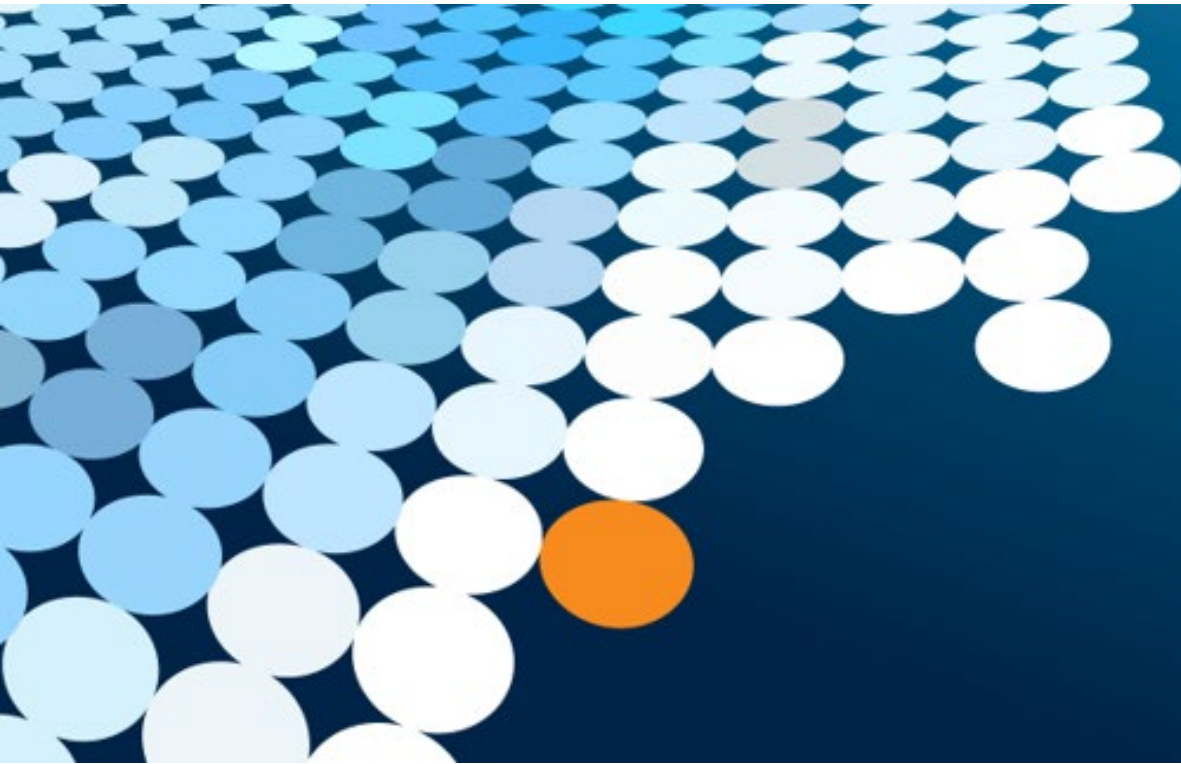


# **NYIC research discussion**

## ***Foreign Exchange Committee***

**September 2024**



FEDERAL RESERVE BANK of NEW YORK

# Disclaimer

The role of the New York Innovation Center (NYIC) is limited to technical experimentation and research.

The NYIC's participation in research projects is not intended to advance any specific policy outcome, nor to signal that the Federal Reserve will make any imminent decisions about the appropriateness or design of tokenized central bank deposits or wholesale central bank digital currency (wCBDC).

The NYIC does not take a view on anything in its reports that is beyond the scope of its limited role, including regarding any potential regulatory or supervisory frameworks. The NYIC's participation is not intended to advance any specific policy outcome, nor to signal that the Federal Reserve will make any imminent decisions about the appropriateness or design of tokenized central bank deposits or wCBDC.

<https://www.newyorkfed.org/aboutthefed/nyic>

# 1

## NYIC overview

# NYIC Mission

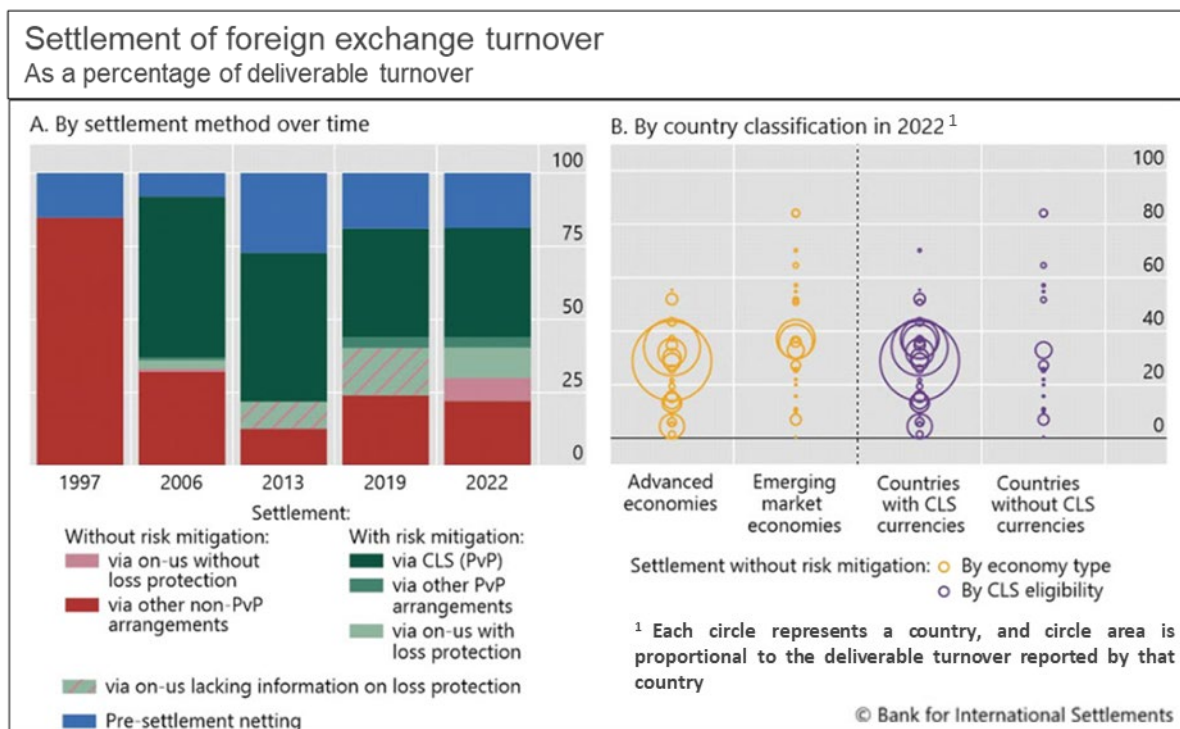
The New York Innovation Center (NYIC) bridges the worlds of finance, technology, and innovation.

The NYIC conducts research, analysis, and technical experimentation to generate insights into **high-value central banking-related opportunities aimed at enhancing the functioning of the global financial system.**

For more information: [New York Innovation Center - FEDERAL RESERVE BANK of NEW YORK.](#)

# Problem Space

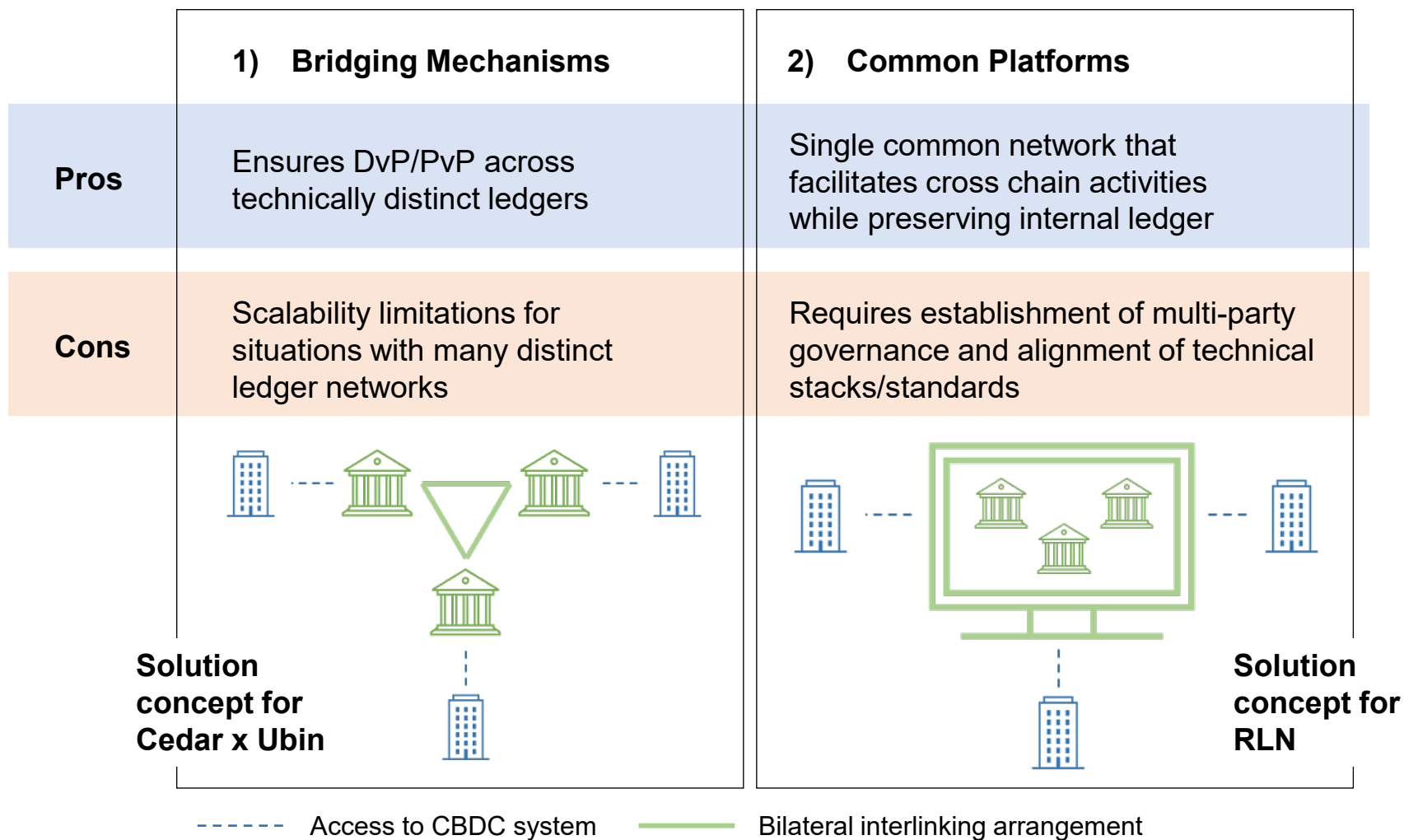
The FX market is the largest financial market in the world, with a daily turnover of \$7.5 trillion in 2022. The United States dollar remains the dominant currency, being on one side of 88% of all trades, but emerging market economies (EME) currencies are gaining market share, reaching 26% of global turnover in 2022. The proportion of deliverable FX trades that are not settled using Payment versus Payment (PvP) has likely increased since the early 2010s, primarily due to growth in EME currencies. According to 2022 BIS estimates, nearly a third of deliverable FX turnover, approximately a daily average of **\$2.2 trillion**, may settle without PvP protection and therefore be subject to settlement risk. Market participants could suffer substantial losses if settlement risk materialized, and large losses could have systemic consequences.



Source: CPMI: [Facilitating Increased Adoption of Payment vs Payment \(March 2023\)](#); BIS: [FX Settlement Risk: An Unsettled Issue \(December 2022\)](#)

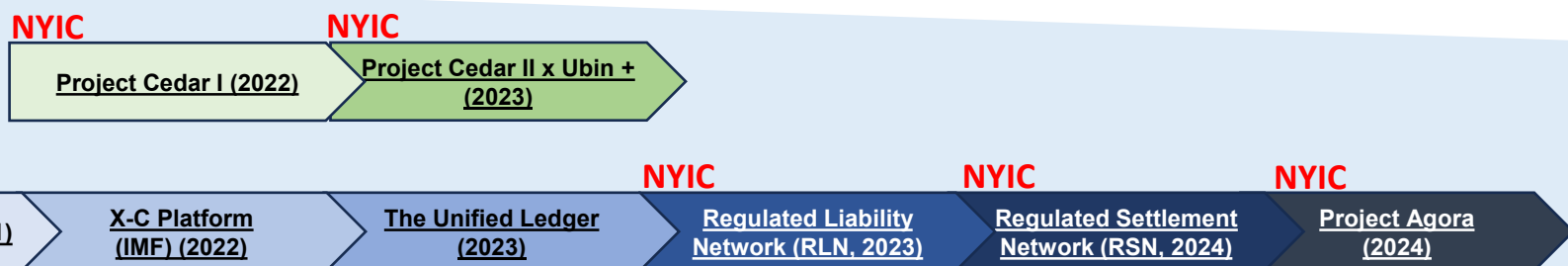
# Solution Concept Development

Technical solutions for interoperability primarily take two forms:



# Research progression

*NYIC research validates the potential to deliver new value propositions anchored in central bank related problems and opportunities contained in specific use cases. Research progresses through validating increasing levels of fidelity of technologies, designs, architectures and requirements considering technical, operational, business and legal issues.*



***RSN and Project Agora** contribute to this growing research domain by uniting the Unified Ledger and RLN concepts that envisions a next-generation FMI operating in accordance with the established Principles for FMIs. This FMI would be a multi-jurisdictional, multi-currency, multi-party system.*

2

# Project Cedar



# Cedar II x Ubin+ Overview

## Overview

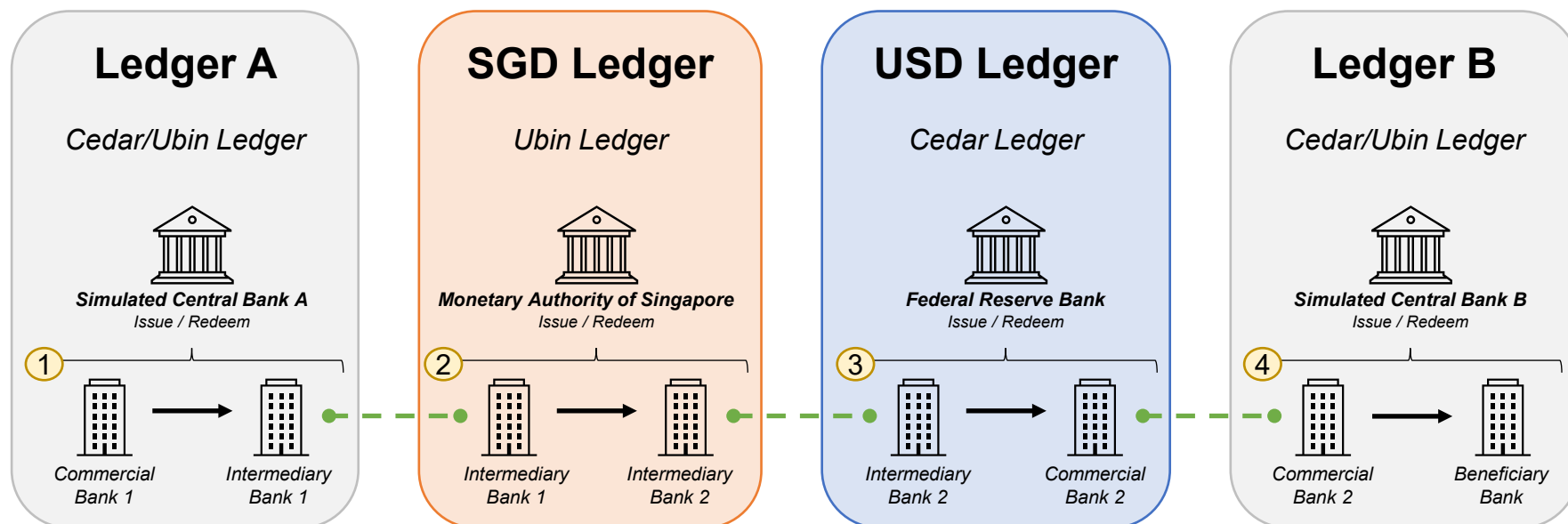
- Memorandum of Understanding (MOU) with the **Monetary Authority of Singapore (MAS)** to conduct research.
- Partnering with the MAS in Phase II to examine how blockchain technology can support Cross-Border Cross Currency Payments. The Phase II use-case examines how blockchain technology can **support illiquid currency corridors including the usage of a "vehicle" currency**.
- Current payment infrastructure provides limited capabilities to connect **longer chain atomic transactions** (e.g., Payment-versus-Payment-versus-Payment)
- Central Banks may choose a diverse set of platforms and technology stacks which requires **ensuring interoperability** with any USD wCBDC platform

## Key Objectives and Research Topics

1. **Continue testing of Cedar Ledger technology:** Continue testing the custom-made ledger solution against a) the NYIC and use-case business requirements and; b) benchmark performance of other industry solutions.
2. **Expand Interoperability:** Connect the Cedar prototype to the MAS wCBDC Ubin+ blockchain platform to execute a simulated cross-border cross-currency payment across different blockchains, with the benefits of blockchain (e.g., atomicity).
3. **Optimize and Enhance:** Continue to add features and functionality to the Cedar prototype. This may include further defined access and entitlements, additional monitoring capabilities, and enhancing resiliency.
4. **Design:** Benchmark and validate various technical design choices (e.g., UTXO vs Account-Based, Consensus, Single vs. Multi-CBDC platform).
5. **Data on Ledger:** Assess what data elements are required to conduct a cross-border cross-currency payments and where to manage within the technology stack.

# Use Case

**The Phase 2 use case is a cross-border cross-currency payment;** a simulated commercial bank in Country A is making a payment to a simulated commercial bank in that wants to be paid out in the currency of Country B. To support a cost-efficient payment, vehicle currencies are used (e.g., SGD and USD) via the **Monetary Authority of Singapore** and **Federal Reserve Bank of New York**. Intermediary banks enable the transaction through their access to wCBDC in multiple countries.



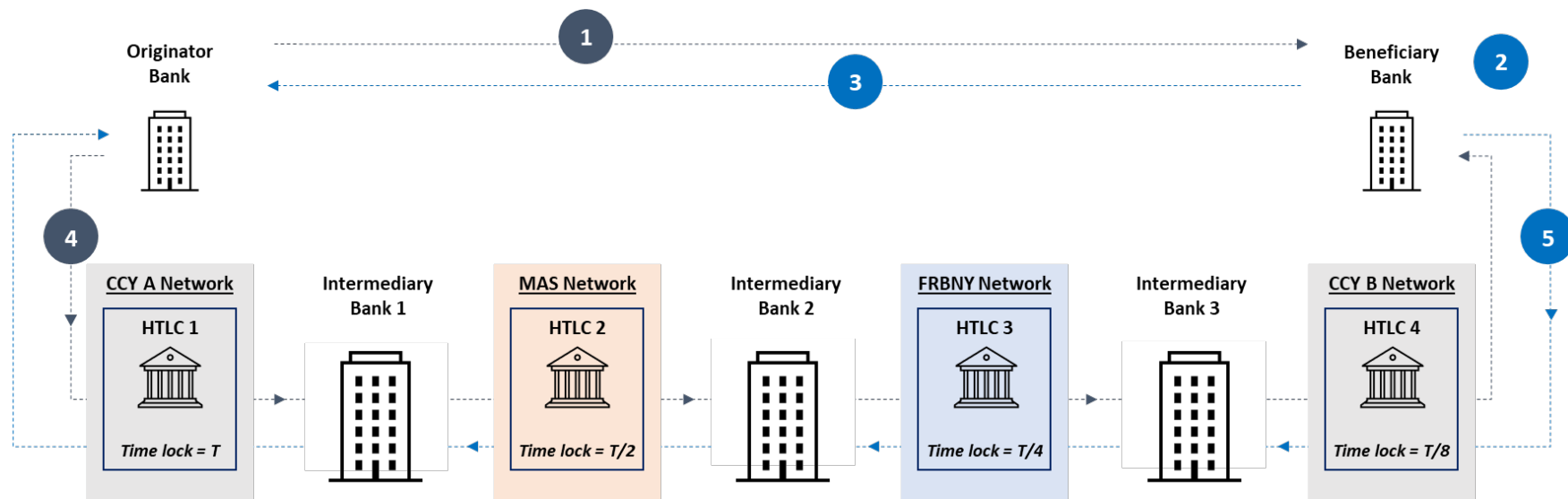
- This use case simulates an environment in which **different central banks transfer wCBDC on a ledger technology of their choice**.
- Each central bank **defines their own currency ledger requirements**, maintained on their own currency ledger.
- Use-case is flexible to testing different scenarios (e.g., using one vehicle currency instead of two)

→ Domestic wCBDC transfer

●- - - ● Cross-ledger wCBDC

# Solution Concept Detail

Project Cedar II x Ubin employs a more complex version of the Project Cedar Phase 1 solution, Hash Timelock Contracts (HTLCs).



- 1) Requests hash of secret  $H(S)$
- 2) Generates secret  $S$  and creates Hash  $H(S)$
- 3) Acknowledges with generated  $H(S)$
- 4) Sends hash  $H(S)$
- 5) Sends secret ( $S$ ) and redeems funds in HTLC

# Primary Findings

## Interoperability

HTLCs **successfully bridged differing underlying DLT systems**. All test scenarios were successfully load tested across the Cedar and Ubin+ stacks.

## Atomic Settlement

The tests demonstrated synchronous settlement for the end-to-end payment across multiple transaction legs through HTLCs and DLT-based ledgers.

- Under the single vehicle currency scenario, all trades settled atomically for all transaction legs across the Cedar II and Ubin+ stack with an average of **6.48 payments per seconds** and settling a peak of **47 payments per second**.
- End-to-end **payments were completed without the need for a central party to discharge obligations** for the transacting parties, and without the need for any participants to have access to all ledgers.

## Instantaneous Settlement

All tested scenarios satisfied the condition of average end-to-end **payment latency of fewer than 60 seconds**.

- In the most complex scenario, which employed three vehicle currencies, the Project Cedar Phase II x Ubin+ solution design achieved an **average end-to-end payment latency of 17 seconds**.

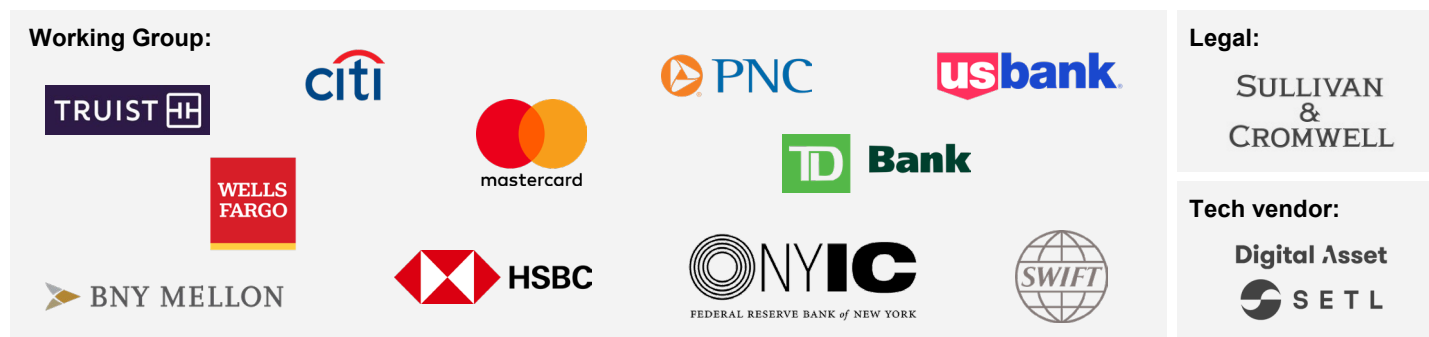
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# Regulated Liability Network

# RLN Overview

The RLN concept envisions a theoretical market infrastructure to efficiently and safely exchange and settle tokenized liabilities.

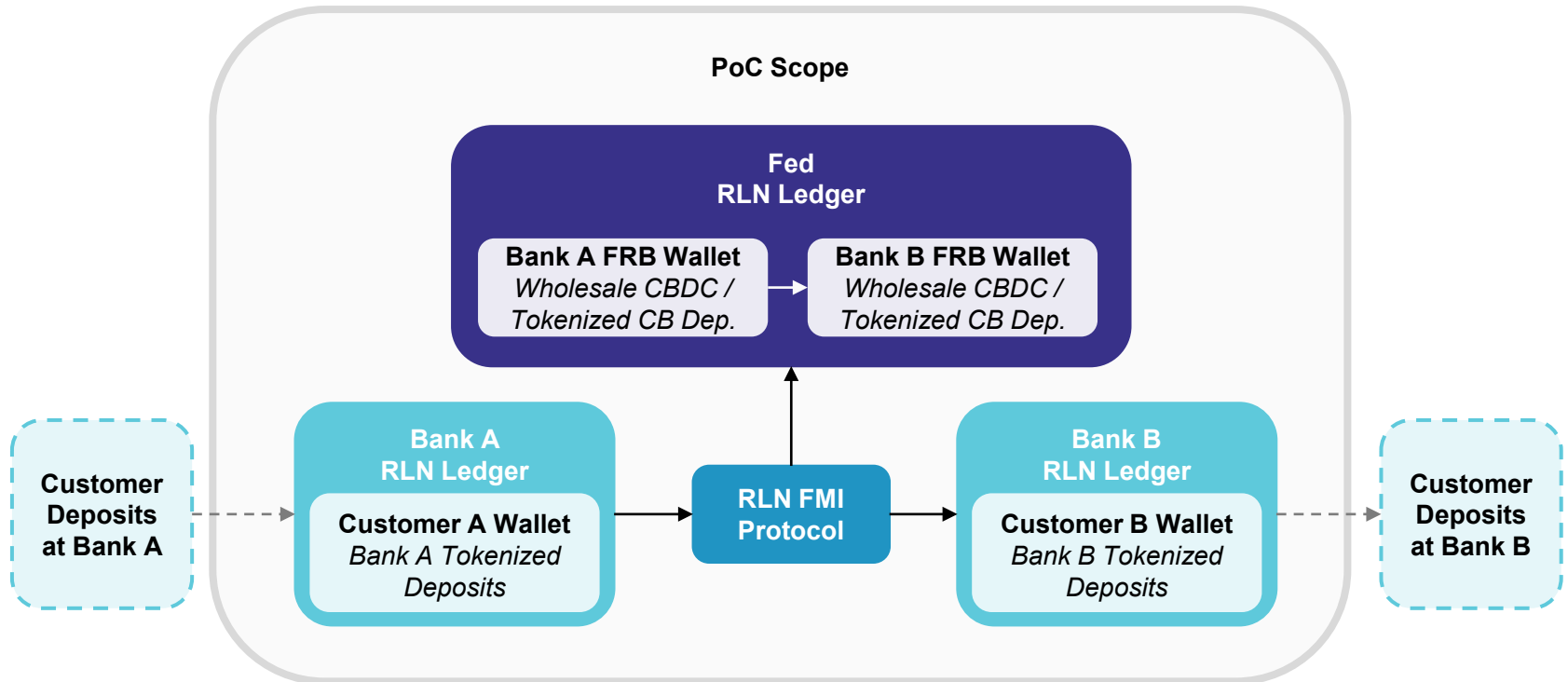
- **Working group** consisted of commercial banks, payment service providers, and the New York Innovation Center.



- **Simulated asset types** were limited to tokenized commercial bank and central bank money.
- **Two use cases** examined both a domestic and cross-border payment transactions.
- **Currency denomination** was limited to USD (e.g., no foreign exchange component)

# Solution Concept

The base use case was a domestic payment between two commercial banks, settled in central bank money.



# Findings

Category	Details
<b>Settlement availability</b>	RLN demonstrated 24/7 settlement with a wCBDC is technically possible; however, availability would be dependent on operational availability of the parties.
<b>Efficiency</b>	Value and data were moved end-to-end in full once the payment settlement route was determined and the transaction was approved.
<b>Privacy</b>	The platform recorded, transferred, and settled liabilities in near real-time, with transaction details known only to involved parties. Details were made available on a need-to-know basis, ensuring data privacy across all network participants.
<b>Near real-time settlement</b>	Settlement occurs on a near real-time basis upon approval by each relevant party to the transaction. Following transaction approval, value was moved across the network through a wCBDC.
<b>Programmability</b>	Participants could include auto-execution rules to fund shortfalls in account balances, with custom rules for both commercial bank and wCBDC accounts.



# 4 Research portfolio

# NYIC produces public goods aimed at enhancing the functioning of the global financial system

Technical Research		
Cedar I	<a href="#">Press Release</a>   <a href="#">Report</a>   <a href="#">Website</a>	
Cedar II x Ubin +	<a href="#">Press Release</a>   <a href="#">Report</a>   <a href="#">Website</a>	
Regulated Liability Network	<a href="#">Press Release</a>   <a href="#">Report</a>   <a href="#">Website</a>	
WIP	Agora	<a href="#">Press Release</a>
	Regulated Settlement Network	<a href="#">Press Release</a>
Research Papers		
Liberty Street Economics: What Makes Cryptocurrencies Different?	<a href="#">Paper</a>	
FEDS Notes: Examining CBDC and Wholesale Payments	<a href="#">Paper</a>	
Regulating Decentralized Systems: Evidence from Sanctions on Tornado Cash	<a href="#">Paper</a>	

# Thank you

