards and procedures for the standardisation of digital euro payments across the euro area.

The scheme is being developed by the Rulebook Development Group (RDG), which was established in January 2023 and whose members are professionals representing consumers, retailers and intermediaries' associations. The purpose of the RDG is to define the roles of all actors involved in a digital euro ecosystem, including end users, vendors and acquirers, in order to ensure a satisfactory payment experience while fostering further innovation and competition. To this end, RDG members have been sorted into dedicated workstreams focusing on specific topics that require particular expertise.

Since the first update published by the RDG in June 2023, the Group has drafted the first draft chapters of the rulebook in line with digital euro design decisions approved by the Governing Council of the European Central Bank (ECB) and with the legislative proposal.[1]

This first draft of the rulebook is an intermediate version that covers, (i) the functional and operational model, which include the end-to-end flows describing the functioning of all use cases and services in scope of a digital euro, (ii) the technical scheme requirements, which depict the high-level architecture of a digital euro and some initial and proposed current market standards to be potentially also used for a digital euro and (iii) the adherence model of the digital euro scheme, which sets out the rights and obligations of scheme members in accordance with the legislative proposal. The document relies on input from the dedicated RDG workstreams with experts from the market participants on (i) authentication and identification, (ii) technical scheme and (iii) scheme compatibility.

The draft rulebook will be completed with additional chapters and a first complete draft will be prepared over the course of the digital euro preparation phase.

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[1]   As outlined in the four publicly available progress reports published in September 2022, December 2022 and April 2023 and in the stocktake on the digital euro.

This document summarises the main sections of the first draft of the digital euro rulebook and the envisaged next steps in the drafting process.

Over the past months, RDG members have been involved in drafting the different chapters of the first draft version of the rulebook. The draft version as it currently stands has been shared with RDG members for an interim review in the first quarter of 2024. This process will be an opportunity for all stakeholders involved to thoroughly review the current draft rulebook. Based on the feedback received as part of this review, the group will consider adjustments to the draft rulebook as required.

Figure 1

Foreseen content within the digital euro rulebook
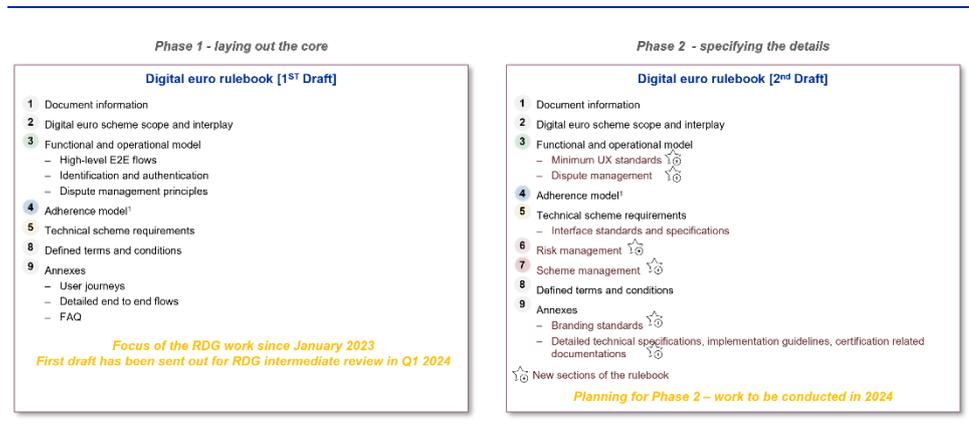
[1] Dependent on the legislative proposal from the European Commission

The rulebook will comply with the outcome of the digital euro legislative process and the necessary changes will be introduced.

2   Key actors in the digital euro scheme

Delivering a digital euro will require the orchestrated interaction of all actors, both private and public.

As defined in the rulebook following the digital euro legislative proposal presented by the European Commission, the main actors involved in the digital euro scheme (apart from the Eurosystem) will be as follows:

- The payer – the party in a payment transaction that agrees to the transfer of digital euro to the payee. In the context of the scheme, a payer might be an individual user, a business user, a government or another public authority.

- The payee – the party in a payment transaction that receives digital euro from the payer. In the context of the digital euro project, a payee might be an individual user, a business user, a government or another public authority.

- The payer's intermediary – the scheme participant that receives the digital euro transfer instruction from the payer and acts on the payment instruction by

initiating the transfer of digital euro from the payer to the payee according to the information provided in the instruction and in accordance with the provisions of the scheme.

- The payee's intermediary – the scheme participant that receives and acts on the notification of digital euro received in accordance with the provisions of the scheme.

An intermediary is an entity acting between the central bank and end users in the digital euro environment. Intermediaries can have various roles and may be credit institutions or other payment service providers (e.g. payment institutions or e-money institutions).

The payer's intermediary and the payee's intermediary may be the same entity.

Figure 2 provides an overview of relationships between the parties within the digital euro ecosystem.

Figure 2

Relationships within the digital euro ecosystem
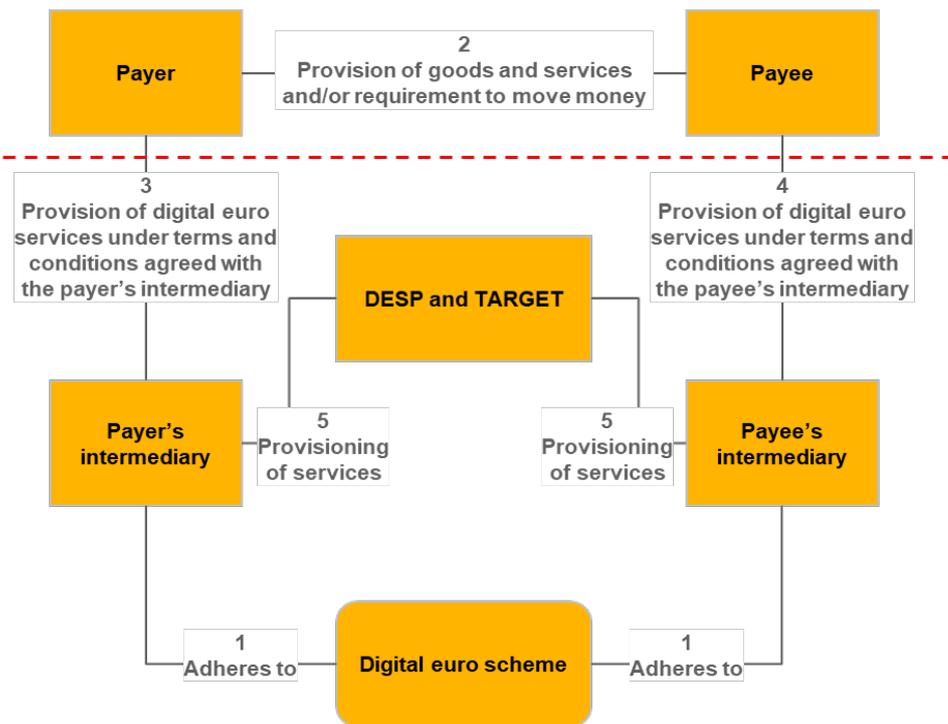
Note: Intermediaries may engage third-party entities as agents or subcontractors to support them in the provision of services they are obliged to provide under the scheme, while retaining full accountability. From a contractual point of view, such third-party entities would not be actors in the scheme.

3 Relationships

The digital euro scheme is built around the relationship between the Eurosystem (as governing authority of the scheme) and the participants ("intermediaries"). While the

legal architecture of a digital euro is not yet finalised, the digital euro rulebook can be expected to form part of that architecture and to be part of an ECB legal act, ultimately approved by the ECB Governing Council.

The relationship between the payer and the payee is not directly governed by the scheme, and its validity does not influence the validity of payments effected under the scheme. For example, the obligation to provide goods and services and/or to pay for such goods and services is outside the scope of the scheme.

The relationship between the payer and/or payee and the payer and/or payee's intermediary concerning the digital euro services to be provided and the related terms and conditions are not directly governed by the scheme, but the rulebook imposes minimum requirements related to user management, liquidity management and transaction management that the intermediary must observe in its relationship with the payer.

The relationships between the payer's intermediary, the payee's intermediary and the Eurosystem (as owner of the DESP and TARGET) concerning the back-end services provided and the related terms and conditions are also not governed by the scheme.

Figure 3
Digital euro core services and actors
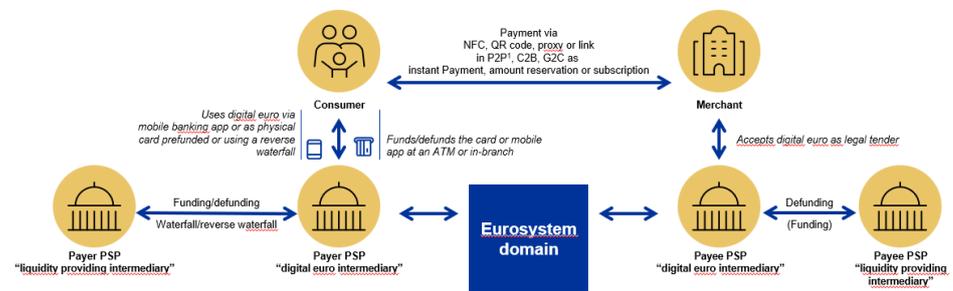
In the case of P2P payments, the receiving party is another "consumer" with an intermediary offering the services depicted under "Payer PSP".

4 Functional and operational model

The draft rulebook includes a section on digital euro functional and operational models with an overview of the services in scope, including access, transaction and liquidity management services, as well as their respective high-level flows and business rules.

4.1 Overview of services

As included in the draft digital euro rulebook, key aspects for digital euro end users include:

- Access management, notably digital euro registration and management, including onboarding, offboarding, and lifecycle management processes from the end users' and intermediaries' perspectives.

- Liquidity management, notably digital euro distribution and control of the amount in circulation, including digital euro wallet funding and defunding via a waterfall account.[2] These processes, which could be performed manually or automatically, would rely on a link between the end user's digital euro wallet and a commercial bank account.

- Transaction management, notably the processing of digital euro transactions, including authentication, payment initiation services and payment confirmation and/or rejection.

Figure 4

Overview of digital euro services

Access management	Liquidity management	Transaction management
Onboarding digital euro end-users	Funding (manual & automated)	Transaction initiation (one-off transactions)
Offboarding digital euro end-users	Reverse waterfall	Authentication
Payment instrument management (both provision and maintenance)	Defunding (manual & automated)	Payment confirmation/rejection notification
Linking digital euro holdings to commercial bank money account	Waterfall	Refunds
User lifecycle management processes (identification, data update, information display on balance and transactions, account portability and end user support)		Dispute/exception management
		Recurring payments
		Pay-per-use enabled via pre-authorisation service
Account information service		Payment initiation service

Core services
Optional services

4.2   Access management

End user onboarding

Supervised intermediaries[3] will be responsible for the onboarding of digital euro end users, including the provision of digital euro account numbers (DEANs), user interfaces and the registration of aliases.

End users will be able to choose between remote and physical onboarding in designated facilities to maximise digital financial inclusion and make digital euro

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[2]   The Eurosystem has included a waterfall functionality within the digital euro design, which would allow users to receive payments in digital euro above the holding limit (yet to be defined) by linking their digital euro account to a commercial bank account. A waterfall would be a way of managing an end user's digital euro holdings via the automatic transfer of digital euro in excess of a holding limit to a linked commercial bank account chosen by the end user (see "waterfall approach" in the digital euro glossary). Holding limits could also be differentiated by type of user to accommodate the payment needs of citizens (typically on the payer side) and businesses (mainly on the payee side).

[3]   The intermediary that provides the onboarding services, including access to the DESP, is called the "access manager". The access manager can also act as an instructing participant and/or authorise a third party to act on its behalf.

accessible to vulnerable social groups, such as the elderly and people with limited technological skills who would benefit from face-to-face assistance.

Figure 5

High-level process flow for digital euro end user onboarding
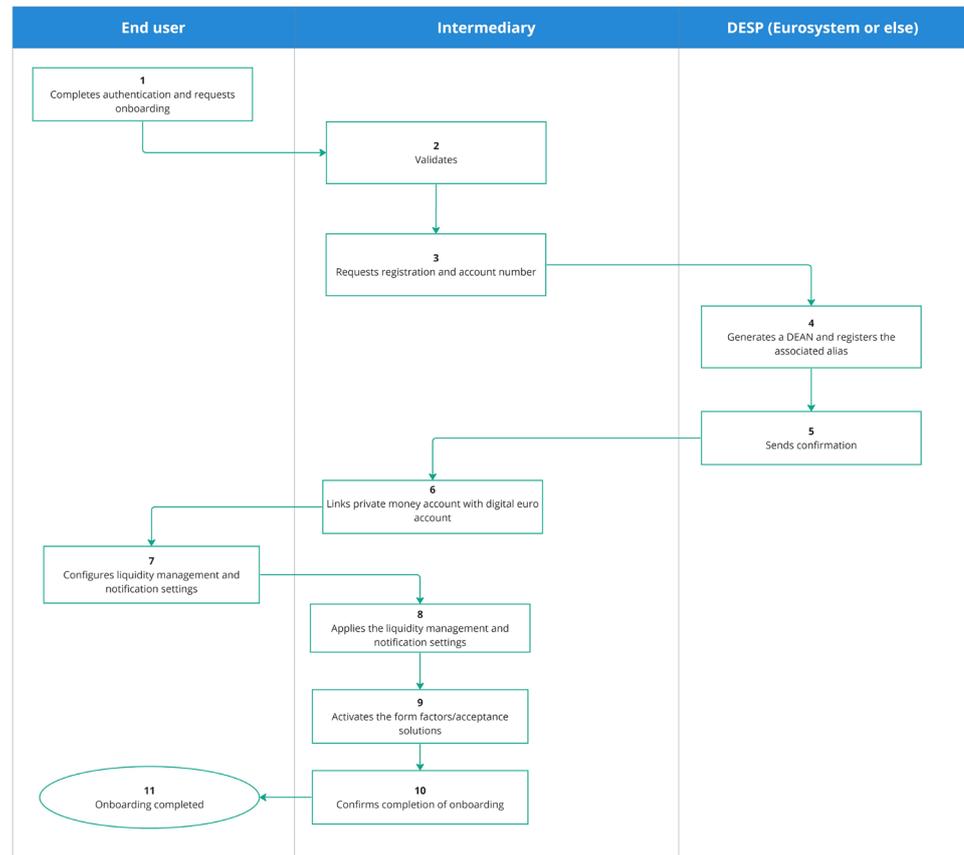
High-level overview of the end-to-end process for digital euro onboarding:

1. The digital euro user completes an authentication process and submits a digital euro onboarding request to the intermediary of their choice.[4]

2. The selected intermediary validates the user credentials and the onboarding request.

3. The intermediary asks the DESP to register the user in a pseudonymised way and to generate a DEAN.

4. The DESP registers the user in a pseudonymised way and generates a DEAN.

5. The DESP confirms the registration and shares the DEAN with the intermediary.

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[4] This description of the process assumes that the end user is already a customer of the selected intermediary and no additional checks are required.

6.   The intermediary registers the assigned DEAN and links a private money account to the digital euro wallet to enable automatic funding and defunding, including waterfall and reverse waterfall functions.[5]

7.   Once the link between a private money account and the digital euro wallet has been made, the user sets up their liquidity management and notification preferences.

8.   The intermediary registers the user's liquidity management and notification settings.

9.   The intermediary activates the user's preferred form factors, including mobile devices or physical cards.

10. The intermediary shares the assigned DEAN with the user, completing the onboarding process.

11. The user is informed about the completion of the onboarding.

In the context business end users, the onboarding process described above will be adjusted as required and will be developed in detail in the digital euro rulebook.

End user offboarding

Digital euro offboarding is initiated when an end user wishes to close their digital euro account. The end user's intermediary will be able to (i) return to the end user any funds associated with a DEAN, (ii) deactivate recurring payments (if applicable), (iii) resolve any pending disputes (e.g. end user claiming fraud and/or a technical issue related to a transaction), (iv) close all open transactions and (v) disable access to the end user's assigned form factors.

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[5]   This service is optional for digital euro end users but mandatory for business users, i.e. merchants.

Figure 6

High-level process flow for digital euro end user offboarding
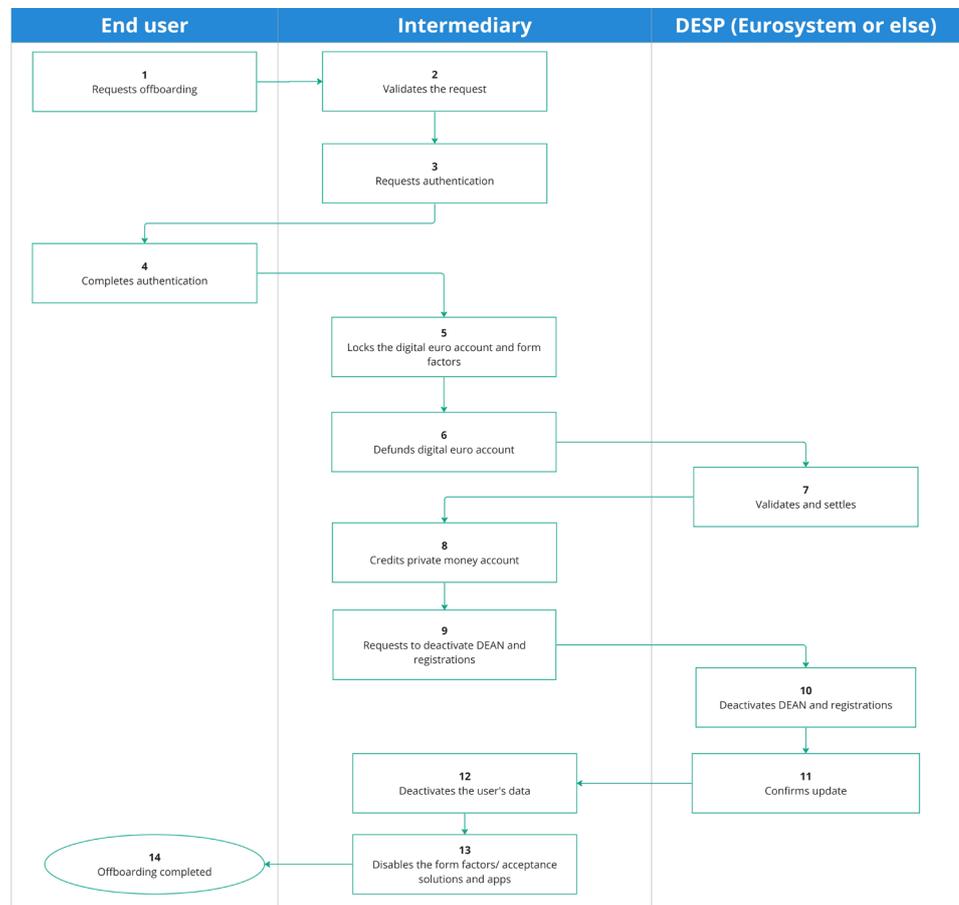
High-level overview of the end-to-end process for digital euro offboarding:

1. The user submits a request to their intermediary to be offboarded from digital euro services.

2. The intermediary validates the user's offboarding request.

3. The intermediary requests user authentication.

4. The user completes authentication.

5. The intermediary locks the user's digital euro account and form factors to ensure payments can no longer be initiated or received.

6. Assuming the user has a positive balance in their digital euro account, the intermediary defunds the account and transfers the money to the user's linked private money account.[6]

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[6] If the user does not have a private money account linked to their digital euro wallet, the remaining balance will be transferred to a private money account specified by the user during the offboarding process.

7. The DESP validates and settles the defunding request and sends confirmation to the intermediary.

8. Following the DESP's settlement confirmation, the intermediary credits the user's private money account with the remaining digital euro balance.[7]

9. The intermediary asks the DESP to deactivate the user's registration, DEAN and alias, if applicable.

10. The DESP deactivates the user registration, DEAN and alias, if applicable.

11. The DESP confirms the deactivation to the intermediary.

12. The intermediary disables the user's data linked to digital euro services.

13. The intermediary disables the user's previously blocked form factors and apps and confirms the completion of offboarding to the user.

14. The user is informed about the completion of the offboarding.

The digital euro rulebook will further detail this high-level flow, distinguishing between offboarding of individual and business digital euro end users.

4.3 Lifecycle management processes for end users

Digital euro lifecycle management processes enable end users to interact with the digital euro environment, including (i) accessing or transferring digital euro information and/or funds (ensuring seamless account portability), (ii) adding and removing private money accounts for digital euro funding and defunding purposes, (iii) adjusting digital euro limits and thresholds (e.g. the point at which automatic funding or defunding is triggered) and (iv) accessing the digital euro balance and transaction history.

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[7] This high-level overview assumes that the user's private money account is provided by the same intermediary that is to perform the offboarding. If that is not the case, the process, which will be detailed in the digital euro rulebook, would have to be adjusted.
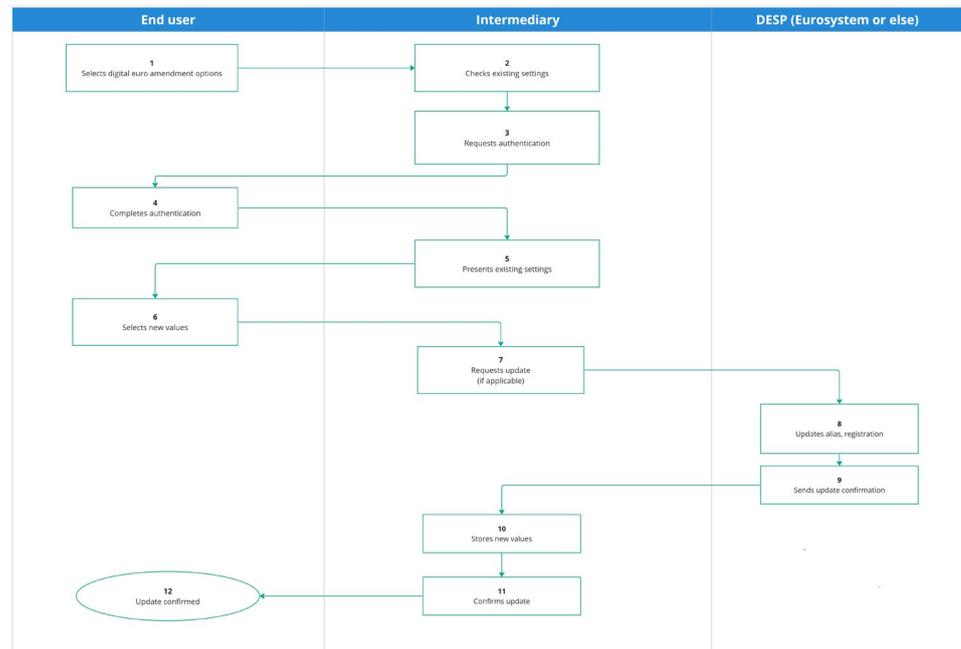
High-level overview of the end-to-end process for digital euro lifecycle management of a user:

1. The user selects an amendment option to make changes to certain terms or conditions associated with their digital euro account and/or payments.

2. The intermediary checks the existing settings related to the amendment option selected by the user.

3. The intermediary requests user authentication.

4. The user completes authentication.

5. The intermediary displays the existing settings related to the amendment option selected by the user.

6. The user specifies the new values for the setting and/or activates or deactivates a setting as applicable.

7. Depending on the amendment option selected by the user, the intermediary can ask the DESP to directly update the user settings in the DESP.

8. If applicable, the DESP updates the user settings.

9. If applicable, the DESP confirms the updates to the intermediary.

10. The intermediary stores the new values as required.

11. The intermediary confirms the updates to the user.

12. The user is informed about the completion of the requested updates.

The digital euro rulebook will further detail this high-level flow, distinguishing between amendments made by individual end users (including alias registration, account linkage, liquidity management setting and notification preferences) and business end users.

Intermediary onboarding

The onboarding of intermediaries enables interactions between intermediaries in the digital euro environment. It includes activities such as assigning intermediary identifiers and roles and granting access to dedicated cash accounts (DCAs).

Figure 8
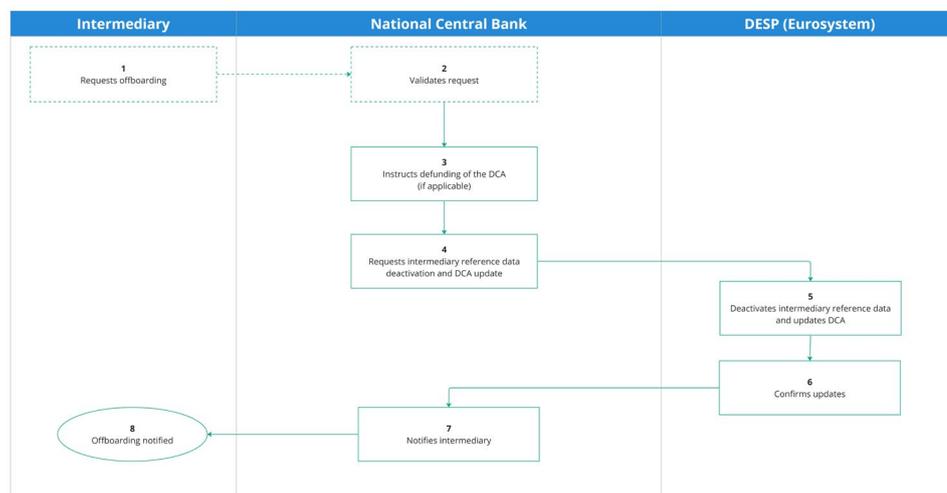High-level process flow for digital euro intermediary onboarding
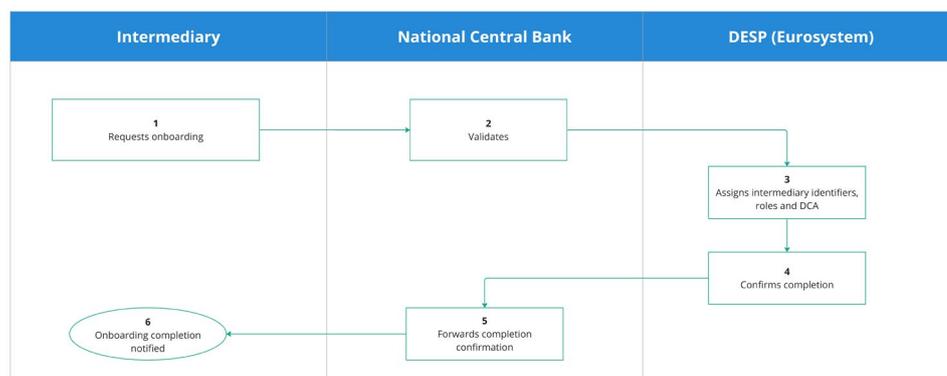
High-level overview of the end-to-end process of digital euro onboarding for intermediaries:

1. The intermediary submits a request to its national central bank (NCB) to be onboarded for digital euro services.

2. The NCB validates the intermediary's onboarding request, checking its eligibility and requesting the DESP to register the intermediary, if applicable.

3. The DESP registers the intermediary, including its applicable roles, unique identifiers and assigned DCAs for digital euro funding and defunding.

4. The DESP confirms the registration to the NCB.

5. The NCB confirms the onboarding to the intermediary.

6. The intermediary is notified of the completion of the onboarding.

Offboarding of an intermediary

Figure 9

High-level process flow for digital euro intermediary offboarding

High-level overview of the end-to-end process of digital euro offboarding for intermediaries:[8]

1. The intermediary submits a request to its NCB to be offboarded from the digital euro scheme.

2. The NCB validates the intermediary's offboarding request.

3. If the intermediary has its own DCA with a remaining positive balance, the NCB instructs its defunding.

4. The NCB asks the DESP to deactivate the intermediary's reference data and update the status of its DCA, if applicable.

5. The DESP deactivates the intermediary's reference data and updates the status of its DCA, if applicable.

6. The DESP confirms the completion of the updates to the NCB.

7. The NCB notifies the intermediary of the completion of the offboarding.

8. The intermediary is informed about the completion of the offboarding.

4.4　Lifecycle management processes for intermediaries

The lifecycle management processes for intermediaries concern any changes that may be required in their digital euro functions, including assigning identifiers and/or

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[8]　This overview assumes that the intermediary requesting the offboarding would no longer have any digital euro users.

roles, recording reference data (e.g. identifiers, addresses, contact details if required) and managing their access to DCAs. These processes are managed and supervised by the NCB responsible for the intermediary.

Figure 10

High-level process flow of the digital euro lifecycle for intermediaries
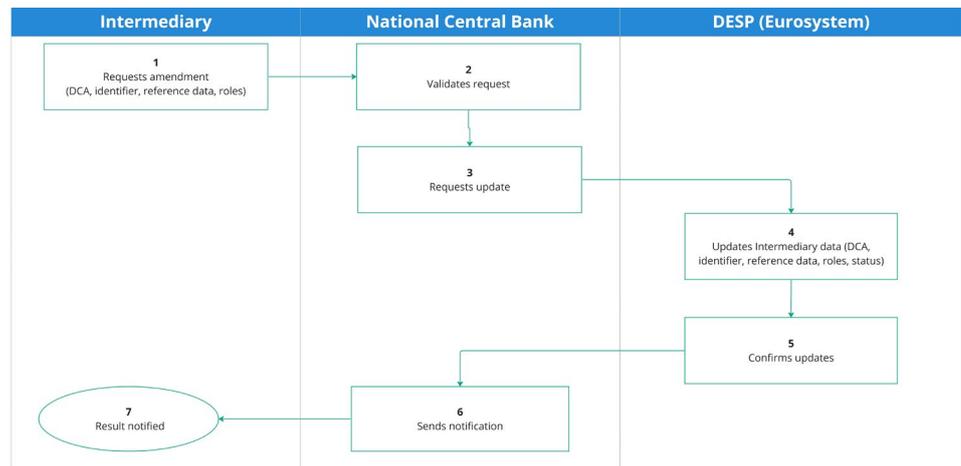
High-level overview of the end-to-end process for digital euro lifecycle management of an intermediary:

1. The intermediary submits a request for an amendment to its NCB to make changes to certain terms or conditions associated with its digital euro account and/or payments, such as a change in its DCA or roles.

2. The NCB validates the intermediary's amendment request.

3. The NCB asks the DESP to update the intermediary's data.

4. The DESP updates the intermediary's data.

5. The DESP confirms the updates to the NCB.

6. The NCB confirms the updates to the intermediary.

7. The intermediary is notified of the completion of the requested amendments.

5   Liquidity management

5.1   Funding

Digital euro funding will be possible via cash (at an ATM or in-branch) or via a private money account. Intermediaries may offer both manual and automated funding. Individual users would also have the option of setting a default balance for their digital euro holdings, which would be funded automatically after any outflow has

occurred. The default balance could not be higher than the holding limit set by the Eurosystem.

Figure 11

High-level process flow of a digital euro funding operation
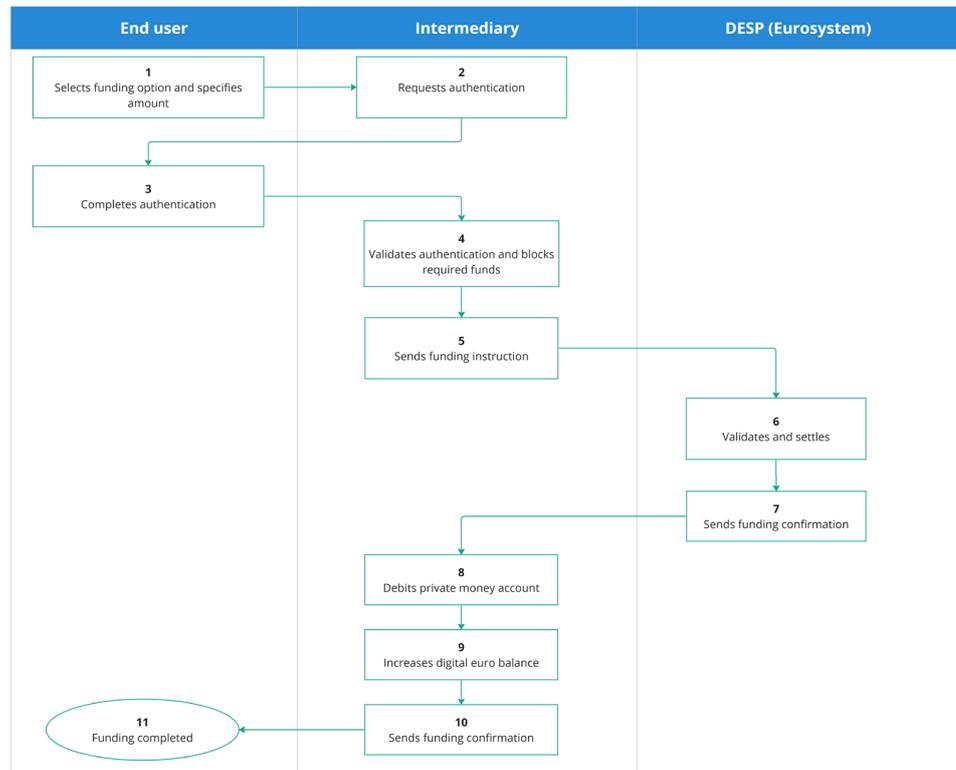
High-level overview of the end-to-end process for digital euro funding:

1.   The user chooses the manual digital euro funding option and specifies the required amount.

2.   The intermediary requests user authentication.

3.   The user completes authentication.

4.   The intermediary validates the funding request and blocks the required funds in the user's private money account.

5.   The intermediary sends the funding instruction to the DESP.

6.   The DESP validates and settles the funding instruction by debiting the intermediary's DCA and issues digital euros for the same amount.

7.   The DESP confirms the completion of the funding operation to the intermediary.

8.   The intermediary debits the funding amount from the user's private money account.

9.   The intermediary increases the balance of the user's digital euro account by the funding amount.

10. The intermediary confirms the completion of the funding operation to the user.

11. The user is informed about the completion of the funding request.

The digital euro rulebook will further detail this high-level flow, including specific flows, such as manual funding from a private money account with the same intermediary.

5.2 Reverse waterfall

The Eurosystem has included a waterfall functionality within the digital euro design, which would allow users to receive payments in digital euro above the holding limit (yet to be defined) by linking their digital euro account to a commercial bank account. A waterfall would be a way of managing an end user's digital euro holdings via the automatic transfer of digital euro in excess of a holding limit to a linked commercial bank account chosen by the end user[9]. Holding limits could also be differentiated by type of user to accommodate the payment needs of citizens (typically on the payer side) and businesses (mainly on the payee side).

The reverse waterfall functionality, which is only possible for online transactions, would allow users to pay in digital euro for purchases even though the digital euro holdings would be less than the transaction value. In this case, as part of the transaction, the digital euro holdings would be funded from their private money account, to allow the transaction to take place. If the user does not have enough funds in their private money account, the payment will not be processed. The settlement of the reverse waterfall process will be fully integrated into the overall digital euro payments settlement.

While the reverse waterfall for the private individuals would be an option to activate, the activation of the reverse waterfall mechanism is mandatory for businesses to ensure compliance with zero holding limits when making digital euro payments (e.g. refunds).

5.3 Defunding

Digital euro defunding will be possible via cash (at an ATM or in-branch) or via a private money account. Intermediaries may offer both manual and automatic defunding. The latter option would be available to individual users where a linked liquidity source, such as a private money account, exists. The user would also be able to customise defunding operations to keep their individual digital euro holdings within their preferred range over time.

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[9] See "waterfall approach" in the digital euro glossary.

Figure 12

High-level process flow of a digital euro defunding operation
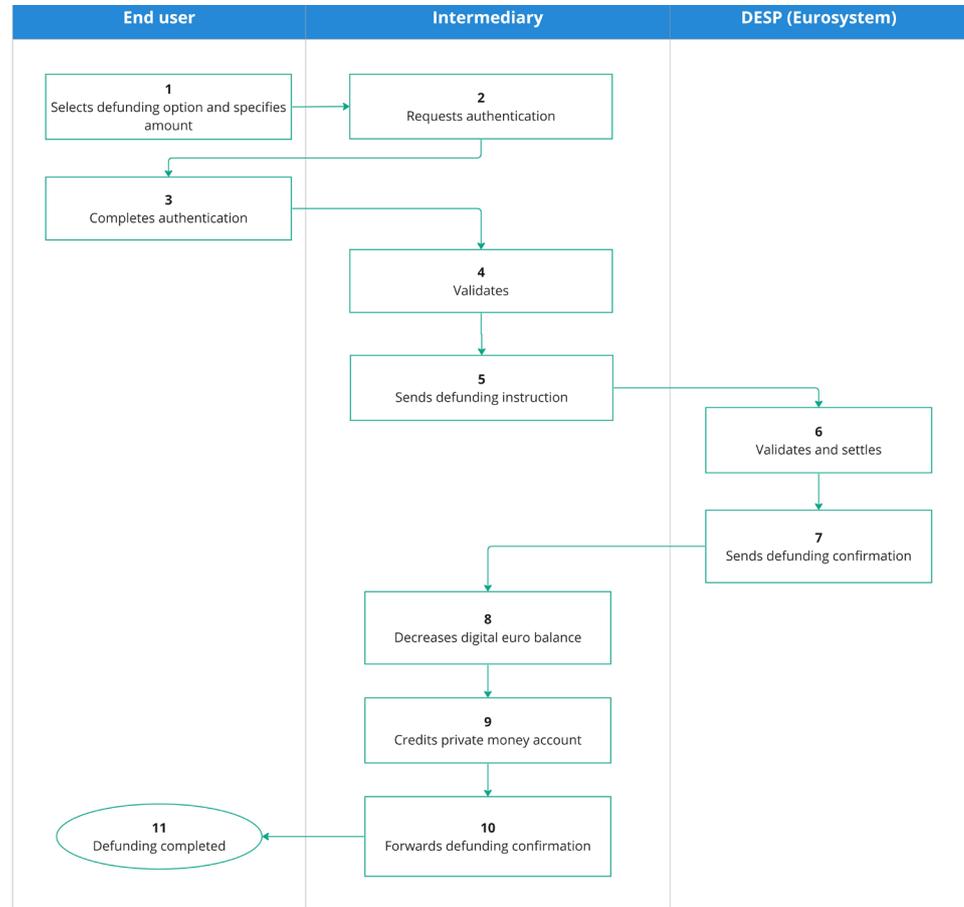
High-level overview of the end-to-end process for digital euro defunding:

1. The individual user selects the defunding option and specifies the amount.[10]

2. The intermediary requests user authentication.

3. The user completes authentication.

4. The intermediary validates the defunding request and checks whether the balance in the digital euro account is sufficient.

5. The intermediary sends the defunding instruction to the DESP.

6. The DESP validates and settles the defunding instruction by redeeming the specified digital euro holdings and crediting the intermediary's DCA for the same amount.

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[10] This example assumes the digital euro user selects a manual defunding option. However, automated defunding would also be possible, based on a periodic fixed amount or a threshold to be decided by the user.

7. The DESP confirms the completion of the defunding operation to the intermediary involved.

8. The intermediary decreases the balance of the user's digital euro account by the defunding amount.

9. The intermediary credits the user's private money account with the defunding amount.

10. The intermediary confirms the completion of the defunding operation to the user.

11. The user is informed about the completion of the defunding request.

The digital euro rulebook will further detail this high-level flow, including specific flows, such as like manual defunding to a private money account with the same intermediary.

5.4 Waterfall

In cases where the digital euro holding limit is reached, individual end users may allow automatic transfers of money to their private money accounts using the waterfall functionality. This mechanism, which is only possible for online transactions, will also allow individuals to set a lower holding cap than the limit defined by the Eurosystem.

The waterfall function is fully integrated into the overall settlement of digital euro transactions. The activation of the waterfall is mandatory for businesses to ensure compliance with zero holding limits when accepting digital euro payments.

6 Transaction management

Digital euro transaction management refers to all elements involved in the process of making and receiving digital euro payments at any time and anywhere in the euro area using various devices and interfaces, such as a physical card or a mobile or wearable device, supporting various data exchange technologies, such as a chip, near field communication (NFC), a quick response (QR) code or possibly an alias, across the prioritised use cases:

- person-to-person (P2P) payments, available online and offline;

- e-commerce payments (including G2X/X2G[11], consecutive and recurring), available online;

- POS payments (including G2X/X2G), available online and offline.

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[11] G2X is "government to person/business", while X2G is "person/business to government".

Digital euro end users will also be able to use digital euros for full or partial payment refunds and will be able to dispute unsuccessful transactions.

Figure 13

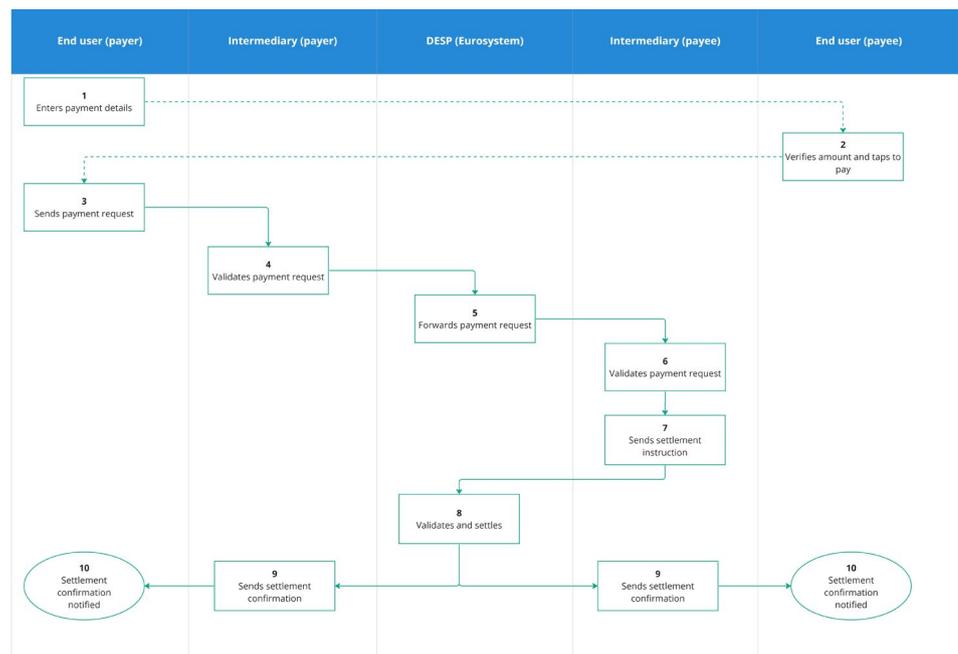High-level process flow of a digital euro payee-initiated transaction
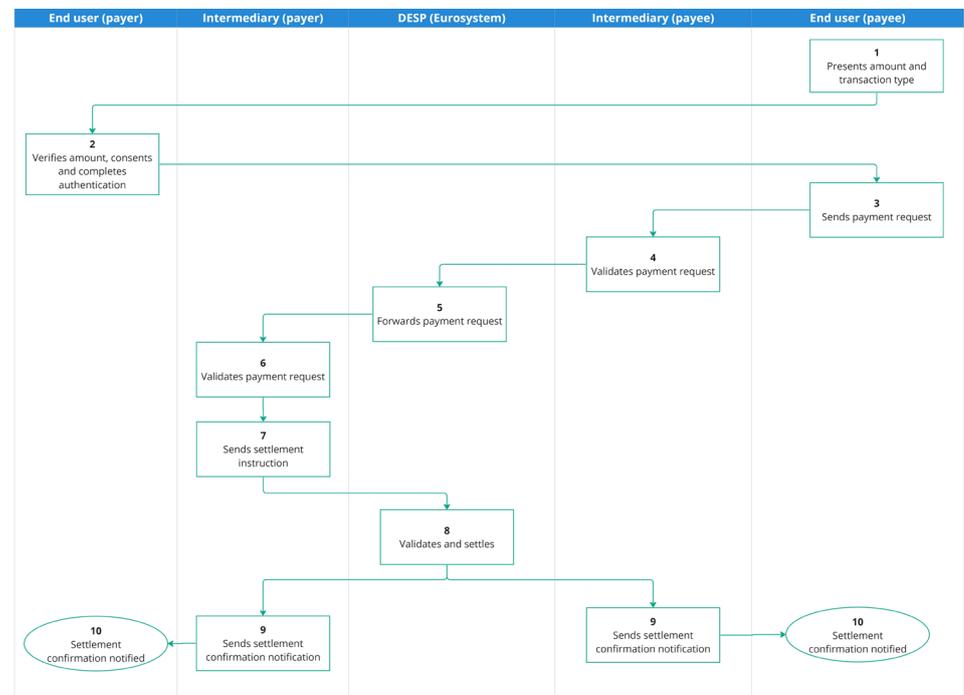
High-level overview of the end-to-end process for a digital euro payee-initiated transaction:

1. The payee presents the amount to be paid to the payer in digital euros.

2. The payer verifies the amount, consents to the payment and completes authentication.

3. The payee submits the digital euro payment request, including the consent details, to its intermediary.

4. The payee's intermediary validates the payment request and sends it to the DESP.

5. The DESP forwards the payment request to the payer's intermediary.

6. The payer's intermediary validates the payment request.

7. The payer's intermediary sends the settlement instruction (including funding instruction if the reverse waterfall is warranted and/or defunding instruction if the waterfall applies) to the DESP.

8. The DESP validates the settlement instruction, settles the transaction and confirms the settlement to both the payer's intermediary and the payee's intermediary.

9. Each intermediary sends a settlement confirmation to its end user.

10. The payer and the payee are notified of the successful settlement of the transaction.

The digital euro rulebook will further detail this high-level flow, including specific flows for certain use cases.

Figure 14

High-level process flow of a digital euro payer-initiated transaction

High-level overview of the end-to-end process for a digital euro payer-initiated transaction:

1. The payer presents the amount to be paid to the payee.

2. The payee verifies the amount, consents and taps to accept the payment.

3. The payer receives the payee's consent and submits the payment request to its intermediary.

4. The payer's intermediary validates the payment request and sends it to the DESP.

5. The DESP forwards the payment request to the payee's intermediary.

6. The payee's intermediary validates the payment request.

7. The payee's intermediary sends the settlement instruction (including funding instruction if the reverse waterfall applies and/or defunding instruction if the waterfall applies) to the DESP.

8. The DESP validates the settlement instruction, settles the transaction and confirms the settlement to both the payer's intermediary and the payee's intermediary.

9. Each intermediary sends a settlement confirmation to its end user.

10. The payer and the payee are notified of the successful settlement of the transaction.

7   High-level architecture and standards

The digital euro rulebook also includes a section on technical scheme requirements, including the foreseen digital euro high-level IT infrastructure, outlining the interplay between digital euro end users, intermediaries, the access gateway (i.e. the selected technology) and the DESP.

Figure 15 depicts the main domains involved in a digital euro and necessary interfaces between them. For further details on the work on interfaces, see the paragraphs below on the technical scheme requirements workstream.

Figure 15

High-level architecture
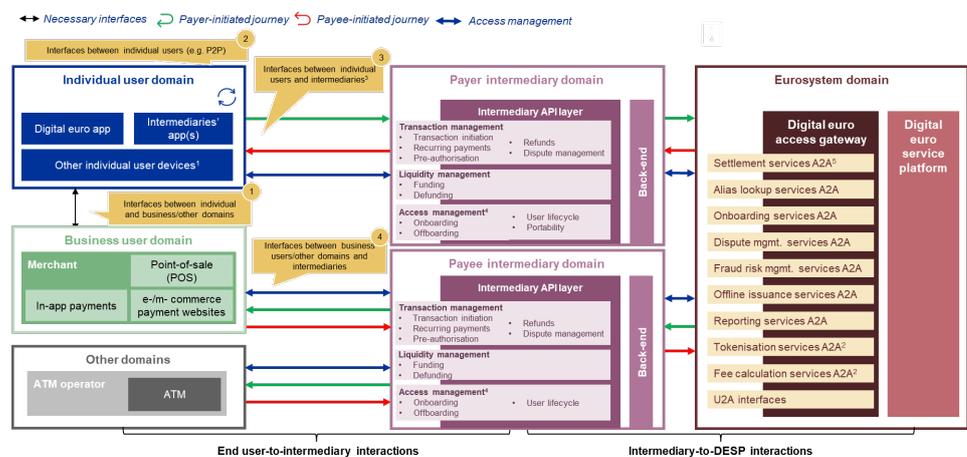
The above architecture identifies various domains that will need to be interfaced for the functioning of a digital euro:

- the individual user domain, containing the devices through which individual users access and use a digital euro (e.g. apps, cards, etc.);

- the business user domain, containing the devices used by businesses to accept digital euro payments (POS terminals, e-/m-commerce payment webpages, in-app payment modules, etc.);

- other domains, including ATMs, for funding/defunding with cash;

- the payer intermediary domain, connected to the individual user domain, other intermediary domains and the Eurosystem domain;

- the payee intermediary domain, connected to the business user domain and other domains (e.g., ATMs), other intermediary domains and the Eurosystem domain;

- the Eurosystem domain, containing the DESP.

In line with the RDG's mandate, in defining the digital euro interfaces the aim is to use existing standards and solutions to the degree possible to smoothen the implementation of a digital euro to the market and facilitate potential interoperability with other payment solutions and other central bank digital currencies, bearing in mind that it must select the most appropriate interfaces for a digital euro.

8 Draft adherence model

Figure 1 outlines the scope of the adherence model covered by the digital euro rulebook and highlights the boundaries with the terms of the contract between the intermediary and the end user (which are not governed by the rulebook but must respect the core provisions of the rulebook). The details of the model will eventually be aligned with the outcome of the digital euro legislation.

Figure 16

Scope of the digital euro rulebook
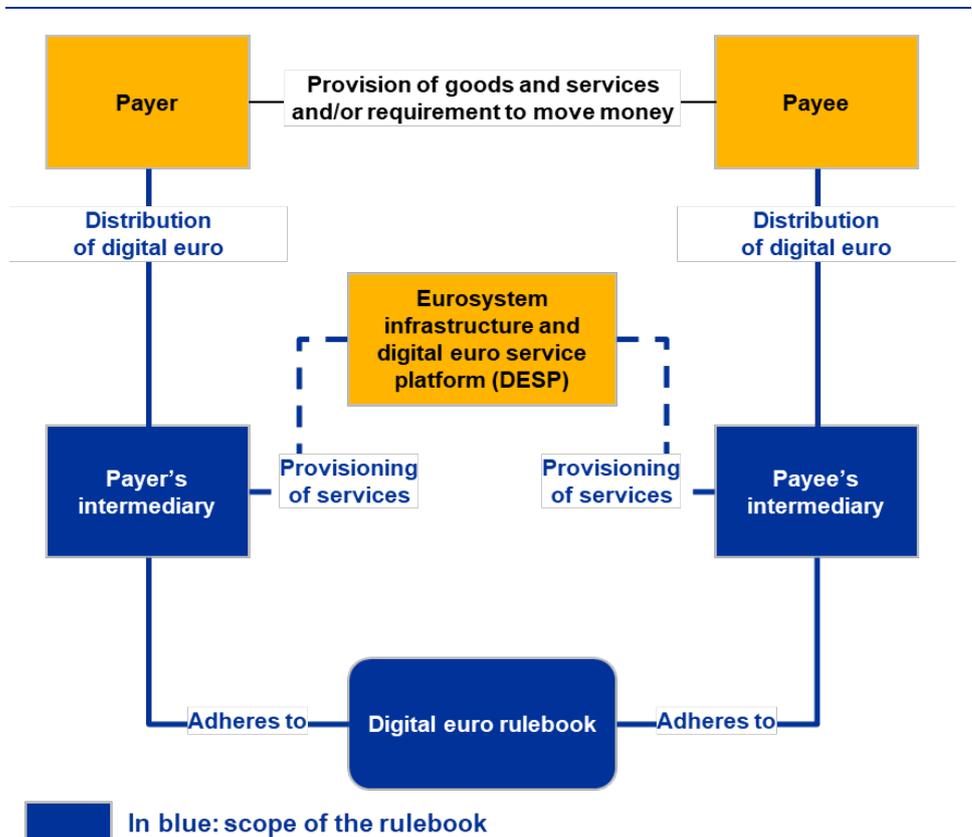
The draft digital euro adherence model– as well as the entire rulebook - would be ultimately aligned with the final digital euro legal act, comprises the guiding principles for participation in the digital euro scheme, which will be ultimately aligned with the final digital euro legislation, and the requirements for scheme participants to ensure reachability and interoperability.

The adherence model also looks into the scheme participants by defining (i) the eligibility criteria, (ii) application and admission process and (iii) outline of the provision and operation of a register of scheme participants. In this regard, the model also outlines the obligations of scheme participants, e.g. as an access, liquidity and/or transaction manager.

In terms of scheme participation, the model details the conditions and circumstances surrounding the termination and/or the suspension of participation in the scheme.

In addition, from a business viewpoint, the digital euro rulebook will also address:

- a set of rules and standards which are binding on all actors who have agreed and been authorised to participate;

- the functioning and limits of the following relationships:

  - payer and payer's intermediary,

  - payee and payee's intermediary;

- a minimum set of data elements to be exchanged by the various actors when performing the functions laid out in the rulebook;

- the various use cases in which a digital euro can be used and with what limitations.

In essence, the digital euro rulebook defines the key functions of the intermediaries, including:

- Access management: onboarding and offboarding of end users into/from the digital euro environment. Onboarding consists of procedures to provide an end user with access to and the ability to use a digital euro account, while offboarding is initiated when an end user ceases to use a digital euro account. Access management also describes the lifecycle management processes enabling end users to interact with the digital euro environment, including the option of digital euro account portability.

- Transaction management: once successfully onboarded an individual should be able to make and receive payments in digital euro at any time and anywhere in the euro area, including:

  - person-to-person (P2P) payments, available online and offline;

- e-commerce payments (including consecutive and recurring payments, and payments to governments initiated on government websites), available online; and

- point-of-sale (POS) payments (including payments to governments at government agencies), available online and offline.

- Liquidity management: end users should be able to fund/defund their digital euro account using cash or a private money/commercial bank account on a 24/7/365 basis either manually or automatically.

- The rulebook will not cover intermediaries' access to and use of the back-end services of the Eurosystem's digital euro service platform (DESP). This will be provided for in the relevant ECB legal act(s) (still to be defined) and contractual arrangements between the intermediaries and the Eurosystem as currently done for other payment services, such as TARGET services.

9 Update on the progress made by dedicated RDG workstreams

RDG members were divided into dedicated workstreams to address specific digital euro topics that require particular expertise, including (i) scheme compatibility, (ii) authentication and identification and (iii) technical scheme requirements. This section outlines the main developments in each workstream.

9.1 Workstream on authentication and identification

This workstream focuses on defining the requirements for the identification and authentication of digital euro end users, aiming to make use of existing practices as much as possible while ensuring the highest standards in terms of digital financial inclusion and user experience.

The introduction of a unique user identifier has been recommended to ensure digital euro holding limits are respected. As a result, the workstream proposed that, when requesting a DEAN from the DESP, intermediaries should have to provide a unique pseudonymised digital euro end user identifier that mirrors the attributes of personal identification data (PID) under the proposed eIDAS2 Regulation[12]. This approach, using a hashing technique, would prevent the Eurosystem from accessing data that could directly identify an end user.

Also, the digital euro end user identifier would take the same form as eIDAS2 PID and may therefore be used in European Digital Identity Wallets, and, conversely, eIDAS2 PID may be used for onboarding to and accessing the digital euro environment, realising the synergies between the two proposals. PSPs will therefore be able create a digital euro personal identifier to allow users to use digital euro

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[12] The second Electronic Identification and Trust Services (eIDAS) Regulation. See Proposal for a Regulation of the European Parliament and of the Council amending Regulation (EU) No 910/2014 as regards establishing a framework for a European Digital Identity, COM(2021) 281 final.

services without having eIDAS2 PID (the user would not be informed about the identifier), respecting the optionality requirement of the proposed Regulation. It is up to each Member State to identify the relevant unique and persistent identifier in conformity with Union law. This approach would also help ensure consistency between the digital euro project and eIDAS and associated initiatives, potentially avoiding duplication of costs and design efforts, as well as avoiding timeline dependencies which could slow down both projects.

Subject to definition of DESP user requirements, DEANs would follow the format to be issued by the Eurosystem, which might look like this: EU + 2 check sum digits + 12 randomised digits (e.g. "EU 12 345678901234").

On the digital euro app, it is proposed that intermediaries would have to conduct end-user authentication using the "invisible embedded" method. This method facilitates a seamless and harmonised user experience, whilst ensuring security of transactions and compliance to relevant regulations, as intermediaries remain in charge of authenticating.

On the intermediary's app or website, user authentication would remain at the intermediary's discretion. Nevertheless, intermediaries would still have to operate within specified guidelines in compliance with the relevant regulations, such as the revised Payment Services Directive (PSD2)[13] and associated regulatory technical standards. In cases where end users make in-app payments (e.g. e-commerce or vendor apps), intermediaries would conduct authentication by redirecting end users either to the digital euro app or to the intermediary's own app.

If an end user is using two different intermediaries, one to access their digital euro account and associated services and another to fund their digital euro account, it is proposed that the intermediary holding the end user's DEAN should conduct the end-user authentication.

For users who do not own a smartphone and/or have disabilities that prevent them from using the usual authentication processes, intermediaries will have to meet specific requirements included in the digital euro rulebook, such as offering payment interfaces that seamlessly accommodate assistive technologies like screen readers and voice recognition software, in line with the provisions of the European Accessibility Act (EEA)[14].

Finally, the digital euro scheme could also allow intermediaries to offer whitelisting services, including the possibility for merchants to create a list of trusted entities or approved reliable sources that would be allowed to perform certain transactions within the digital euro system. Any such functionality, which might be envisaged only

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[13] Directive (EU) 2015/2366 of the European Parliament and of the Council of 25 November 2015 on payment services in the internal market, amending Directives 2002/65/EC, 2009/110/EC and 2013/36/EU and Regulation (EU) No 1093/2010, and repealing Directive 2007/64/EC (OJ L 337, 23.12.2015, p. 35).

[14] Directive (EU) 2019/882 of the European Parliament and of the Council of 17 April 2019 on the accessibility requirements for products and services (OJ L 151, 7.6.2019, p. 70).

for future digital euro releases, should always ensure the highest possible level of protection for end users.

9.2   Workstream on technical scheme requirements

This workstream focuses on developing the technical interfaces in the front-end digital euro space, including the end user's and intermediary's respective devices, and the digital euro non-functional standards and requirements.

Since its launch, the workstream has:

- identified possible digital euro technical standards related to: (i) connectivity (between intermediaries and end users), (ii) security (encryption of data), (iii) data and systems integrity (e.g. transaction recovery capabilities, anti-replay capabilities, etc.) and (iv) non-functional requirements (see examples below);

- proposed a high-level architecture[15] for the digital euro which identifies four key categories of digital euro interface across all digital euro domains;[16]

- recommended ways to identify and authenticate specific technical components (ATMs, POS terminals, etc.) as well as non-functional requirements such as availability, reliability, performance, scheme compatibility, maintainability and integrity.

Currently, this workstream is focusing on developing a "menu" of APIs for the digital euro in the front-end space, meaning the set of interfaces that intermediaries will need to make available to end-user devices.

9.3   Workstream on scheme compatibility

This workstream is focused on making the digital euro scheme compatible with existing functional standards and specifications (such as those listed below) as well as with other schemes and payment infrastructures. It has prioritised further investigating the following front-end standards related to core digital euro services.

EPC standards

Applicable to QR, pay-by-link and alias use cases, European Payments Council (EPC) standards are widespread and well-established in Europe. The EPC plays a significant role in shaping the technical specifications and communication standards that underpin SEPA payments. SEPA Proxy Lookup (EPC250-18), SEPA Request-

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[15]   See Figure 15.

[16]   These categories are (i) between individual users and intermediary domains; (ii) between individual users themselves; (iii) between individual users and business user domains; and (iv) between business users and intermediary domains. The workstream proposed using application programming interfaces (APIs) to match the proposed digital euro high-level architecture with the interactions foreseen in the end-to-end flows of the digital euro. See also the section 3 on the digital euro operational model.

To-Pay (EPC014-20), SEPA Instant Credit Transfer (EPC004-16 2023) and EPC QR code standards (EPC_ISO_QR_193) provide guidelines for data exchange for proxy-based payments, payment initiation, instant credit transfers and QR code standardisation.

ECPC (CPACE)

Applicable to contactless card and NFC use cases, the CPACE standard for the level 2 kernel, overseen by the European Card Payment Cooperation (ECPC), is designed to make European card issuers independent of existing proprietary contactless level 2 kernels. This European standard has been rolled out in countries such as Germany, France and Portugal. Predicated on EMVCo foundations, particularly EMV books and level 1 kernel information, CPACE provides its licensing free of charge. The licensing of this standard could provide further flexibility to adapt the standard to digital euro needs.

NEXO standards

Applicable to balance update, reconciliation and ATM use cases, NEXO standards (e.g., CAPE) offer a comprehensive structure for card payment messages in Europe, particularly for ATM interactions with intermediaries serving merchants (e.g., acquirers). It is based on ISO 20022 for data structures. Considering that the acquiring side of the market can be fragmented (especially with regard to communication between terminals and merchants and between merchants and acquirers), this standard would provide homogeneity.

EMV specifications

Applicable to contactless card and NFC use cases, the globally accepted EMV specifications are governed by EMVCo. These standards offer guidelines on NFC payments and interactions between different EMV platforms.

NextGenMobileP2P

Applicable to the alias use case, the NextGenMobileP2P standard, which is specific to Europe, focuses on providing a framework for mobile P2P schemes. Developed by the Berlin Group, a European payments industry association, in alignment with the EPC SEPA Proxy Lookup service, NextGenMobileP2P aims to streamline transaction initiation across Europe and could be used as a communication standard for alias payments

OpenFinance API

Applicable to pay-by-link, balance inquiry and reconciliation use cases, the Berlin Group's openFinance API, which is primarily used in Europe, is aimed at enhancing credit transfer mechanisms and introducing innovative payment/credit services. The openFinance API is based on the NextGenPSD2 framework.

OpenFinance API is one option to standardise some recent non-traditional payment methods, such as paying by link and aliases.

ISO standards

Applicable to QR code, alias, pay-by-link, balance update and reconciliation use cases, International Organization for Standardization (ISO) standards like ISO 17442, ISO 24366, ISO 20022, ISO 18245 and ISO 9564 have a global reach. These standards encompass a wide range of subjects, from financial messaging to PIN security, playing a pivotal role in reference data, information exchange and security.

ISO standards provide a framework for quality management and process improvement, leading to consistent and reliable products and services. They are recognised and accepted internationally. Standards like ISO 20022 enable interoperability and compatibility among systems, promoting seamless communication and integration.

As a next step, discussions between the relevant standardisation bodies and the Eurosystem would need to take place to further assess the implications of reusing any existing standards for the digital euro.

10   Next steps

As a next step the RDG members – representing consumers, retailers and intermediaries – will execute an interim review of the first parts of the rulebook that have now been drafted in the first quarter of 2024. Over the past months, RDG members have been involved in drafting the different chapters of the first draft version of the rulebook. The draft version as it currently stands has been shared with RDG members for an interim review in the first quarter of 2024. This process will be an opportunity for all stakeholders involved to thoroughly review the current draft rulebook in its entirety. Based on the feedback received as part of this review, the group will consider adjustments to the draft rulebook as required.

The draft rulebook will be completed with additional chapters and finalised over the course of the digital euro preparation phase. As of January 2024, the RDG will focus on preparing an updated draft of the digital euro rulebook, including new sections on (i) user experience minimum requirements, (ii) branding and communication standards, (iii) certification, (iv) testing and approval procedures, (v) internal rules, (vi) risk management and (vii) interoperability and implementation specifications.