



EUROPEAN CENTRAL BANK

EUROSYSTEM

FULL-DLT INTEROPERABILITY solution (Banque de France)

Focus Session
Potential use of ntwCeBM

15 December 2023




BANQUE DE FRANCE
EUROSYSTEMÈME



EUROPEAN CENTRAL BANK

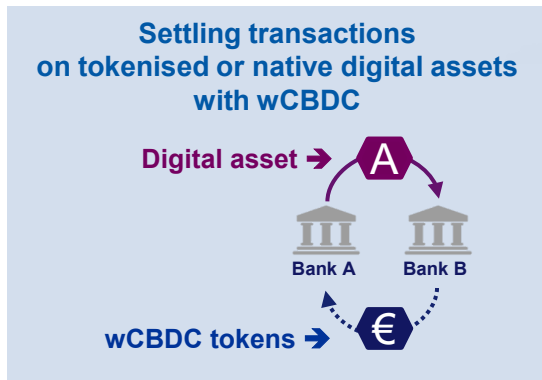
EUROSYSTEM

Full DLT Interoperability solution

AGENDA

- FULL-DLT INTEROPERABILITY solution:
How would it work if implemented?
 - The experiments leading to FULL-DLT solution
 - How it would work if implemented?
 - The FULL-DLT INTEROPERABILITY solution in implementation view
- FULL-DLT INTEROPERABILITY solution:
Set up for exploratory work

A large scope of 12 experiments leading to the FULL-DLT solution



LEGEND

Public DLT Private/Permissioned DLT

FULL-DLT solution tested:

INTEROPERABILITY DISTRIBUTION INTEGRATION

USE CASE 1 – SECURITY : ENSURING DVP IN WCBDC OF FINANCIAL INSTRUMENTS IN A TOKENISED WORLD

1	2	3
IZNES	FORGE SOCIETE GENERALE GROUP	SEBA
UCITS^(*)	Supranational bonds	Listed security delivered in T2S
	European Investment Bank	
4	5	6
Sovereign bonds	SME shares	Digital bond issuance
AGENCE FRANCE TRÉSOR	LiquidShare	Banque Centrale du Luxembourg, European Investment Bank
		Santander, Goldman Sachs, SOCIETE GENERALE

USE CASE 2 – NON-EURO CURRENCY: CROSS-CURRENCY TRANSACTIONS

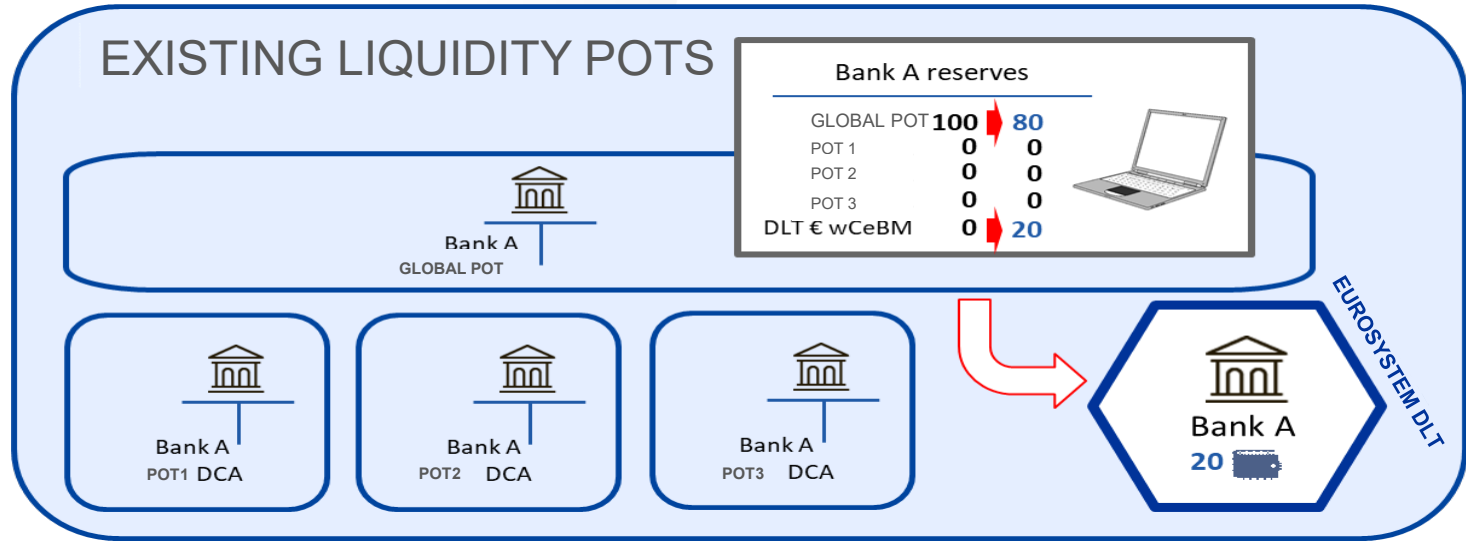
7	8	9
MAS	HSBC	JURA
Cross-currency payments	Cross-currency payments	Cross-currency payments and cross-border settlements
		SNB BNS, BIS Innovation Hub, accenture
10	11	12
Prosperus	MARIANA	Swift
Remittances	Automated Market Makers	Cross-chain and cross-currency payments
Banque Centrale de Tunisie, Central Bank of Tunisia	BIS Innovation Hub, MAS, SNB BNS	HSBC, DTCC, SWIFT, INTERCOM, SIX MELLON

(*) Undertakings for the Collective Investment in Transferable Securities

See further details:

- In Appendix
- In last [BdF report \(17 July 2023\)](#)

Forward-looking view of a FULL-DLT INTEROPERABILITY solution if implemented*



1

The Eurosystem DLT would be an additional service offered by the Eurosystem

2

Wholesale Central Bank Money (wCeBM) available on the Eurosystem DLT would be a direct liability to the Eurosystem (equivalent of balances in their central bank cash account)

3

The Eurosystem would ensure seamless liquidity management between existing liquidity pots and the new Eurosystem DLT liquidity pot

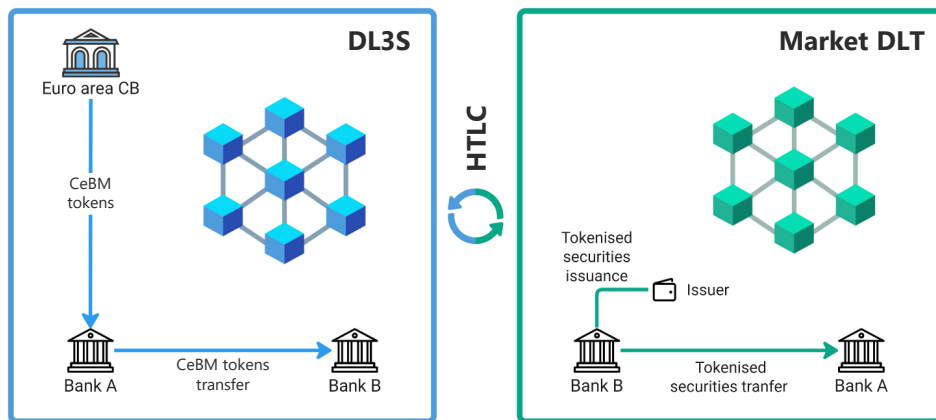
4

wCeBM Settlement on the Eurosystem DLT would be final and irrevocable

FULL-DLT INTEROPERABILITY MODEL: Settlement in implementation view

OBJECTIVE

- Enabling settlement between distinct DLTs:
 - One being the Banque de France DL3S DLT platform on which CeBM would be issued and used for settlement and
 - The other(s) being DLT(s) set up by the private sector (e.g. market DLT) or by other jurisdictions outside the euro area
 - **With both cash and securities available in the form of tokens**



MAIN CHARACTERISTICS

- Market participants can hold Wholesale Central Bank Money (wCeBM) in the form of tokens on DL3S
- A DvP/PvP occurs on two DLT platforms, the DL3S and an external or market DLT:
 - On DL3S, the settlement in wholesale Central Bank Money occurs with transfer of wCeBM tokens
 - The digital asset leg is settled on an external DLT platform operated by a third party
 - Relying on a mechanism such as HTLC for atomic settlement



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Full DLT Interoperability solution

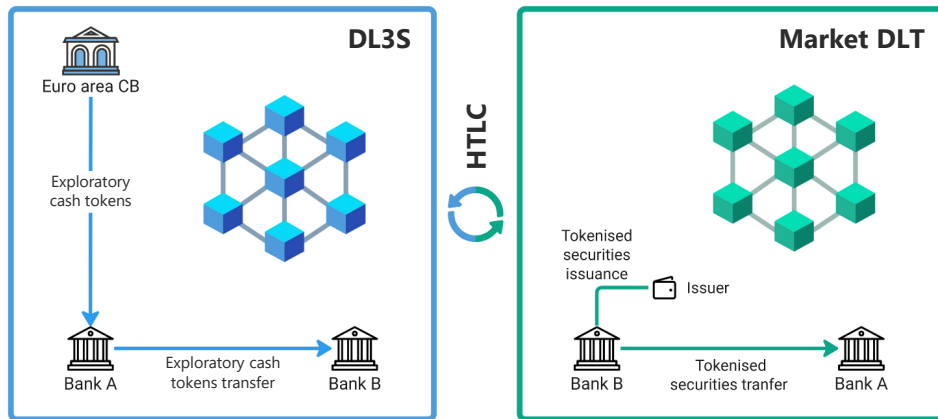
AGENDA

- FULL-DLT solutions: How would it work if implemented?
- FULL-DLT INTEROPERABILITY solution: Set up for exploratory work
 - Set-up for exploratory work
 - Actors on the DL3S Cash DLT
 - Solution features and technology
 - Atomic Settlement: HTLC protocol description
 - How to participate in the FULL-DLT INTEROPERABILITY solution?

FULL-DLT INTEROPERABILITY MODEL: Set-up for exploratory work

Objective

- Enabling settlement between distinct DLTs:
 - One being the Eurosystem DLT on which CeBM would be issued and used for settlement and
 - The other(s) being DLT(s) set up by the private sector (e.g. market DLT) or by other jurisdictions outside the euro area
 - **With both cash and securities available in the form of tokens**

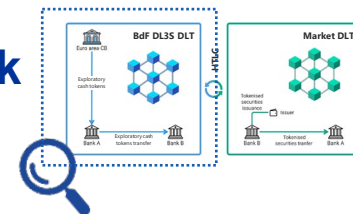


MAIN CHARACTERISTICS

- For the purpose of exploratory work:
 - **EXPLORATORY CASH TOKENS (ECT)** as proxy for wholesale Central Bank Money (wCeBM) on DLT
 - **DL3S** as proxy for a Eurosystem DLT

FULL-DLT INTEROPERABILITY MODEL: Set-up for exploratory work

Actors on the DL3S DLT platform



PAYMENT BANKS



- Has a **RTGS account** in TARGET
- **Holds and transfers Exploratory Cash Tokens (ECT)** in a Dedicated Cash Wallet (DCW) managed by its NCB under its own name on the Cash DLT platform (DL3S)
- **Creates and manages Dedicated Cash Wallets** for the usage of its customers
- Holds and transfers customers' Exploratory Cash Tokens
- Consults its customers and **owns cash wallets' balance and transactions history**
- In charge of the **Hash Timed Locked Contracts (HTLC)** for its managed Dedicated Cash Wallets (i.e. clients' sub-wallets) for movements intra Cash DLT platform (DL3S) and with Market DLTs.

CENTRAL BANKS



- **Mint and burn the Exploratory Cash Tokens (ECT)**
- Can be either the NCB of the financial institution or Banque de France as solution provider

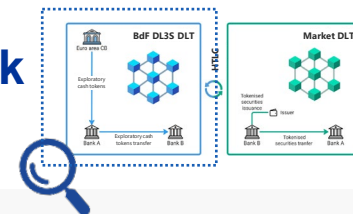
CLIENTS OF PAYMENT BANKS (OPTIONAL)



- Has an exclusive usage of a cash wallet (also called **"sub-wallet"**) owned by its payment bank
- Sub-wallets use the RTGS account of the Payment Bank's wallet
- Has a **read-only access** to its purchasing power

FULL-DLT INTEROPERABILITY MODEL: Set-up for exploratory work

Solution features and technology

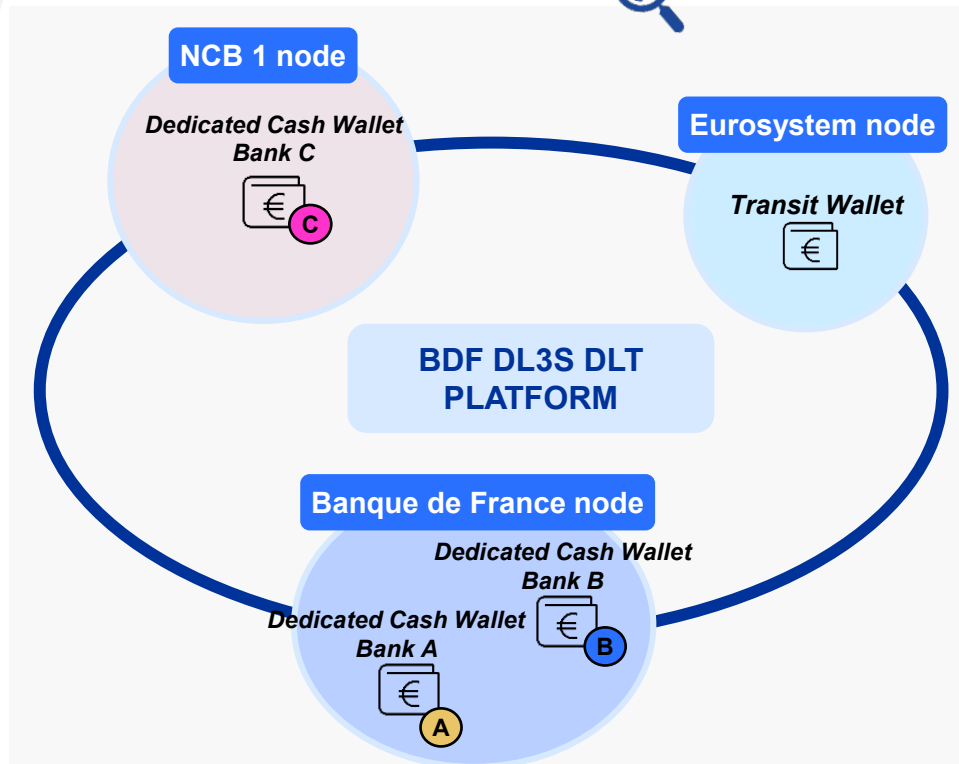


The DL3S DLT is using Hyperledger Fabric:

- Representing digitally a business network
- On a **permissioned network**
- A **node** represents an organisation:
 - Authorised to join the network (onboarding)
 - With a role (granted to access to data and usage of function)
 - All nodes share a unique and distributed ledger

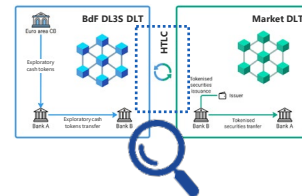
Commercial banks and participating NCBs nodes are **hosted on the Banque de France's cloud**.

- Provision of a specific and own NCB instance in the BDF cloud
- Access to the Virtual Machine for NCB
- BDF handles the deployment

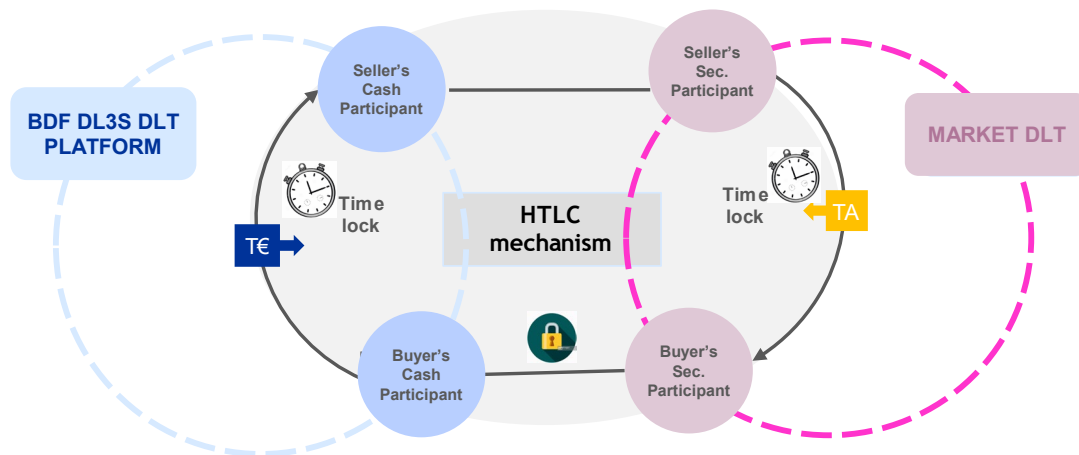


FULL-DLT INTEROPERABILITY MODEL: Set-up for exploratory work

Atomic settlement with HTLC protocol



- HTLC are time-bound conditional payments cross networks that do not require a trusted third party.
- Seller and Buyer have their corresponding Cash and Securities participants involved in the networks.
- Securities and Cash (in the form of ECT) are settled on an **“all-or-none”** basis:
 - Cash is paid and securities are delivered under a time lock process
 - Should the settlement of any resource fail, the whole DvP will be unsettled
 - No delivery without ECT cash payment
 - No ECT cash payment without securities delivery
- Should the DvP fail for any other cause, a pre-agreed contingency procedure shall intervene
- DvP instruction is initiated by the Market DLT based on trade information that are legally binding.



FULL-DLT INTEROPERABILITY MODEL: Set-up for exploratory work

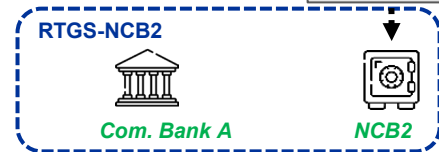
How to participate in exploratory work?

STEP 2: NCBs onboard their participating commercial banks as RTGS participants

RTGS component of TARGET Services

STEP 1:

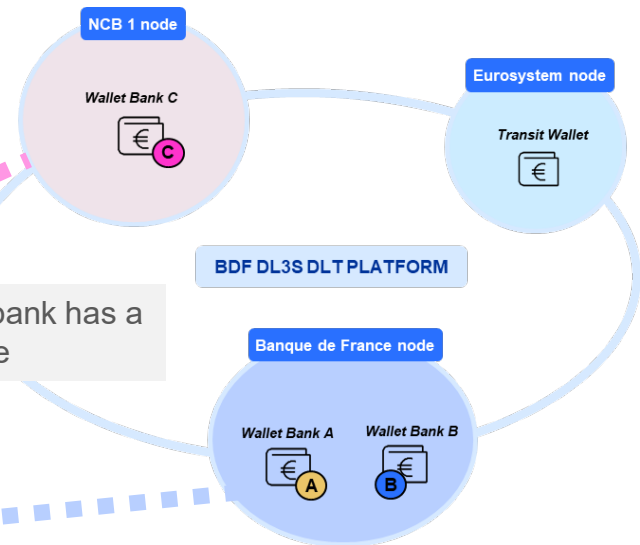
Commercial Banks contact their local NCB



Information flow

STEP 3: Commercial bank has a wallet on NCB 1's node

STEP 3 BIS: Or, if NCB 2 does not have a node on the DL3S DLT, the commercial bank has a Dedicated Cash Wallet on the BdF node*



*Commercial Bank A maintains its relationship with NCB 2 and relies on NCB 2 for the escrow mechanism in the RTGS

NEXT

2. Demo session



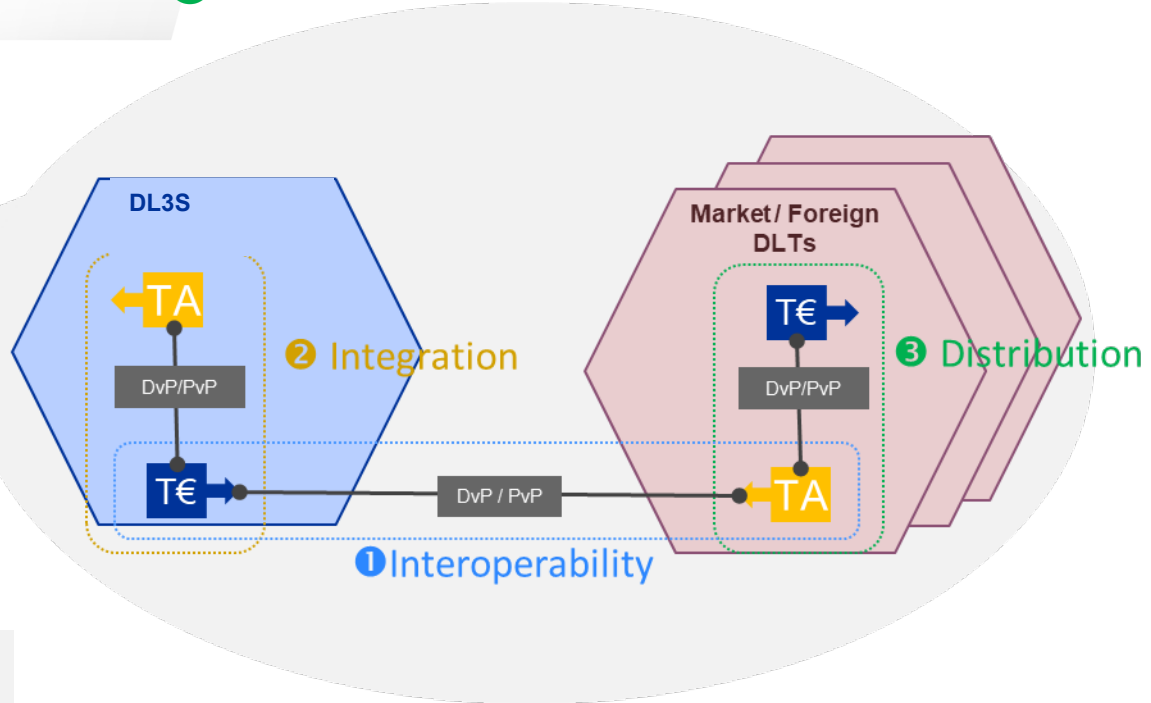
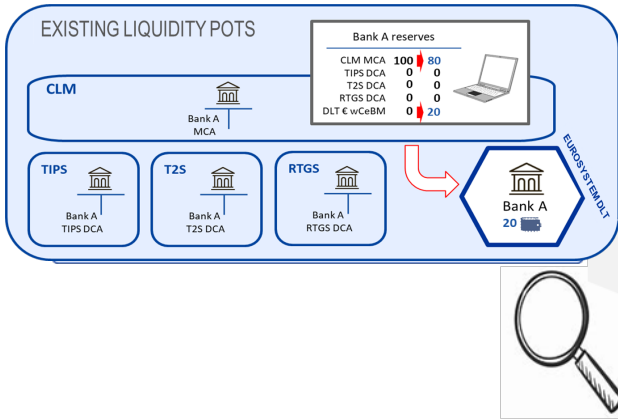
3.



[Contact at : monnaie-innovation@banque-france.fr](mailto:monnaie-innovation@banque-france.fr)

Annex: The 3 FULL-DLT solutions

- 1 FULL-DLT INTEROPERABILITY
- 2 FULL-DLT INTEGRATION
- 3 FULL-DLT DISTRIBUTION



Legend

← TA Tokenised asset

T€ → Token of € wholesale central bank money