THE REGULATED LIABILITY NETWORK

DIGITAL SOVEREIGN CURRENCY

WHITEPAPER

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**THE REGULATED
LIABILITY NETWORK**

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EXECUTIVE SUMMARY

Blockchain technology has created a wave of innovation at the edge of the regulatory perimeter. Despite the hype, the adoption of distributed ledger technology (DLT) by the regulated financial system has yet to lead to large-scale transformation of market infrastructures. This paper presents one potential avenue for upgrading sovereign currency systems with shared ledger technology.

Digital Money Alternatives

- As physical methods of payment decline, several digital money alternatives are in contention. Society is faced with an important question: **What type of digital money do we want to use in the future?**
- Central bank money, commercial bank money, and e-money issued by regulated non-banks make up the family of sovereign money as defined in this paper. Sovereign money is issued by public and regulated private institutions (banks and non-banks) under authorization by the nation state.

Sovereign versus Non-sovereign Money

- People may take it for granted that money is an integral part of the nation state, like the legal system and law enforcement. However, there is a counter-thesis. Computer code may enable digital money that operates outside national jurisdictions in the form of cryptocurrencies.
- Cryptocurrencies such as Bitcoin attempt to de-couple money from the nation state. Novel instruments like "stablecoins" are yet to be incorporated within the regulatory perimeter.
- If allowed to develop outside of regulation, cryptocurrencies and stablecoins may substitute for sovereign money. They may diminish an important instrument of national self-determination and negatively affect financial stability.

The Database of Money: Proprietary Islands versus Shared Ledger

- Sovereign currencies currently operate across proprietary databases run within each regulated institution. Every institution is its own island of data, representing its books and records of customers and their deposits.
- Traditional payment systems require messaging between these islands of data and involve convoluted reconciliation and settlement processes, leading to frictions and delays.
- Cryptocurrencies and stablecoins operate on shared ledger technology that can be "Turing complete" or programmable. Proponents of blockchain technology consider it a superior computational substrate for the future of financial services.

The Technological Neutrality of Legal Instruments

- If shared ledger technology has advantages over traditional financial technologies, then sovereign currencies can be represented on them without changing their legal nature.
- We argue that legal instruments are independent from the arbitrary technology used to represent them. In other words, a deposit recorded on a paper ledger is the same as one recorded on a traditional database or a blockchain. Legal code comes before computer code.

Regulated Liabilities: Facets of the Sovereign Currency System

- Sovereign currencies are "regulated liabilities," meaning they are promises made by regulated institutions to pay the customer on demand at par value in national currency units. The purpose of financial regulation is to maximize the user's probability of redemption.
- Central bank digital currencies (CBDCs) focus on upgrading one facet of the sovereign currency system: the central bank liability. The development of CBDC may set up a contest between public money and regulated private money, even though they belong to the same family of sovereign currency.
- Most economic actors transact in non-public facets of the sovereign currency system: commercial bank and e-money liabilities. Regulated private money on bank balance sheets is the raw material for lending in the economy and plays a vital role in economic growth and entrepreneurship.

The Regulated Liability Network (RLN) Concept

- This paper explores the concept of an RLN, the potential for a regulated Financial Market Infrastructure (FMI) that could deliver an interoperable network of all facets of the sovereign currency system: central bank money, commercial bank money, and e-money (and in the future, regulated stablecoins).
- The RLN concept explores the conjunction of shared ledger technology and the sovereign currency system. If blockchain has the potential to upgrade financial services, then it should be applied to regulated financial services.
- RLN is a design for digital sovereign currency that is not limited to central bank liabilities.

Potential RLN Benefits

- The RLN scheme may offer potential for a new global settlement infrastructure based on regulated issuers and instruments.
- Such a network might ensure that tokenized, programmable money is interoperable across different regulated issuers.
- The wider scope of RLN that includes all aspects of sovereign currency might enable it to address a broader range of use-cases than narrower proposals, while maintaining the two-tier structure of public and regulated private balance sheets.
- The scheme may be extensible in potentially interesting directions: (1) including stablecoins when they are within the regulatory perimeter, (2) incorporating multiple currencies to solve for cross-border payment efficiency, and (3) representing multiple asset types.
- Financial messaging has largely been solved through structured ISO20022 messages flowing at the speed of light. The missing piece of the puzzle is a global solution for settlement.

Contribution to Policy Debate and Industry Outcomes

- An exploration of the technical, legal, and business characteristics of RLN might enrich the global debate on the future of digital money and lead to more coordinated industry outcomes.
- A positive contribution can be made to industry thinking whether or not the RLN thesis is supported in the course of further community investigations.

> ❝ *The physical form of money has changed over time and as we ponder the leap into digital money, we must make sure that the medium of exchange in our economies continues to be an extension of the sovereign. The development of blockchain technology might technically make it possible for unregulated entities to create their own money, but that does not and should not make it legally permissible. CBDC may have a role to play, and we should not stifle innovations built on blockchain unnecessarily, but the money in our digital pockets is intrinsically linked to credit creation through the regulated banking system. The RLN proposal argues for an upgrade to sovereign currencies in a way that includes public and regulated private money on a shared ledger. This may prove an interesting alternative to instruments based exclusively on the central bank balance sheet.*
>
> **Lord King, Baron of Lothbury,** KG, GBE, DL, FBA
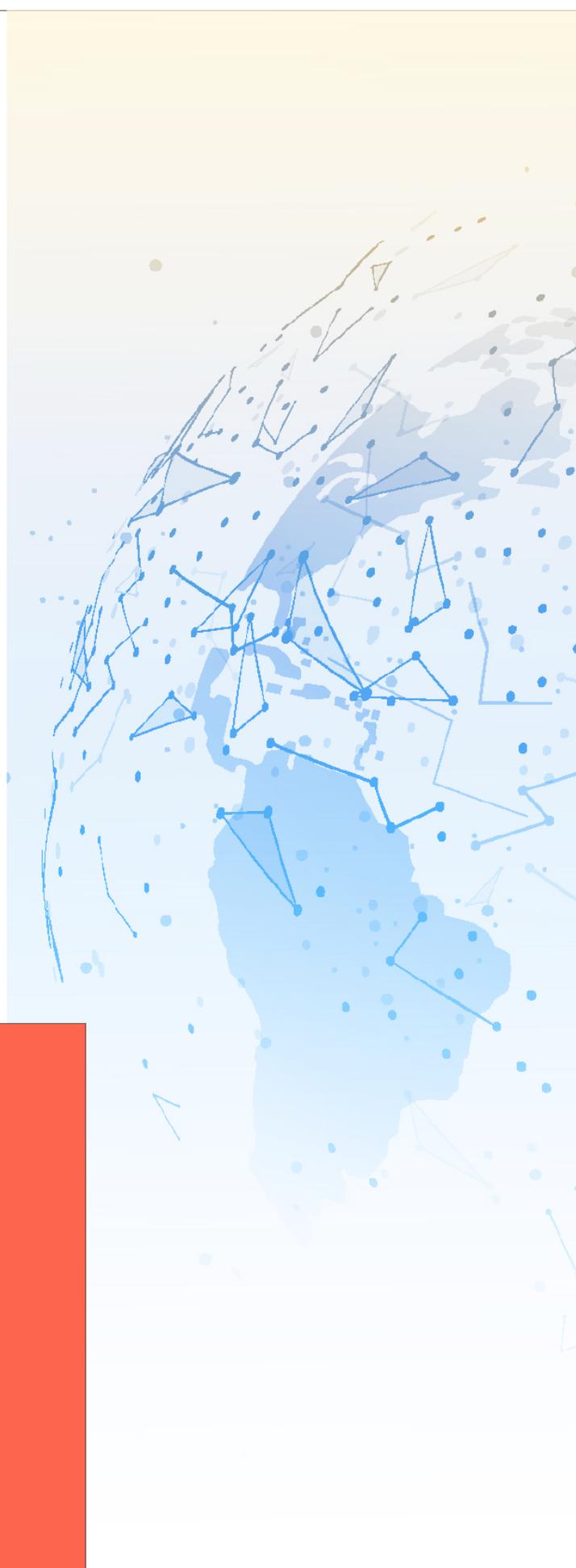
PREFACE

This paper shares a vision of the future of digital money that is pro-national currency.[1] The suggested **Regulated Liability Network (RLN)** is intended to provide on-chain, 24*7, programmable, final settlement in sovereign currencies, consisting of the liabilities of both public and private regulated financial institutions. Offering a new computational substrate for regulated money might enable a wave of responsible financial innovation and secure the leading position of sovereign currencies over unregulated, non-sovereign alternatives.

The Bitcoin whitepaper introduced the radical notion of digital money being de-coupled from the nation state.[2] Existing digital forms of sovereign currency are liabilities of trusted institutions like central banks, commercial banks, and regulated non-bank "e-money" issuers. These liabilities are promises to pay a known user on demand at par value in national currency units. In contrast, Bitcoin and other cryptocurrencies are non-liabilities— they are non-sovereign, non-regulated forms of money. They do not represent the notion of a promise to pay national currency units from a trusted, regulated institution to a known user.

Bitcoin contrasts with traditional payment systems because the value being transferred is "in" the network. Traditional payment systems consist of messaging systems between institutions that maintain their own proprietary databases. The money is "in" the institutions in the form of proprietary database records of liabilities in favor of known users.

Public blockchains like Ethereum display global qualities that may be desirable in the regulated financial system: they are "always on," "programmable," and "multi-asset." Can these features be incorporated into the regulated financial system through the adoption of shared ledger technology?

This paper explores the notion of a novel Financial Market Infrastructure (FMI) that makes use of blockchain technology to upgrade sovereign currencies. Liabilities of regulated institutions denominated in national currency units in favor of known users would be stored, processed, and settled on a shared ledger. The resulting RLN is a potential way of capturing the purported benefits of Distributed Ledger Technology (DLT) while affirming the right of nation states to decide what money is, and maintaining the concept of digital money as the liability of a regulated institution in favor of a known user.

The exploration of RLN may point toward development of an "always on," "programmable," "multi- asset" financial system based on sovereign currencies that is less siloed and more inclusive.

> *The two-tier financial system is vital to the economic health of every free market society. We may not often reflect on the fact that the dominant form of money is a promise to pay by regulated private-sector financial institutions. The entire edifice of financial regulation exists to make sure that those promises are likely to be kept. When our money is on the balance sheet of risk-taking institutions, we are funding mortgages, capital spending, supply chains and the next entrepreneur. The nation state needs to defend sovereign currency from unregulated alternatives, but not necessarily by centralizing payments and deposits at the central bank. The RLN design demonstrates one potential avenue to upgrade sovereign currency while maintaining the two-tier banking system that is so vital to our continued prosperity.*
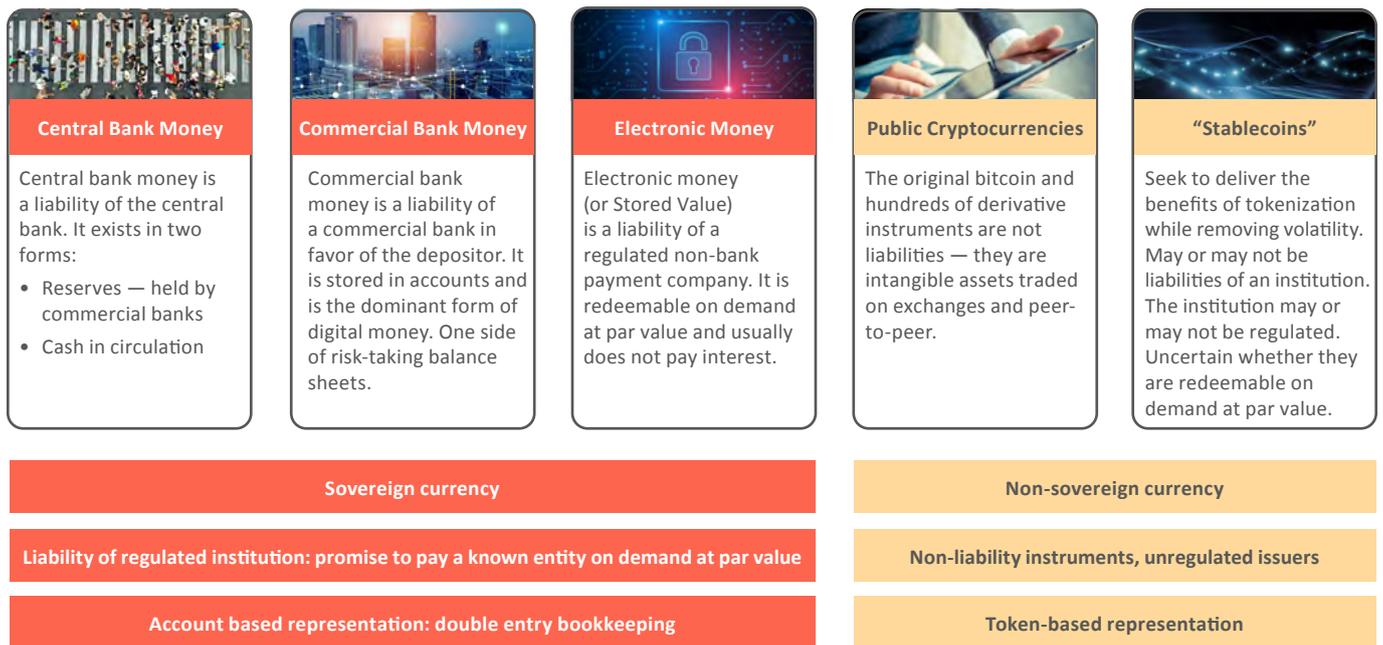>
> **Paul Ryan,** Senior Advisor, Digital Asset

THE DIGITAL MONEY FORMAT RACE

Effectively cashless societies may be on the horizon. As the contest between physical and digital forms of money enters the endgame, attention turns to the nascent battle between **different forms of digital money.** Competition between different conceptions of digital money raises new risks and opportunities for policy makers, market participants, and users.

There are five alternative visions of digital money:

Central Bank Money	Commercial Bank Money	Electronic Money	Public Cryptocurrencies	"Stablecoins"
Central bank money is a liability of the central bank. It exists in two forms: • Reserves — held by commercial banks • Cash in circulation	Commercial bank money is a liability of a commercial bank in favor of the depositor. It is stored in accounts and is the dominant form of digital money. One side of risk-taking balance sheets.	Electronic money (or Stored Value) is a liability of a regulated non-bank payment company. It is redeemable on demand at par value and usually does not pay interest.	The original bitcoin and hundreds of derivative instruments are not liabilities — they are intangible assets traded on exchanges and peer-to-peer.	Seek to deliver the benefits of tokenization while removing volatility. May or may not be liabilities of an institution. The institution may or may not be regulated. Uncertain whether they are redeemable on demand at par value.

Sovereign currency	Non-sovereign currency
Liability of regulated institution: promise to pay a known entity on demand at par value	**Non-liability instruments, unregulated issuers**
Account based representation: double entry bookkeeping	**Token-based representation**

Each of these visions has its pros and cons and its community of adherents. Each road leads to a different set of societal and economic outcomes. We can begin to understand the nature of each alternative by considering them through the following lenses:

1. Regulation: Is the form of digital money inside or outside of the regulatory perimeter?

- Central bank money, commercial bank money, and e-money are within the perimeter.
- Unpegged cryptocurrencies and stablecoins are not yet clearly regulated in most jurisdictions.

2. Sovereign versus Non-Sovereign Money: This point is inextricably linked with regulation: Is the instrument authorized by the nation state?

- Central bank money, commercial bank money, and e-money from regulated non-banks are the constituent parts of sovereign money. They are issued under license from the nation state in national currency units.
- Unpegged cryptocurrencies and stablecoins are

not issued under the authority of the nation state. Therefore, they are non-sovereign forms of digital money.

- Stablecoins may use the national unit of account, but the instrument is not issued with the blessing of the nation state unless and until they are operated under an appropriate regulatory framework.

3. Liability: Is the form of digital money an institutional promise to pay the user on demand at par value in national currency units?

- Central bank money, commercial bank money, and e-money meet this test. Unpegged cryptocurrencies and stablecoins currently do not.
- The utility of liabilities as a medium of exchange stems from their role as a diversified funding source for risk assets on commercial bank balance sheets.
- Liability of stablecoin issuers is unclear. Most end users of the instruments do not have an unambiguous contractual relationship with the issuer, which may affect the viability of any legal claim. The issuer may

not be licensed in the country where the stablecoin is distributed or circulated.

4. Representation Technology: Is the form of digital money represented on a private proprietary ledger, or some form of shared public ledger?

- Central bank money, commercial bank money, and e-money are now largely represented on private proprietary ledgers. Each institution is an island of data.
- Unpegged cryptocurrencies and stablecoins are represented on distributed public ledgers. This raises questions about whether sovereign forms of money might adopt shared ledger technology, and whether doing so would deliver any benefits.

5. Public versus Private Money: Central bank money is public, while the remaining forms are private. In some countries, the case for CBDC is based in part on the desire to maintain access to public money as use of physical cash declines. The argument goes that the ability to freely convert private money into public money on demand is an important foundation of trust in the financial system. Private money can be subdivided into two categories:

- **Regulated Private Money:** Commercial bank money and e-money are regulated. Regulated private money is part of

the sovereign currency system because it is issued under authorization by the nation state—for example, through banking licenses or licenses awarded to non-bank issuers of e-money.

- **Unregulated Private Money:** Unpegged cryptocurrencies and stablecoins are not issued under authorization by the nation state and are therefore not components of the sovereign currency system.

What kind of digital money does society want and need to use in the future? Will money remain the prerogative of the nation state, or will it roam free on global computer networks?

The development of unregulated digital money has prompted a reaction from the official sector such that dozens of central banks are investigating the development of CBDC. A rich literature has developed that explores CBDC design choices as if the sole component of the sovereign currency system is central bank money. We may have rushed to the conclusion that an upgraded form factor for central bank money is the appropriate response to the rise of novel forms of non-state digital money.

The preceding analysis indicates that other options may be available to policy makers – it may be possible to apply shared ledger technology to all components of the sovereign currency system.

> "It is unavoidable to move towards a certain degree of currency digitalization, but awkward that the policy debate today is focused on two extremes: CBDC for retail payments, and non-regulated tokens like stablecoins. It is critical to look towards models of currency digitalization that are based on the tokenization of regulated money. There is no reason why DLT should be a tool only wielded by unregulated finance. In this regard, the RLN is a solution that warrants close attention, and could provide an answer that unites the regulated community.
>
> **Christian Noyer,** Honorary Governor, Banque de France. SETL Director Assistant Secretary of the Treasury for Financial Stability

POTENTIAL POLICY RESPONSES

How might we choose among the five alternative forms of digital money? A starting point is to consider this fundamental question: **Is money the prerogative of the nation state?**

It is possible to answer in the negative. For example, Friedrich Hayek argues for free competition between privately issued monies in his 1976 book *The Denationalization of Money.* Answers to the question may be strongly influenced by the country where one lives or prevailing inflationary conditions. The Bitcoin whitepaper envisages a system of money that is not rooted in the nation state and its authorized financial institutions. We now have technology that enables unregulated digital money to be created, circulated, and used globally and outside of national control.

This paper is written from the point of view that money is rooted in the social contract and is one of the effective monopolies that citizens cede to the nation state. From that perspective, one might be concerned if unregulated, non-sovereign currencies might begin to substitute for sovereign currencies on a large enough scale to affect money as an instrument of national self-determination.

Novel forms of unregulated digital money may have functionality that national currencies lack in their existing form factors. If so, then unregulated digital money may begin to supplant national currencies more and more, thereby undermining sovereignty.

Unregulated digital money could gain advantage over national currencies in two possible ways:

- **Regulatory Arbitrage:** Unregulated forms of digital money may have more degrees of freedom than national currencies—for example, by not being limited to known users and otherwise operating outside of constraints imposed on regulated institutions.
- **Functional Superiority:** Unregulated forms of digital money may use superior technology and thereby gain a functionality advantage—for example, "programmability" through "smart contracts." Unregulated forms of money in tokenized form may offer more convenient access to new business models developed on blockchain technology.

This suggests two possible, non-exclusive policy responses:

- **Remove Regulatory Arbitrage:** Bring novel forms of digital currency within the regulatory perimeter and enforce a level playing field based on "same activity, same regulation". Many jurisdictions are aiming to modify existing rules or create new frameworks for digital assets in general and novel forms of digital money in particular. *Please note that this potential policy response is not the subject of this paper.*

- **Upgrade National Currency Infrastructure:** Ensure that digital national currencies meet all valid existing and anticipated needs of users in the modern digital economy. This can be achieved through upgrades to the existing payments paradigm, e.g., through the creation of instant payment schemes and other augmentations. It may also be possible for sovereign currencies to adopt the "money encapsulated in a smart network" paradigm that is currently the sole preserve of cryptocurrencies and stablecoins.

This paper presents one possible way to upgrade the sovereign currency system so that it does not lose out to non-sovereign currencies based on functionality. Non-sovereign currencies may have been adopted simply because they fulfill valid functions that cannot be adequately served by the current form factor of sovereign currencies.

In the digital money format race, the shared ledger technology used by cryptocurrencies and stablecoins might be a source of long-term competitive advantage, versus the kinds of technology currently deployed by the traditional financial sector.

The future of the sovereign currency system cannot be a one-way bet on the current database structures employed by the regulated financial system. Tremendous enhancements are being made to regulated payment systems. However, these efforts may not be sufficient to address the emerging challenge of novel forms of unregulated money. The potential to use shared ledger technology to upgrade the paradigm of regulated payments may be worthy of close study.

The RLN concept deserves attention from everyone who thinks about the future of money. It broadens the parameters of the debate about how to modernize payments, what to do about stablecoins, and whether to create CBDCs. It offers a different way of thinking about distributed ledger technology, as a shared platform for the transfer of multiple financial assets.   In short, the concept represents a new option worthy of consideration.

Timothy Massad, Research Fellow, Harvard Kennedy School Mossavar-Rahmani Center for Business and Government and Director, M-RCBG Digital Assets Policy Project | Former Chairman of the Commodity Futures Trading Commission & former Assistant Secretary of the Treasury for Financial Stability

In the past, the financial system was improved by new forms of money when two factors coincided: new user needs and new technologies that enabled a functionally better form of money: Metal casting made coins possible. Letterpress printing allowed for printed banknotes. Computer technology was the precondition for digital commercial bank money. It's time to do it again: upgrading sovereign currencies using new technology to meet the needs of a digitized world. There is no reason to leave the benefits of new technologies only with cryptocurrencies or stablecoins. The race is on to find the best new form of money. Central banks and regulated institutions have an opportunity to win it!

Claus George, Head of Digitalization & Innovation TxB, DZ BANK
Manfred Richels, Managing Director, UniCredit Cash Management Products
Katharina Vogt, Senior DLT Expert, Commerzbank Group Technology Foundations

Technology is changing our concept of money, creating new possibilities for the way we pay while introducing new challenges to keeping the world's financial system interconnected. SWIFT is an active participant in many innovation projects worldwide. Our focus on enabling interoperability across borders underpins our commitment to exploring new forms of money within a connected global financial ecosystem. We welcome the collaborative public-private approach taken in the RLN, and look forward to exploring this model with our community in pursuit of an inclusive, interoperable future.

Nick Kerigan, Managing Director, Head of Innovation, SWIFT

ONGOING ENHANCEMENTS TO PAYMENT SYSTEMS

Work to upgrade **sovereign currency infrastructures** is already under way on multiple fronts. The question is whether the sum of this work is sufficient to ensure the continued dominance of the sovereign currency system in the digital age. Industry efforts to improve existing payment systems include:

Development of New Payment Systems

- Several countries have implemented domestic instant payment systems that deliver real-time credit transfers between bank account holders.[3]
- These systems support extended services like proxy databases, Request to Pay functionality, QR codes, and bill payments.

Upgrades to Existing Systems

- ISO20022 is being adopted as an enhanced messaging standard by several domestic and international payment systems.[4] It improves the fidelity of payment messages and increases the information payload associated with each payment.
- SWIFT Global Payments Innovation (SWIFT gpi) has delivered end-to-end tracing of cross-border payments.[5]
- SWIFT is building a new API-based transaction management platform aimed at replicating the instantaneous domestic experience for international payments.[6]

Interconnectivity of Payment Systems

- The payments community is engaged in multiple initiatives to create linkages between national payment systems that would improve cross-border payments. The recently announced IXB initiative is one example.[7]
- A recent paper from the European Central Bank (ECB) argues that the interconnectivity of payment systems and CBDC points toward the holy grail of cross-border payments.[8]

Increased Competition from Regulated Non-banks

- Regulated non-banks have deployed innovative e-money payment schemes to hundreds of millions of consumers and businesses around the world. Examples include PayPal, Wise, Revolut, M-PESA, Mercado Pago, and Paytm.
- Big tech companies offer embedded financial services within their platforms. Services like Apple Pay and Google Pay have reduced friction in customer payment experiences.

Regulatory Developments

- Regulatory developments continue to drive improvements in payment systems:
  - **FATF Travel Rule:** Ensuring the transmission of data required to interdict financial crime.[9]
  - **Strong Customer Authentication (SCA):** Improving the mechanisms for authentication of payment instructions.[10]
  - **Confirmation of Payee:** Validating beneficiary details to reduce Authorized Push Payment fraud.[11]
  - **Open Banking:** Offering API access to bank account information and payment initiation from authorized third parties.[12]

In addition to initiatives based on traditional technology, work in the regulated space is now seeking ways to modernize national currencies based on blockchain technology.

- **Central Bank Digital Currency (CBDC):** Work is under way to digitize central bank liabilities to enable their use by a wider range of economic actors. The potential for CBDC to disintermediate regulated private players is well documented in the literature. However, policy makers are investigating CBDC's potential to address a range of policy objectives, including improvements in financial inclusion and cross-border payments.
- **Multi-CBDC Schemes:** Project Dunbar[13] and mBridge[14] projects aim to demonstrate the utility of central bank liabilities from multiple countries on interoperable networks. These schemes currently operate exclusively in central bank money, but they could contribute to more efficient cross-border settlements.
- **Commercial Bank "Coins":** Some banks have created tokens that represent their own liabilities, such as JPM Coin.[15] This paper argues that the representation of customer deposits at regulated banks are merely a different form factor for an existing legal instrument. Tokenized deposits are not stablecoins, because they are not collateralized. Each bank creating its own "coin" in isolation may not lead to an efficient market structure. An interoperable network of tokenized deposits might be preferred.
- **Industry Consortia:** Schemes like the Fnality[16] and Partior[17] initiatives are from industry players seeking

to create new international payment networks based on DLT. Schemes like the USDF Consortium[18] and the Tassat[19] solution aim to tokenize commercial bank money across groups of financial institutions.

It is possible that these myriad initiatives could lead to an upgraded sovereign currency system that meets all valid needs of economic actors in the modern digital economy. It could be argued that the industry is moving forward in a fragmented manner, for example:

- The development of CBDC may lead to an internal competition within the sovereign currency system between central banks and regulated private sector banks and non-banks. CBDC may not prove to be a substitute for non-sovereign currencies so much as a stand-in for other regulated payment services.
- It is possible that the private sector pursues several proprietary paths that lead to the creation of separate islands of functionality. For example, if each bank creates its own "coin," these proprietary systems may not be interoperable with each other. Individual efforts are not likely to add up to an effective response to novel forms of unregulated digital money that operate on global computer networks.

What are we trying to solve for? We are seeking to ensure that the sovereign currency system employs the best available technology to respond to the demands of new business models. Economic actors should not be forced to use unregulated digital money simply because the sovereign alternative is not responsive to their needs.

CBDC seeks to augment one facet of the sovereign currency system: the central bank liability. But the system has other facets that serve the broader needs of economic actors. It may be necessary but not sufficient to upgrade the public face of regulated money. It may be possible to upgrade the public and private faces of sovereign money through a public/private partnership.

66 *The representation of digital assets on blockchain networks has introduced new capabilities that may allow capital markets to operate more efficiently. For instance, transactions requiring multiple steps and reconciliation across settlement systems in traditional finance can be completed with a single transaction on public blockchains. However, these networks, such as Bitcoin and Ethereum, were not designed to operate within the regulatory environment in which most financial instruments are owned and exchanged. RLN may provide a means for banks to tokenize deposits and other traditional liabilities, enabling improvements in operational efficiency while maintaining compliance with existing laws and regulations.*

Don Relyea, Chief Innovation Officer, U.S. Bank

PUBLIC VERSUS PRIVATE MONEY

The transition from physical money (a liability of the nation state) to private digital money raises important questions.[20] If the only form of **public money** is physical notes and coins, then access to public money may diminish over time as economic actors migrate to digital forms of money supplied exclusively by private providers.

This could result in a situation where economic actors only have access to **private money,** which might not be a desirable outcome. CBDC projects seek to ensure continued access to public money in digital form as the underpinning of trust in the sovereign currency system.[21]

This paper acknowledges the important distinction between public and private money, and the potential need for public money to be made available in digital form as physical cash diminishes. The question is whether the desire to digitize public money should be decisive in selecting the appropriate policy response.

We propose that the looming contest between **sovereign money** and **non-sovereign money** may be a more powerful guide to action. We examine the possibility that shared ledger technology might enable an upgrade to the entire sovereign currency system, not limited to public money.

Our definition of sovereign money includes the liabilities of regulated public- and private-sector issuers: central banks, commercial banks, and regulated non-bank e-money issuers. We class the liabilities of these issuers as **"regulated liabilities."** They are called this because the structure of regulation is designed to maximize the probability that these promises to pay will be honored.

It may well be important to maintain access to public money as cash usage declines. However, it is imperative that economic activity does not transition from the regulated to the unregulated sector—**from sovereign money to non-sovereign money.**

Blockchain/shared ledger technology might potentially lead to the creation of a less siloed, more inclusive financial system. CBDC is a policy response with a narrow focus on the digitization of central bank liabilities, but it is not just the future of public money that is at stake in the digital money format race.

This paper suggests that a wider focus on "regulated liabilities" might result in a more robust, coordinated defense of the primacy of sovereign money in the digital age. We argue that "regulated liabilities" are existing legal instruments that can be represented on shared ledger technology within a framework that offers finality of settlement. Representing the different facets of the sovereign currency system together on an interoperable network is potentially much more powerful than narrower CBDC proposals.

> " *If blockchains are to become venues for mainstream markets, then it probably makes sense to develop a method of payment that is native to these new networks. It is too early to discern which blockchains might attract mainstream commerce, and there may well be multiple competing venues for the foreseeable future. There should be competition between different kinds of digital money, but it should be conducted within the regulatory perimeter on a level playing field. This is not easy to achieve when technology moves so quickly, regulations are not yet developed, and the networks involved are global. The RLN proposal enriches the discussion as we contemplate what blockchain native digital money might become.*
>
> **Bengt Holmström,** Paul A. Samuelson Professor of Economics Emeritus, MIT

REGULATED LIABILITIES: TRUSTED PROMISES TO PAY

This paper assumes that four core features of sovereign digital money will continue into the future, even though the technological representation of sovereign digital money may change.

1. **Unit of Account:** If digital money is to remain the prerogative of nation states, then the unit of account is given as the national currency unit.

2. **Medium of Exchange:** Nation states will not revert to commodity forms of money. This means that the medium of exchange will remain in the form of promises to pay, or liabilities of regulated institutions. Liability money is inextricably linked to credit creation.

3. **Two-tier Financial System:** Nation states will likely maintain a two-tier banking system, meaning a separation of public- and private-sector balance sheets. The private tier will consist of regulated banks that create risk assets, as well as regulated non-banks that offer payment services. The public tier offers a settlement asset that is free of counterparty risk.

4. **Known Users:** Although Bitcoin is a non-liability that does not represent the relationship between an institution and a known user, digital sovereign money will be effectively limited to known users—that is, liabilities of regulated institutions in favor of known legal entities or individual persons. Know Your Customer (KYC) requirements are foundational in combatting financial crime.[22] A return to anonymous bearer instruments may not be consistent with the direction of financial regulation.

These essential features of the sovereign currency system are desirable and shared between the existing forms of regulated money: central bank money, commercial bank money, and e-money offered by regulated non-banks.

Non-regulated, non-sovereign forms of digital money do not have these characteristics. They may be commodity instruments, not denominated in national currency units, not supportive of credit creation, and not tied to known users.

The components of the sovereign currency system share a common core: **they are unambiguous promises to pay the customer on demand at par value in national currency units.** The issuers of these forms of money are explicitly authorized by the nation state. Furthermore, nation states regulate these institutions to maximize the probability that their promises will be kept.

For this reason, we consider the components of the sovereign currency system to be "regulated liabilities." If novel instruments like stablecoins are to be incorporated into the sovereign currency system, then they should join the family of regulated liabilities and share the four essential common characteristics listed above.

This paper proposes that as nation states ponder the future of their sovereign currencies, the focus should not be limited to public money—that is, central bank liabilities. A limited focus on central bank money could potentially promote one aspect of sovereign money, to the detriment of other parts of the regulated sector. The competition should not be between **different constituents** of the sovereign currency system, but between the sovereign currency system and non-sovereign currencies.

It may be more powerful to consider the potential of a coherent plan for the future of all sovereign currency components. That is, the object of attention should be on **"regulated liabilities"** as a whole. The objective should be the modernization of the entire national currency, not just the public portion of national currency. This suggests a potential pivot in the projects examining the merits of CBDC and individual bank coins toward a broader industry focus on the digitization of regulated liabilities. The suggested pivot is from 'Central Bank Digital Currency' to **"Digital Sovereign Currency"**.

The formative phase of blockchain has been dominated by non-regulated instruments and players. This has given the impression that developments are outside of the legal perimeter. To understand how regulated liabilities might be upgraded with shared ledger technology within the existing legal system, it is important to recognize that legal instruments are independent of the technology used to represent them. Once that is acknowledged, a possible roadmap to upgrade the sovereign currency system becomes clearer.

> " The currency payments paradigm is based on messaging between thousands of different institutions that each manage their own books and records on proprietary and separate databases. This presents a huge reconciliation task for the industry, resulting in notorious speed, cost, and quality inefficiencies with payments. RLN proposes a shared ledger with tokenized assets and tokenized regulated liabilities on the same chain, operating within a regulated Financial Market Infrastructure (FMI). This dramatically advances the topology of the legacy payments system, combining the best features of the established, time-tested system with the smart agility of powerful new technologies. So, instead of coordinating payments across thousands of islands, they are orchestrated in a common, programmable substrate that provides a single source of truth, thereby delivering a quantum leap in regulated payment and settlement efficiencies.

Naresh Nagia, Independent Senior Advisor, Deloitte

THE TECHNOLOGICAL NEUTRALITY OF LEGAL INSTRUMENTS

The development of DLT and public blockchains may have resulted in a conflation of **what is technically possible with what is legally permissible.**

New technology may make it possible to create schemes inconsistent with prevailing rules and regulations. In some cases, it will be appropriate to modify rules to reflect new technologies. In others, it will not. For example, the development of laser photocopying may have made counterfeiting easier... it did not make it legal.

Public blockchains might be thought of as digital printing presses. They may technically allow the creation of a non-sovereign central bank that issues its own unit of account, but that does not mean that such schemes would be legally permissible.

In the contest between computer code and legal code, the former may be faster to develop and deploy, but the latter must prevail if the sovereign currency system is to persist. The legal instruments transacted over distributed ledgers should be authorized by the nation state when they perform vital functions such as providing the prevailing medium of exchange.

The policy debate on the future of digital money is clarified by clearly distinguishing between legal instruments and the means of representing them. **Legal instruments are best considered as independent from their technological representation.**

The intuition behind the assertion that legal instruments are independent from their technological representation can be summarized through a brief look at history:

- In the 19th century, the liabilities of regulated institutions were recorded on paper ledgers. Written records represented the balance sheet "promises to pay" of financial institutions.
- With the development of affordable computing technology in the 20th century, these paper records were transferred to proprietary databases controlled by each institution. The balance sheet meaning of a database record is the same as the paper record.
- When the method of recording the liabilities changed due to technology, the legal instrument did not change. A paper "IOU" has the same legal weight as one recorded on a computer database, or any other arbitrary way that might be imagined to record those legal instruments.
- By extension, if in the future the liabilities of regulated institutions are recorded on shared ledgers, then the legal instrument does not change, only the technological method of recording the instrument. A shared ledger is a kind of database and changing the database does not alter the balance sheet reality of a legal instrument.
- Rules and regulations should not be dependent on the kind of database used to represent a legal instrument.

> " *The approach and emphasis of the RLN Whitepaper in distinguishing the private law aspects of digital assets from their regulatory characterization is a distinction that has been long recognized. Although many (but by no means all) crypto and DeFi tokens and activities are designed or structured without reference to legal or regulatory considerations, the private law has adapted to apply conventional legal principles to such tokens and activities while regulators and policymakers separately adapt and apply regulation to them. By contrast, very little adaptation of private law, and often no adaptation of regulation, is required where new technology is deployed to deliver existing regulated activities. As a rule, there is generally no difference in the legal characterization of a deposit at a bank whether it is recorded in a physical ledger, in an on-site hard drive, in the cloud, or on a distributed ledger.*
>
> **Michael Voisin,** Partner, Linklaters

Legal instruments should be considered independently of their technological representation.

PAPER LEDGER

TRADITIONAL DATABASE

DISTRIBUTED LEDGER

- Any of these technologies may be utilized to record liabilities without changing their legal meaning
- DLT may lend itself to recording the liabilities of different regulated institutions on the same network

If this principle is accepted, then it will be possible to upgrade the substrate of national currencies within existing legal frameworks. The regulated sector may adopt new database technology – including blockchain/shared ledger technology – within existing laws and regulations.

Conversely, the technological capability of creating unregulated financial instruments does not lead to the conclusion that these activities are, or should be, legally permissible.

Regulations may be changed to codify innovations unlocked by technology; the legal code and regulatory perimeter is not static. However, the principle of **"same activity, same regulation"** should be applied in a technologically neutral manner, to avoid creating regulatory arbitrages based on technology choices. For example, it would be peculiar if an e-money scheme operating on a blockchain were to be regulated differently from an e-money scheme using traditional database technology.

If we can migrate existing legal instruments to new technology, the next question would be to identify the problem to be solved. Otherwise, we have a solution searching for a problem. We argue that the application of shared ledger technology to existing legal instruments might help to address a fundamental requirement: **the ability to achieve finality of settlement on a global, multi-asset, multi-currency basis.**

> " *Caught up in the fervor surrounding stablecoins, market participants generally pay insufficient attention to the private law framework of these assets. Holders of reserve-backed centralized stablecoins may not realize that their right to redeem their coins for cash is typically subject to limitations and may be suspended without notice. Similarly, stablecoin holders might not appreciate that they would be treated as unsecured creditors in the event of bankruptcy, with proceedings that may well take place in a foreign jurisdiction. Going forward, stablecoin issuers should offer easily enforceable and unqualified redemption rights, as well as structure their reserves in such a way that holders of these coins would be protected in the event of issuer bankruptcy.*
>
> **Andrea Tosato,** Associate Professor, School of Law, University of Nottingham

SOLVING FOR GLOBAL SETTLEMENT

Market practitioners have called for improvements in financial settlement systems for many years. In 1994, Charles Sanford from Bankers Trust forecast how settlements might be conducted in the year 2020:[23]

> 66 *To further increase the system's efficiency, all financial claims (including claims on volatility) will be in book entry form, and ownership of all these claims will be transferable instantly anywhere around the globe via 24-hour multi-currency payment systems. Settlement risk will be eliminated and with it a major bottleneck to transaction flows. This has enormous implications for releasing capital and lowering transaction costs.*

Sanford's vision of a global, multi-currency, multi-asset settlement system **has not yet been delivered by the traditional financial system.** However, progress in some areas has been made, such as the development of the CLS Group to address Herstatt risk in foreign exchange transactions. Proponents of blockchain/shared ledger technology argue that we now have the technology required to build such a system.

Meanwhile, the lack of a global settlement system leads to frictions in vital operations such as international payments.[24] We have solved the problem of financial messaging—structured payment messages are transmitted between counterparties at the speed of light. The missing piece of the puzzle is a global solution for settlement.

Digital payments in national currency amount to the **transfer of liabilities** between one institution and another. At the beginning of a payment transaction between Alice and Bob, Institution A owes $100 to Alice. At the end of the transaction, Institution B owes $100 to Bob.

Traditional payment systems achieve this liability transfer through separate processes of **messaging** and **settlement.**

- **Messaging:** The messaging layer is a secure, structured communication from Institution A to Institution B saying, "Please pay Bob $100." Modern electronic communications networks enable this layer to operate at the speed of light, and ISO20022 is steadily becoming the de facto format in which these messages are transmitted.

- **Settlement:** Institution B will only accept a new liability toward Bob if it receives a matching asset through the settlement layer. For example, Institution A might transfer a central bank liability to Institution B to settle the transaction through a Real-Time Gross Settlement (RTGS) system, such as the Fedwire Funds Service or CHAPS. The liabilities of Institution B increase by the amount of the payment, but so have its assets.

Settlement in central bank money is considered the most secure method. Central bank money offers an asset free of counterparty risk to extinguish obligations. It is supported by the legal construct of settlement finality, meaning that the transactions may not be unwound through insolvency proceedings.

In Bitcoin, there is no transfer of liabilities between institutions and no separation of messaging and settlement. The transfer of Bitcoin is "settled" once the transaction is recorded in the public ledger. Settlement in Bitcoin is not supported by a legal construct of settlement finality. However, it may be that settlement on the network is remote from insolvency proceedings for different reasons—for example, lack of clear legal jurisdiction over the operations of the Bitcoin network and lack of an identifiable operator.

The **separation of messaging and settlement** in traditional payment systems gives rise to the need for extensive reconciliation operations in each participating institution. The means of settlement are also not always operational—for example, because RTGS do not typically run 24*7.

Few traditional financial markets are "always on," including the largest financial markets in the world: foreign exchange, money market, equities, debt, etc. This is partially because we cannot continuously access settlement systems.[25] In contrast, public blockchains operate continuously and create immutable records of "settlements" performed on the network.

When developing next-generation national currency based on "regulated liabilities," a desired outcome is to deliver both continuous settlement and finality of settlement in central bank money. Ideally, it would be possible to deliver both continuous settlement and finality of settlement in the liabilities of multiple central banks.

These benefits might be delivered through development of an FMI in which "regulated liabilities" are recorded, transferred, and settled with finality on a shared ledger interfaced with the back-office systems of regulated market participants. In other words, it may now be possible to realize Charles Sanford's vision of a new global settlement system.

> ❝ *Having a regulated 24*7 tokenized cash ecosystem with a common bridge asset that supports peer-to-peer interactions is foundational to improving settlement efficiency of digital assets and enhancing market liquidity. Initiatives like RLN and Fnality are designed to upgrade our settlement rails, based on the application of shared ledger technology. Solving for the digital native cash leg of commercial and financial transactions could unlock a host of industry innovations and enhancements. The ability to embed self-executing smart contracts within a regulated and compliant token that provides settlement finality could be transformational for the industry.*
>
> **Vivek Kohli,** Head of Emerging Technology & Digital Assets, BNY Mellon

> ❝ *RLN is proving to be an outstanding design for digital currency. It promises to provide an essential cash ledger on chain at scale to catalyze the reshaping of financial market infrastructure and accelerate cycle times for the global economy. It brings the benefits of digital currency, while protecting the two-tier financial system globally. Importantly, it also protects the fractional reserve system to enable credit formation against bank deposits, unlike a stablecoin which impairs credit formation due to the required narrow bank model. We are excited to see the level of interest by central banks in exploring, and ultimately adopting, RLN to deliver a digital version of its sovereign currency.*
>
> **Richard Walker,** Partner and Global Co-Lead for Web3, Bain & Company

THE REGULATED LIABILITY NETWORK (RLN) CONCEPT

To reprise the argument so far: society is faced with a choice in what type of digital money it will use in the future. The major choice is between sovereign and non-sovereign kinds of money. Sovereign currency is comprised of regulated liabilities: central bank money, commercial bank money, and e-money issued by regulated non-banks. These existing legal instruments may be represented on shared ledger technology without major modification to existing rules and regulations. Doing this might help to address a major industry pain point: the lack of a global, multi-currency, multi-asset financial settlement system.

With these building blocks in place, we raise the possibility of a new FMI called the **Regulated Liability Network (RLN).**[26]

_____

The purpose of RLN would be to create a new shared ledger substrate for the sovereign currency system that is "always on," "programmable," and "multi-asset." The network would deliver "on-chain" finality of settlement between the participating institutions in sovereign currencies and be compliant with all existing rules and regulations.

_____

The RLN would operate a shared ledger that records, transfers, and settles regulated liabilities of central banks, commercial banks, and regulated non-banks. As the regulatory perimeter encompasses stablecoins as a form of regulated liability in some jurisdictions, these too may be incorporated into the network and become interoperable with other forms of tokenized money.

Regulated liabilities stored in the RLN would be readily exchangeable with traditional account-based forms of money at par value because they are effectively the same legal instrument: the promise of an institution to pay the user at par value on demand in national currency units. The RLN would change the venue where institutions record and transfer their liabilities, not their legal nature.

The RLN would be a regulated FMI run in accordance with the **Principles for Financial Market Infrastructures (PFMI)** and achieve end-to-end finality of settlement within the network. Furthermore, it would be regulated by multiple supervisors if it were to include participants from multiple jurisdictions, like the regulatory arrangements for Continuous Linked Settlement (CLS).[27]

The RLN would deliver continuous settlement and finality of settlement in multiple national currencies and potentially multiple

assets. In solving for **settlement,** RLN could be a platform for responsible innovation that may help maintain the functional superiority of national currencies facing competition from unregulated novel forms of digital money. The availability of RLN could spur advances across all aspects of finance that require programmable, instant settlement in national currency units.

> 66 *Digital Finance will be a combination of both centralized and decentralized networks build on distributed ledger technologies that enables tokenization of real-world assets. ANZ's working hypothesis is these new networks are emerging forms of financial markets infrastructure with new form factor for transacting value. Central to this new ecosystem for transacting value are tokenized commercial bank monies, paving the way for regulated interoperability across networks. We foresee significant customer benefits from these emerging capabilities in terms of lower costs, reduced settlement times, more resilient infrastructure, and mitigation of counterparty risks.*
>
> **Luke Marriott,** Global Head of eFICC (Electronic Fixed Income, Currencies, and Commodities), ANZ

RLN TRANSACTION FLOWS

The RLN concept seeks finality of settlement between participants over a shared ledger operated by a regulated FMI. The basic operations of the proposed system are illustrated in this flow chart. For the purposes of illustrating the core settlement mechanism of RLN, this depicts a transfer between two commercial banks, each with their own access to central bank reserves.
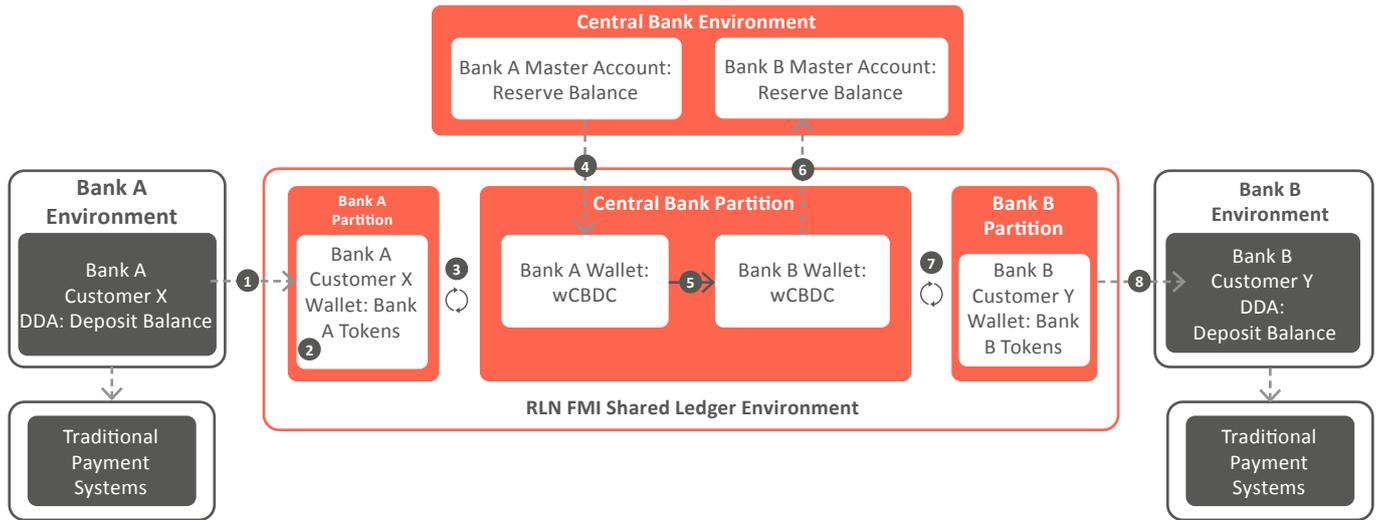

- **Step 1:** A customer of Bank A transfers a portion of their deposit balance to an RLN Token balance. This function is provided by the electronic banking system of Bank A.
- **Step 2:** The customer instructs a payment to a counterparty at Bank B.
- **Step 3:** The RLN evaluates the ability to execute the end-to-end transaction.
- **Step 4:** The Treasury Operations team at Bank A will have made sure that sufficient wholesale CBDC is available in their RLN Wallet to conduct the anticipated transactions for the day.
- **Step 5:** The transfer of wholesale CBDC within the RLN environment is necessary to settle the transaction between Bank A and Bank B.
- **Step 6:** The Treasury Operations team at Bank B will have real-time visibility over receipts into their RLN wallet holding wholesale CBDC.
- **Step 7:** RLN updates the balances simultaneously to settle the transaction "atomically." Bank A, Bank B, and the Central Bank partitions are updated at the same time, and a single record is created of the settlement.
- **Step 8:** The beneficiary of the payment may transfer the RLN Token balance to their deposit account if they wish. This function is provided by Bank B's electronic banking system.

This process illustrates the most basic operation of the RLN: to affect the exchange of regulated liabilities at par value on a shared ledger. However, this process flow does not appear to indicate any advantage over existing instant payment systems. In fact, it includes additional frictions for both the payer and beneficiary by introducing transfers into and out of token balances that do not exist today (although these operations might be hidden from end users).

> *RLN is an exciting foundation for the industry to make regulated commercial bank money interoperable to an extent we have never been able to achieve before. Commercial bank money smart contracts could be designed to be smoothly interoperable across commercial banks and central banks. Having made regulated money interoperable to this extent, we can then open innovation opportunities for smarter, more competitive payments.*
>
> **Peter Left,** Head of Prudential Liquidity Management, Lloyds Banking Group

RLN FMI Shared Ledger Environment
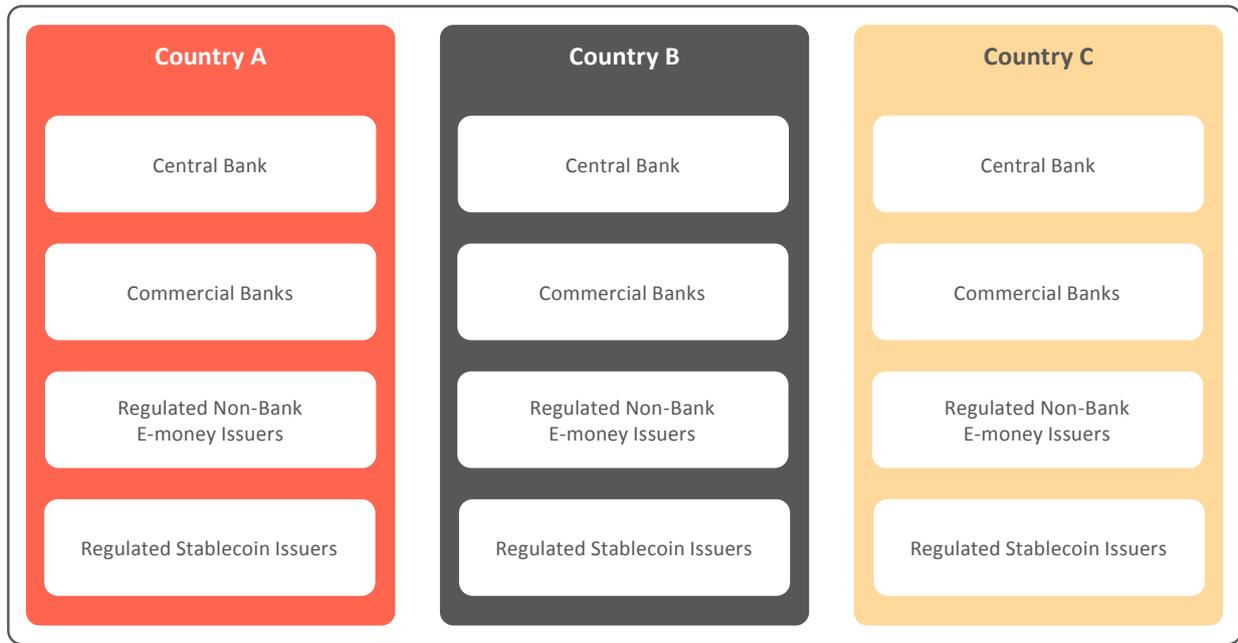
RLN will only prove beneficial if it offers delta improvements to financial settlements that would be harder to achieve through upgrades to the existing paradigm, in which each financial institution holds its own proprietary books and records.

The RLN thesis relies on the potential of shared ledger technology by creating incremental degrees of innovation freedom in the following areas:

- The ability to incorporate **multiple currencies** in the system by including multiple central banks and the regulated financial institutions from various locations.

- The ability to represent the liabilities of **additional participant types** within the network—that is, regulated non-bank institutions including e-money providers and, in the future, regulated stablecoin issuers.

- The ability to represent **multiple types of digital assets** on the network beyond money—for example, debt, equity, and other regulated instruments.

- The ability of the network to offer a layer of **"programmability"** across the digital assets represented within the system.

- The ability of the network to achieve legal **finality of settlement** across the digital assets represented within the system.

A mature RLN might present the kind of multi-currency, multi-asset settlement platform Charles Sanford envisioned in 1994.

The next section expands on potential benefits of a mature RLN scheme.

> " *We need to separate the wheat from the chaff when applying DLT to regulated financial services. We don't want to create anonymous currencies that are de-coupled from nation states and thus proper and valuable oversight. We want to provide a safe and secure medium of exchange that users will have confidence in. Upgrading the applicability of sovereign currency with new technology, such as DLT, makes sure that the regulated financial sector continues to innovate.*
>
> **Jon Prendergast,** Head of Payment Strategy, TD Bank

POTENTIAL BENEFITS OF RLN

The development of Bitcoin and other cryptocurrencies including stablecoins presents nation states with the challenge of preventing migration of financial activity from regulated to unregulated financial networks.

"Shadow banking" and illicit financial activity have always existed. But they may achieve greater scale when combined with modern technologies that develop ahead of legal structures to regulate them. Unregulated financial networks may present novel risks to consumer protection and financial stability, as well as new opportunities for financial crime. The growth of unregulated forms of digital money may de-couple money from the nation state, which could erode an important instrument of sovereignty.

> 66 *One of the attractive design features of the RLN concept is that every end user of the system is a customer of a regulated institution. This is in contrast with schemes that disconnect the issuer of the instrument with the end user. For decades we have been reducing the usage of bearer instruments in the fight against financial crime. The next generation of value transfer systems need to maintain the principles of "Know Your Customer" on which many vital controls are based.*
>
> **Michael Knorr,** Head of Payment and Liquidity Management, Wells Fargo

Nation states may respond by bringing novel forms of digital money into the regulatory perimeter and by further improvements in traditional account-based payment systems. An opportunity to go further may arise by adopting the same shared ledger technologies used by the new challengers to sovereign currency.

If the sovereign currency system is to adopt shared ledger technology, then interoperability should be an important consideration. The emergence of CBDC, bank coins, and stablecoins as separate islands may not lead to an efficient market structure.

The RLN proposal suggests the exploration of a public/private partnership across international lines to meet the challenge from rapidly developing unregulated forms of digital money based on blockchain technology. The RLN approach might offer the following potential benefits.

- **Globality:** The challenge from novel forms of digital money is global in nature, and so must be the response to it. The RLN concept suggests a new global settlement service that could support both domestic and international use-cases, addressing specific pain points in cross-border payments and international remittances identified by the G20 Head of State and Government Summit.

- **Sovereignty:** The RLN would operate exclusively in national currency units and would not create new synthetic currencies that might compete with domestic currencies.

- **Competition:** RLN would provide central banks, commercial banks and regulated non-banks with a common platform on top of which value-added services could be constructed. This innovation layer might increase industry competition and reduce barriers to entry.

- **Coherence:** Existing measures, such as the development of CBDC based only on central bank liabilities and proprietary bank "coins," risk fragmenting the regulated sector. The RLN approach presents an inclusive vision of programmable sovereign currency that includes different regulated issuers within an interoperable scheme.

- **Interoperability:** Many economic actors transact with multiple providers—for example, a multi-national corporation that has relationships with several banking partners. These users require interoperability across providers to conduct their basic liquidity management operations. The RLN design offers transfers at par value between participating RLN Institutions.

- **Functionality:** Shared ledger technology has the potential to lead to a more capable regulated financial sector, including development of "programmable" money. For example, conditional payments could be triggered as a result of conditions reported through trusted network "oracles", e.g., reporting the delivery of goods in port.

- **Compliance:** The RLN construct is based on new technology but also on existing legal instruments and frameworks.

- **Inclusion:** The RLN shared ledger could present a common infrastructure available to regulated banks and non-banks that might reduce the cost of serving other customer segments. One way for smaller institutions to participate in RLN could be through consortia instruments that would be interoperable with tokens issued by larger institutions.

- **Innovation:** The RLN shared ledger may offer a more powerful settlement system for other parts

of the financial system that require improved cash settlement—for example, Delivery versus Payment (DVP) in securities operations.

- **Reduced Silos:** Public blockchains like the Ethereum network can represent multiple types of digital asset in the same substrate, whereas the traditional financial system is replete with siloed infrastructure dedicated to individual legal instruments. In the digitization of national currencies through RLN, it may be possible to incorporate other forms of digital asset in the same construct. This could give rise to the "on-chain" recording, transfer, and settlement of multiple types of regulated assets and liabilities.

- **Private Regulated Balance Sheets:** The RLN concept may ameliorate the disintermediation effect of "narrow" CBDC on private balance sheets, maintaining diverse retail funding for risk assets.

- **Always On:** The RLN design could deliver a 24*7 domestic and global payments experience for retail and institutional users.

- **Customer Protection:** The scheme is based on liabilities of regulated financial institutions in favor of end customers—promises to pay the customer on demand at par value in national currency units. Existing regulatory structures such as deposit insurance and bank capital requirements are intended to maximize keeping these promises to pay.

- **Compliant Digital Money:** RLN is based on institutional grade KYC, AML, sanctions, and other regulations to prevent financial crime.

- **Anti-fraud:** All transactions could be protected by Strong Customer Authentication (SCA) to reduce payment fraud, and all transactions in the network could be digitally signed. Please note that it would be the responsibility of the RLN Institution to offer the user interface to the RLN User.

- **Liquidity Management:** Improved liquidity management for participating financial institutions may be possible. One example could be through the ability to move money instantly between subsidiaries and branches. This could potentially reduce inefficient liquidity buffers, nostro balances, and reconciliation tasks.

- **FX Markets:** Expedited Payment versus Payment (PVP) settlement may be possible through an RLN incorporating multiple central banks on the network.

- **Securities Markets:** Expedited Delivery versus Payment (DVP) settlement may be possible as digital assets proliferate. Securities might conceivably be represented

directly with the RLN. The scheme might also offer the cash settlement layer supporting a separate tokenized asset infrastructure.
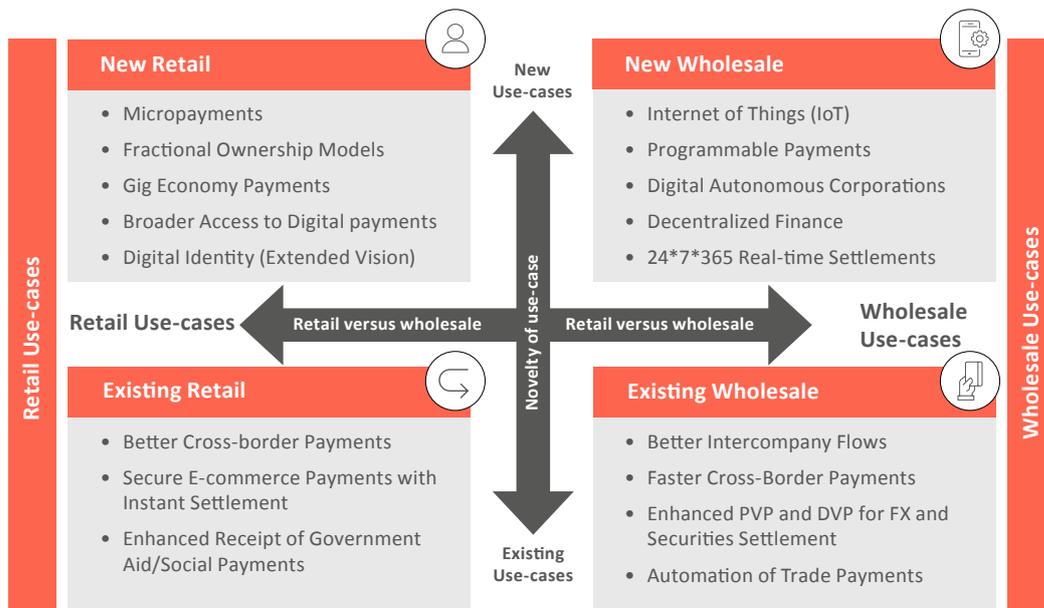
These potential benefits are still hypothetical at the time of writing. As noted, several enhancements to the sovereign currency system are under way or being evaluated through the application of both traditional and novel technologies. The deployment of shared ledger technology within a regulated framework may create a new innovation space, or it may not. The RLN Community intends to put the thesis to the test through technical, legal, and business investigations and experimentation. This work is intended to add to the body of knowledge on digital currencies, whether the thesis is proven true or false.

> " *RLN presents a paradigm shift in the mindset of banking infrastructure that leverages modern technology to overcome friction in today's payment and settlement landscape. I am particularly excited by the opportunity to provide digital access to money for millions of unbanked individuals in developing markets of South-East Asia through a network of regulated instruments (CBDCs, private bank monies, and e-wallets) instantly on a 24*7 basis with trust and security.*
>
> **Melvyn Low,** Head of Transaction Banking, OCBC

POTENTIAL RLN USE-CASES

The RLN would be designed to support the same use-cases as account-based "regulated liabilities" but with the enhanced functionality of programmable, always-on digital money offering "on-chain" finality of settlement.

New Retail
- Micropayments
- Fractional Ownership Models
- Gig Economy Payments
- Broader Access to Digital payments
- Digital Identity (Extended Vision)

New Wholesale
- Internet of Things (IoT)
- Programmable Payments
- Digital Autonomous Corporations
- Decentralized Finance
- 24*7*365 Real-time Settlements

New Use-cases

Retail Use-cases

Novelty of use-case

Retail versus wholesale   Retail versus wholesale

Wholesale Use-cases

Existing Retail
- Better Cross-border Payments
- Secure E-commerce Payments with Instant Settlement
- Enhanced Receipt of Government Aid/Social Payments

Existing Wholesale
- Better Intercompany Flows
- Faster Cross-Border Payments
- Enhanced PVP and DVP for FX and Securities Settlement
- Automation of Trade Payments

Existing Use-cases

Retail Use-cases

Wholesale Use-cases

- **Internal Book Transfers:** RLN Institutions that are global banking groups may find it convenient to move money between international branches through RLN, simplifying complex internal nostro arrangements that require extensive reconciliation processes.
- **Person to Person (P2P):** P2P transactions would take place instantly between RLN Users either domestically or internationally, subject to compliance and fraud checks.
- **Business to Business (B2B):** The RLN would support programmability to enhance B2B flows—for example, conditional payments and future dated payments dependent on trigger events.
- **Consumer to Business (C2B):** The RLN would support new business models, such as those requiring micro-payments.
- **Business to Consumer (B2C):** The RLN would support new economy models, such as the gig economy. Gig economy workers would be able to receive RLN Payments from multiple employers instantly.
- **Consumer to Government (C2G):** The programmability of RLN would facilitate consumers and businesses timely settlement of obligations to governments, such as taxes, permits, and other payments paid on an automated basis.
- **Government to Consumer (G2C):** Governmental users would be able to leverage RLN programmability to automate aid and other social payments, such as conditional on risk or medical assessments.

- **Collateral Management:** The RLN could be used as the cash settlement leg of a collateral management transaction.

> " *More and more consumers, governments and businesses are exploring the benefits of using digital currencies for payments. In addition to considerations around CBDCs and compliant stablecoins, there should be the option of leveraging the scale and economic value of bank deposits. The RLN is an innovative proof of concept led by the industry that could help shape how consumers and businesses view the credibility of token-based payments.*
>
> **Raj Dhamodharan,** EVP Blockchain/Digital Asset Products & Digital Partnerships, Mastercard

In addition to these use-cases, the RLN could support other capabilities:

- **Payment versus Payment (PVP):** RLN could settle obligations in multiple currencies on a PVP basis through atomic settlement arrangements.

- **Delivery versus Payment (DVP):** RLN could support the orchestrated settlement of RLN Liabilities versus other regulated assets, either within the RLN construct or through connection to other FMIs.

- **Global RTGS Capability:** As multiple central banks may manage partitions in RLN the network could have 24*7 settlement capability in multiple central bank liabilities. This would deliver the equivalent of a global RTGS system, offering the participants next-generation settlement capabilities. Solving for multi-currency settlement would be a significant contribution to the G20 roadmap for enhancing cross border payments.[28]

- **Multi-asset Capability:** One of the interesting features of DLT is that it can express any arbitrary asset on a common, programmable substrate. Therefore, RLN is potentially capable of tokenizing not only regulated liabilities but also other regulated assets. This may lead to a regulated financial system that is less siloed.

> " *Commercial bank money is a powerful contributor to economic well-being because it performs two functions at once. It provides a convenient medium of exchange for most economic purposes and these transfers increasingly happen in real time. More subtly, commercial bank money provides the raw material for the creation of the risk assets—the lending that powers economic growth and progress. If DLT is a superior technology platform, then the right kind of money to deploy on DLT is commercial bank money.*
>
> **J. Christopher Ward,** EVP, Head of Wholesale Payments, Truist

> " *Working with banks, importers, exporters, and transport companies, we have proven with Contour that Trade can be transparent, digitized and de-fragmented with enhanced coordination using de-centralized technology. However, we process all related payments off-chain using traditional rails. We can further improve Trade reconciliation if we can bring payment and settlement on chain as well because every Trade transaction ends with a payment.*
>
> **Carl Wegner,** CEO, Contour Network

> " *Market volatility dictates the speed at which collateral needs to be mobilized but the technology deployed across the market determines the speed at which it operates. In a T+0 ecosystem, HQLAx already facilitates the transfer of ownership of securities at precise moments in time but the ability to mobilize collateral 'on chain' versus payment and with increased velocity is the panacea.*
>
> **Guido Stroemer,** CEO, HQLA[x]

CORPORATE CASH MANAGEMENT APPLICATIONS OF RLN

The investigation of RLN is concerned with solving for real-world problems that may not be readily addressed by alternative approaches. One focus area is corporate cash management. This may be an area where programmable sovereign currency might be useful, but it is not an obvious use-case for CBDC or stablecoins. In fact, there are strong reasons to conduct these operations in commercial bank money.

A multinational corporation might operate through hundreds of legal entities around the world. The centralized treasuries of these firms manage the liquidity needs of subsidiaries in multiple currencies. In-house banking arrangements manage shortfalls in one subsidiary through intercompany lending arrangements. Good liquidity management for a corporation means having enough liquidity on hand to meet obligations, but not excessive amounts that could be better deployed within the firm.

In domestic environments, businesses and consumers are becoming accustomed to making instant payments in single currency through new real-time clearing systems. But corporations have no such facility to use on a global, multi-currency basis. Let's say a corporation needs to move USD between a subsidiary with money at Bank A in Hong Kong to a subsidiary in Australia that is working with Bank B. Significant friction occurs in such operations that might be addressed through a multicurrency instant settlement system such as RLN. Better cash management reduces working capital and funding costs, enabling corporations to deploy capital into productive projects more efficiently.

When considering programmable money, corporations could take advantage of smart contracts to further automate liquidity management across hundreds of subsidiaries. Corporations have also expressed interest in programmable money to empower new applications such as the Internet of Things (IoT) and micropayments.

Corporate cash management is a salient use-case when considering alternative digital money propositions, because it is an activity that could not readily be supported by either CBDC or stablecoins.

• Conducting corporate cash management on CBDC would move hundreds of billions of dollars of liquidity from private-sector to public-sector balance sheets, significantly impacting the ability of the affected institutions to lend.

• Corporate cash management could not readily be conducted through stablecoins while they remain on the fringes of the regulatory perimeter. They are not cash-equivalent instruments, and the nature of their claim on the issuer is unclear. Even if stablecoins were regulated, they have the disadvantage of being pre-funded instruments. This is not an ideal arrangement for multinationals that often rely on intra-day and overnight lines of credit to conduct cash management operations. Stablecoin regulation also may not permit remuneration of balances on these instruments, which would represent another significant impediment to corporate adoption.

This deep dive into corporate cash management is intended to demonstrate that potential use-cases for programmable sovereign currencies exist that address real-world problems, but they cannot readily be conducted through alternatives such as CBDC and stablecoins.

> " As the financial system adopts new technologies like DLT, there will be a strong need for interoperability and common rules. RLN is an initiative that looks into the future of tokenized finance and recognizes the need to solve for settlement in an interoperable way. Corporations do business in multiple geographies, currencies and with multiple banking partners. They are looking for banking solutions that take advantage of the latest technologies and are beginning to demand the kind of services that might take advantage of blockchain technology to deliver smarter money.
>
> **Vincent Lau,** Asia Head of International Payments, HSBC

The corporate cash management case study reinforces the point that upgrading the sovereign currency system through shared ledger technology should be considered a public/private partnership. It needs to encompass the different faces of regulated money: central bank money, commercial bank money, e-money, and in the future, regulated stablecoins.

This flow chart illustrates how corporate cash management in a single currency could be achieved through RLN.
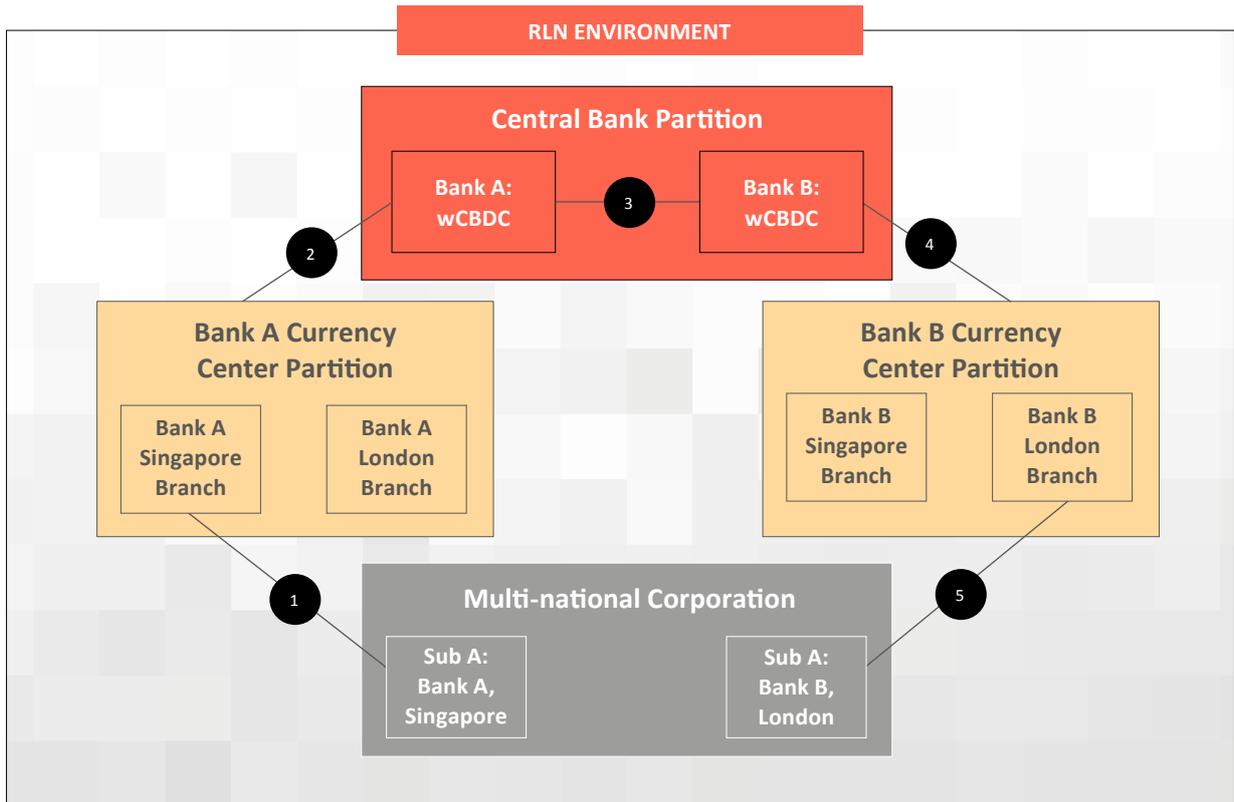
In this example, a multinational corporation wants to make an instant transfer of USD between its subsidiary in Singapore that is banking with Bank A, to a subsidiary in London that is banking with Bank B:

- Subsidiary A has an RLN Wallet in USD with the Singapore branch of Bank A.

- The Singapore branch of Bank A has an RLN Wallet in USD with the Currency Center of Bank A in New York.

- The Currency Center of Bank A has an RLN Wallet holding wCBDC with the central bank.

- Subsidiary B has an RLN Wallet in USD with the London branch of Bank B.

- The London branch of Bank B has an RLN Wallet in USD with the Currency Center of Bank B in New York.

- The Currency Center of Bank B has an RLN Wallet holding wCBDC with the central bank.

- **Step 1:** Sub A instructs the Singapore branch of Bank A to effect payment to Sub B in London.
- **Step 2:** The Singapore branch of Bank A settles with the Currency Center of Bank A.
- **Step 3:** The Currency Center of Bank A settles with the Currency Center of Bank B in wCBDC.
- **Step 4:** The Currency Center of Bank B settles with the London branch of Bank B.
- **Step 5:** The RLN Wallet of Sub B is credited in USD.

Please note that these transactions are executed atomically on the shared ledger. This is so that the customer payment flow and the balance sheet updates at the branches, currency centers, and central bank take place simultaneously. This arrangement effectively delivers a global instant-payment scheme for corporate cash management flows on a multi-bank basis. The scheme could be extended to instant multi-currency operations through the participation of multiple central banks in the RLN scheme.

> "*Corporate cash management is one application of programmable money that might be conducted using tokenized commercial bank money. Domestic instant payment schemes have proven popular and satisfy the needs of local consumers making relatively low-value payments. RLN could extend the benefits of instant payments to corporations globally. This could not only assist with internal liquidity management but could also create better payment connectivity to commercial counterparties. A new global settlement rail could be a significant contribution to G20 objectives to improve cross-border payments.*
>
> **Shahmir Khaliq,** Global Head of Treasury & Trade Solutions, Citi

RLN NEXT STEPS

The construction of a new industry utility is a complex and time-consuming task that requires significant commitment from many stakeholders. The RLN Community wants to explore the core thesis in a collaborative model. Success is measured by the insights and experience the community shares in the global debate on digital currency, expanding the discussion beyond CBDC and stablecoins. Whether or not the RLN thesis is proven, a strong contribution to the debate can be made through investigation of RLN's technical, legal, and business attributes.

The RLN Community will explore the concept along these 5 dimensions:

1. **Legal Viability:** Legal analyses will examine the following in selected jurisdictions:
    - The hypothesis that "regulated liabilities" in tokenized form are legally equivalent to their traditional representations.
    - The nature of the retail or wholesale CBDC incorporated in the RLN structure, and whether such an instrument may be issued within existing legal frameworks.
    - The network's ability to achieve legal finality of settlement domestically and internationally.

2. **Technical Feasibility:** Several RLN sandboxes will likely be developed by different vendors. Various areas of investigation would be included:
    - Technical ability to deliver the functionality envisioned.
    - Performance metrics such as Transactions Per Second (TPS).
    - Security and cyber resilience.
    - Architectural choices, such as one DLT versus an interconnected network of DLTs.

3. **Network Utility:** The RLN Community is more interested in testing business hypotheses than in making claims about any given technology. A fundamental question is whether a network of "tokenized" liabilities delivers any improvement over what might be achieved through alternative approaches. In other words, the RLN Community will want to answer the question, "What are these coins uniquely good for?"

4. **Community Engagement:** The RLN construct will be evaluated alongside other visions for the future of digital currency to see whether it could serve as a common vision among regulated players. The RLN Community will reach out to many kinds of stakeholders to determine whether RLN meets their needs.

5. **Regulatory Engagement:** RLN could only succeed as a public/private partnership. In particular, it needs the active engagement of central banks. RLN depends on the willingness of regulated institutions to get comfortable with storing their liabilities on an external computer system.

The RLN Community welcomes discussion and engagement with policy makers, central banks, commercial banks, regulated non-banks, stablecoin issuers seeking regulation, technology partners, law firms, prospective users, and other stakeholders in the payments ecosystem to further refine these propositions.

Central banks seeking to explore the RLN concept are likely to encounter strong support from the regulated financial community that wants to directly contribute to fundamental improvements in the operations of the sovereign currency.

If after a sufficiently robust period of experimentation there appears to be legal justification, technical feasibility, and strong community/regulatory engagement, then the RLN Community may consider next steps in building RLN, or incorporate learnings in future industry initiatives.

> " *Multinational corporates are beginning to explore and demand programmable money to support new business models like internet of things and machine-to-machine payments. There is an emerging consensus that new form factors of the Euro could lead to significant efficiency gains and innovation. Corporations believe that a uniform standard will be required for tokenized commercial bank money—they do not want each bank to develop their own coin systems in isolation. They have walked that road already with proprietary electronic banking systems. RLN demonstrates how the regulated private sector can collaborate with the public sector to deliver an interoperable programmable currency that will meet these emerging needs.*
>
> **Dr. Jan Rosam,** Partner and EMEIA Digital Asset & Digital Currency Consulting Lead, Ernst & Young

CONCLUSION

Society is facing a choice among five alternative conceptions of digital money. Central bank money, commercial bank money, e-money, cryptocurrencies, and stablecoins offer different visions for the future of money. The contenders fall into two major camps: regulated sovereign money and non-regulated, non-sovereign money.

This premise of this paper is that sovereign money needs to meet the legitimate needs of economic actors as the digital economy continues to expand. It would not be desirable if the only option to participate in new economic models based on blockchain technology are provided by non-regulated, non-sovereign forms of money. Any significant shift from regulated to non-regulated money would be highly undesirable.

How is the sovereign currency system to respond to the challenge? An enormous program of work is ongoing to develop new payment systems and upgrade existing rails. Many of these seek to augment the existing paradigm, in which regulated money is represented in the proprietary databases of each financial institution.

CBDC projects are under way in many countries, to provide public money in digital form so that lower cash usage does not result in all money being private. Several banks are engaged in creating their own digital "coins," and stablecoins may be brought within the regulatory perimeter in due course.

It is unclear whether the sum of existing efforts to upgrade the sovereign currency system can meet the challenge of unregulated digital money. Enhancements to the existing messaging paradigm may be insufficient. CBDC projects may set up competition within the sovereign currency system and not act as substitutes for the external threat. The creation of proprietary bank coins may lead to a fragmented market structure that does not meet the needs of multi-banked users such as corporations.

In the digital money race, shared ledger technology might possibly offer sustainable competitive advantage to non-sovereign forms of digital money. These advantages could lead to the progressive substitution of non-sovereign money for sovereign money over time.

> *In 2020, the Digital Dollar Project announced a U.S. CBDC champion model as a tangible contribution to the U.S. maintaining leadership in the rapidly evolving digital economy. Programmable money could unlock a new wave of innovation while maintaining the vital role of U.S. dollars in the global economy. The RLN concept adds another candidate model that merits close consideration. Rigorous testing and analysis of a range of different models is the best way to reach consensus on the next generation of national digital currencies.*
>
> **Jennifer Lassiter,** Executive Director, Digital Dollar Project

If shared ledger technology is a superior computing substrate, then the sovereign currency system should consider adopting it in a joined-up manner. The future of the sovereign currency system should not be a one-way bet on a set of enhancements to the existing paradigm of payments. We might consider a new way to structure the database of sovereign money: it may have to be represented "on-chain".

The components of the sovereign currency system are regulated liabilities: unambiguous promises to pay the customer on demand at par value in national currency units. These existing legal instruments can be represented and processed on shared ledger technology without significant changes to existing rules and regulations. Stablecoins may be represented within such a network when they gain the status of regulated liabilities.

What problem might such a network solve? Payments are made up of messaging and settlement layers. Messaging is largely solved, but settlement is not. The world lacks a global, multi-currency, multi-asset settlement layer that can achieve legally certain finality of settlement.

The RLN proposal may point toward the creation of such a network, ensuring that the sovereign currency system maintains supremacy. The RLN Community wants to explore the technical, legal, and business viability of such a network as a contribution to the debate on the future of digital money. A positive contribution may be made whether the RLN thesis is supported or falsified through further investigation. The objective of this work is to encourage a cohesive response by the sovereign currency system to the challenges that may arise from the growth of non-regulated, non-sovereign currencies.

> *The RLN is an intriguing concept. It promises to bring potential efficiencies from distributed ledger technology to the world of payments, without creating the same financial stability and economic growth problems of a central bank digital currency. With RLN, commercial bank money and central bank money maintain their current roles, but both could transfer on a blockchain. As a result, they could displace other less regulated and less safe money-like instruments whose current selling point is 24*7 on-chain availability.*
>
> **Greg Baer,** CEO, Bank Policy Institute

INDUSTRY CONTRIBUTORS
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- **Chris Swanson** is Senior Vice President and Product Innovation Director with U.S. Bank's Innovation team. He has been engaged in the blockchain and cryptocurrency space since 2014 and leads U.S. Bank's exploration and application of the technology across all business functions. He has spoken extensively on the technology and its impact in financial services and beyond at events such as South by Southwest Interactive and Consensus.

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GLOSSARY OF RLN TERMINOLOGY

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- **Finality of Settlement:** Legal certainty that payments entering RLN are finally settled, regardless of whether the sending participant has become insolvent or payments have been revoked in the meantime.[29]

- **Financial Market Infrastructure (FMI):** A multilateral system used for the purposes of clearing, settling, or recording payments, securities, derivatives, or other financial transactions.

- **Principles for Financial Market Infrastructures (PMFIs):** A set of internationally accepted principles and best practices for the sound operation of FMIs.[30]

- **RLN Community:** The group of interested parties exploring RLN potential. Participants include central banks, commercial banks, regulated non-banks, technology vendors, industry consortia, and others.

- **RLN Consortium:** The group of regulated institutions that may come together to build the RLN in the future, if testing of the thesis points to tangible benefits.

- **RLN Institution/Participant/Member:** Central banks, regulated central banks, commercial banks, and regulated non-bank payment institutions (potentially including licensed stablecoin Issuers, when encompassed within the regulatory perimeter).

- **Regulated Liabilities:** The liabilities of regulated institutions, namely central banks, commercial banks, and regulated non-bank e-money providers. Regulated liabilities are promises to pay the known customer on demand at par value in national currency units. The regulatory framework is designed to maximize the probability of redemption on demand.

- **Regulated Liability Network (RLN):** A conceptual regulated FMI that provides settlement services to its participants in multiple currencies and potentially across multiple asset types.

- **RLN Liabilities:** The liabilities of an RLN Institution recorded in the RLN Partition operated by that institution. Please note that the liabilities of regulated institutions include, but are not limited to, deposits.

- **RLN Partition:** The portion of the RLN network in which the liabilities of the RLN Institution are recorded. The RLN Partition is an extension of the RLN Institution's own books and records. The RLN Institution is in complete control over the operations within its RLN Partition. Please note that the concept of the RLN Partition is a legal/conceptual structure, rather than an indication of how this structure might be implemented on any given computer system.

- **RLN Rulebook:** The agreed-upon operating rules of the RLN FMI.

- **RLN Shared Ledger:** The technical infrastructure on which the RLN operates. The RLN infrastructure is currently undefined, because the construct may be amenable to a range of technical architectures and approaches. It may be a single DLT, or a network of DLTs. It may not be a DLT at all. The RLN construct is currently independent from any particular technology.

- **RLN Token:** A digital representation of an RLN Liability on the RLN Shared Ledger.

- **RLN User:** A known customer of an RLN Institution subject to KYC due diligence. RLN Users may be any economic actor, either wholesale or retail customers. Customer access to RLN-related services is the prerogative of the RLN Institution.

- **RLN Wallet:** RLN Institutions that may provide RLN Users with RLN Wallets to access RLN Liabilities. Please note that the customer interface to RLN is determined by the RLN Institution.

- **Tokenized Deposit:** A Regulated Liability issued by a commercial bank. It is not a stablecoin, because it is not collateralized. It is a different form factor for recording a deposit liability.

APPENDIX A: PROPERTIES OF RLN LIABILITIES

The RLN scheme records, transfers, and settles the "regulated liabilities" of RLN Institutions. The liabilities of an RLN Institution recorded on an RLN Partition are intended to be equivalent to a normal account balance recorded in the RLN Institution's proprietary ledger system. The only difference is that RLN Liabilities are stored and processed on a shared ledger that can perform finality of settlement among participants.

Liabilities of an RLN Institution are in favor of that institution's known customers. These RLN Users may be the RLN Institution's wholesale or retail customers. The RLN User has the right to demand redemption at par value from their own institution. The RLN Institution will offer instant transfers between traditional account representations and RLN representations of its liability to the RLN User.

RLN Liabilities share a range of properties.

- **Issuance:** RLN Liabilities may only be issued by central banks, regulated financial institutions, and non-bank regulated institutions authorized to issue e-money. RLN Liabilities would be issued in exchange for cash or account-based central bank money, commercial bank money, or e-money.

- **CBDC Support:** RLN liabilities issued by the central bank may be "retail" CBDC issued to the general public, "wholesale" CBDC issued to institutions for the purposes of settlement, or both.

- **Currency Unit:** RLN Liabilities are only denominated in national currency units. No synthetic units that may gain preference against sovereign units of account will be created.

- **Redeemability:** The RLN Institution would be liable to redeem RLN Liabilities in the relevant currency on demand at par value to the RLN User.

- **Legal Status:** RLN Liabilities are intended to be directly equivalent to their "regulated liability" equivalents when represented in account-based format on the proprietary databases of the RLN Institution.

- **Deposit Insurance:** Regulated liabilities that benefit from deposit insurance in traditional account-based form are intended to have the same treatment when represented on the RLN.

- **Interest:** RLN Institutions could pay the same interest on RLN Liabilities as they would on ledger balances (e-money institutions may not permitted to pay interest in some jurisdictions). Interest on RLN Liability balances may be paid within the RLN construct, or credited to traditional account balances.

- **Wallet Characteristics:** RLN Wallets would be made available by participating institutions only to fully KYC'd account holders. There would be no non-KYC'd wallets on RLN unless central banks want to make this feature available on a limited basis—for example, to promote financial inclusion.

- **Balance Sheet Treatment:** RLN Liabilities are designed to be in favor of the RLN User. They are intended to be counted as deposits on the balance sheet of the participating RLN Institution. This overcomes a potential downside of "narrow" CBDC designs that concentrate deposits at the central bank. The balance sheet characteristics of RLN maintain the essential features of the two-tier financial system.

- **Usage:** RLN Liabilities could be made available to retail and institutional customers of the RLN Institution to support all valid payment wholesale and retail use-cases.

- **Programmability:** RLN would support smart contracts that can act on RLN Liabilities (such as conditional payments). RLN Smart Contracts could be accessed by the RLN User through the RLN Institution.

- **Interoperability:** RLN would be designed to be interoperable with existing payment/ liquidity networks (like correspondent banking or the Swift messaging platform) and emerging networks (such as tokenized asset networks).

> **"** *The benefits of regulated liability networks for financial services firms are vast. When paired with the right smart contract and distributed ledger technology, the regulated network itself contains the necessary privacy and scalability features essential for maintaining regulatory compliance and ensuring the foundation for the continued growth of digital currencies and the tokenization of related financial instruments.*
>
> **Yuval Rooz,** Co-Founder and CEO, Digital Asset

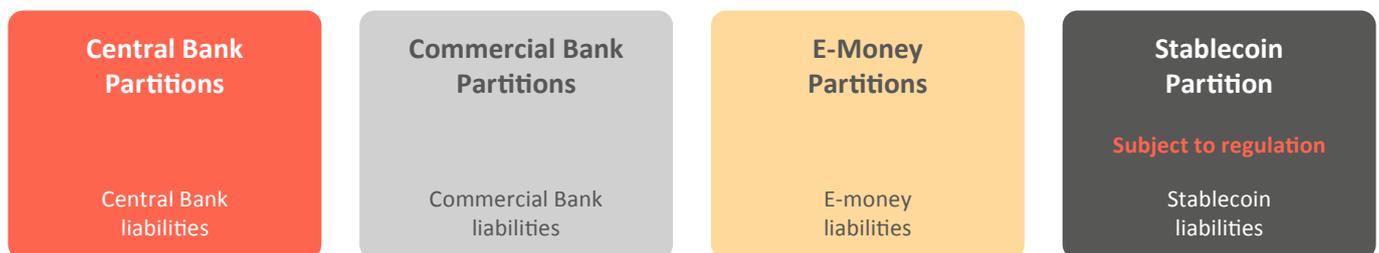# APPENDIX B: RLN SHARED LEDGER AND PARTITIONS

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The RLN FMI would operate a shared ledger for the recording, transfer, and settlement of RLN Liabilities. At this stage, the shared ledger to be used has not been specified.

The essential conceptual feature of the scheme is that the liabilities of the participating institutions are recorded "in" the network and that this network can directly act on those liabilities in a programmatic manner. In other words, the money is "in" the network, the network operates continuously, it can perform a variety of programmable operations on the money in the network, and it is able to achieve legal finality of settlement.

The RLN construct is amenable to a range of technical approaches that will likely change over time. The following explanation of the workings of the RLN Shared Ledger is therefore to be considered conceptual rather than technical.

The RLN Shared Ledger would be comprised of several logical/legal **partitions,** or extensions of the bookkeeping conducted by each RLN Institution. The concept of "partition" in RLN is analogous to the notion that the embassy of a country in a foreign land is considered the territory of the home country.

Regulated Liability Network FMI

Central Bank Partitions	Commercial Bank Partitions	E-Money Partitions	Stablecoin Partition
			Subject to regulation
Central Bank liabilities	Commercial Bank liabilities	E-money liabilities	Stablecoin liabilities

In the same way a partition run by an RLN Institution is the "territory" of the institution, the RLN Institution decides who has access to that partition. Any liabilities recorded in the partition operated by an RLN Institution are intended to be the unambiguous obligations of that institution.

This implies that the RLN Institution **must be satisfied to record its liabilities in an external computer system.** Furthermore, it must accept that authorized operations may be conducted on those liabilities within an external computer system that displays legal finality of settlement.

The following sections describe how these partitions are intended to function within the RLN design.

Central Bank Partitions

RLN Liabilities held in the central bank partition are the liability of the central bank. They are supported by the full faith and credit of the sovereign entity and are therefore free of counterparty risk. RLN Liabilities issued by the central bank in RLN represent Central Bank Digital Currency (CBDC).

- Multiple central banks may operate on the RLN, each providing their liabilities in their own currency as a 24*7 settlement asset within the network.
- The central bank offers RLN Wallets to RLN Users according to its own access rules. For example, the central bank may want to limit access to private RLN Institutions. Alternatively, it may decide to extend access to a broader set of economic actors, including individual persons. In other words, the RLN construct supports both "wholesale" and "retail" CBDC use-cases.
- If the central bank wants to offer access to retail customers, then it may do so either directly or through private-sector distribution agents (so-called "Two Tier CBDC"[31]).
- If the central bank decides to deploy a scheme for the transfer of RLN Liabilities in an "offline mode," then it may do so. Each RLN Institution, including the central bank, would be responsible for its own customer interface to the scheme.
- Each central bank enforces its own access rules. Only those authorized to participate in a central bank partition may hold wallets in that partition. In other words, not all RLN Institutions would have automatic access to the central bank partitions available on the RLN.
- If the central bank does not grant access to its partition to a regulated non-bank RLN Institutions (for example, an e-money institution), then those participants would settle through partner institutions that do have access to the central bank partition.
- If an RLN Institution does not have access to the partition of a central bank in which it wants to make a payment, then it would use the services of an RLN Institution that does have access to that central bank partition.
- If a commercial bank has access to the central bank partition, then those RLN liabilities are equivalent to the reserves of the commercial bank as if they were held in a normal central bank reserve account—that is, they are High Quality Liquid Assets (HQLA).
- Please note that RLN does not operate "omnibus" accounts on behalf of participants to give access to central bank money in the RLN scheme. Each RLN Institution granted access to a given central bank partition directly holds the liability of the central bank.

> ❝ *The RLN provides a potential path forward the interoperability of the different aspects of sovereign currency. The suggestion of a common transaction network for central bank money, commercial bank money and regulated e-money could provide food for thought for monetary authorities thinking about the next generation of national payment systems. Bitt's experience shows that there is appetite to modernize national currencies through the latest technologies, with our platform being interoperable with multiple underlying transaction networks. We consider RLN to be an intriguing addition to the thought process, with the potential to unite commercial banks, fintechs and central banks in a common vision.*
>
> **Simon Chantry,** Co-Founder and Chief Information Office, Bitt

Commercial Bank Partitions

- Each commercial bank has its own partition on RLN per the legal entity that wishes to participate. The partition belongs to a given legal entity.
- RLN Liabilities held in a commercial bank partition are the liability of the commercial bank. It is intended that there is no legal, accounting, or balance sheet difference between a liability held in the form of an RLN Liability or a liability held in the bank's existing proprietary account-based ledger system in its own data center.
- Commercial bank liabilities in the RLN are not stablecoins. They are not new legal instruments. They are not 100% collateralized or backed by central bank money.[32]

- Commercial bank liabilities in the RLN are backed by the balance sheet of the commercial bank in the same way as customer account balances.
- There is no fixed connection between the tokens in the commercial bank partition and the wallet that the commercial bank will hold in the central bank partition.
- RLN Liabilities in the commercial bank partition are customer balances. They are suitable for use by wholesale and retail customers of the commercial bank.
- RLN Liabilities in the wallet that the commercial bank holds in the central bank partition are intended to be counted as bank reserves.
- When a commercial bank wants to make a book transfer between clients in its own books, RLN Liabilities move between wallets in the commercial bank's own partition.
- When a commercial bank wants to make a payment to another party, tokens are "burned" in the commercial bank partition because the RLN Liability is extinguished.
- When a commercial bank receives a payment from another party, a token is "minted" in their Partition, because a new RLN liability is created.
- When liabilities are transferred between parties, ultimately they are always settled through transfers of RLN Liabilities in the central bank partition. Settlement could be achieved in gross or net modes.
- Commercial bank liabilities in the RLN may pay interest, because they are normal liabilities of a commercial bank. Likewise, they will be protected by any extant deposit protection scheme, just like account-based commercial bank liabilities.

Commercial Bank Consortia Partitions

- Schemes such as the USDF Consortium and the Tassat solution have been developed to enable groups of commercial banks to collaborate on the issuance of tokenized commercial bank money.
- The instruments from such consortia may be issued in the RLN and would thereby become interoperable with the RLN liabilities issued by other institutions in the network.
- The inclusion of RLN Liabilities issued by consortia of regulated institutions may reduce the barriers to participation for smaller institutions to join the network and offer programmable money to their customers.

> *As we seek to leverage the benefits of blockchain in financial services, it is critical that we maintain the numerous protections and benefits that our two-tier banking system provides today. We believe it is critical that banks be able to perform the same credit creation role on-chain as they do in every other market. USDF is committed to ensuring that banks of all sizes can leverage tokenized deposits and participate in the RLN ecosystem.*
>
> **Rob Morgan,** CEO, USDF Consortium

Electronic Money Partitions

- Each regulated non-bank e-money provider has its own partition in the RLN per legal entity.
- In contrast to commercial banks, e-money providers will need to 100% collateralize tokens in their partition, according to existing e-money or stored value rules.

- They may hold these safeguarded funds either within the RLN construct or outside. For example, the e-money provider may hold client funds in a wallet in a commercial bank partition. They may also hold client funds in a normal commercial bank account.
- If the central bank chooses to give access to e-money providers, then they may be able to hold their client funds or operate a settlement facility in the central bank partition. It is the prerogative of the central bank to decide who may participate in the central bank partition.
- Existing e-money rules would apply to liabilities held in an e-money partition in the RLN. For example, if interest is not allowed for account-based e-money, then it is not allowed for RLN Liabilities in the e-money provider's partition.

Stablecoin Partitions

- Currently, the regulations to bring stablecoins into the regulatory perimeter are still in development in most major markets.
- The ability for a stablecoin issuer to become an RLN Participant would be dependent on the outcome of these rule-making processes and the emergence of regulated issuers within those frameworks.
- Regulated stablecoin issuers may participate in RLN once a clear regulatory framework is in place that establishes stablecoins as belonging to the class of "regulated liabilities."
- So-called "algorithmic" stablecoins are unlikely to qualify as regulated liabilities in the foreseeable future, because their ability to sustainably redeem at par value on demand remains uncertain.
- A participating regulated stablecoin issuer would be required to know the end users and have a clear contractual relationship with them that establishes their unambiguous legal claim against the stablecoin issuer.
- The RLN does not support "bearer instruments" in the scheme.[33] This means that stablecoins in RLN could not be passed to non-customers of the regulated stablecoin issuer without KYC processes being applied.
- The RLN could potentially enable regulated stablecoin issuers to participate and interoperate with the regulated financial system.

> *Novel settlement infrastructures powered by innovative DLT technologies and "smart money" offer tremendous benefits for regulated financial institutions, while laying a foundation for continued innovation. The concept of the RLN promises to enable an interoperable network of sovereign currencies, unlocking liquidity across emerging financial market infrastructures. R3 is proud to participate and contribute to the research and development of the RLN and the ongoing transformation of the global financial system.*
>
> **Alisa DiCaprio,** Chief Economist, R3

APPENDIX C: RLN COMPLIANCE WITH PFMI

The RLN would be a Financial Market Infrastructure (FMI) to deliver legal finality of settlement in the network. The RLN design fits within the Bank of International Settlements (BIS) definition of an FMI:[34]

An FMI is defined as a multilateral system among participating institutions, including the operator of the system, used for the purposes of clearing, settling, or recording payments, securities, derivatives, or other financial transactions. FMIs typically establish a set of common rules and procedures for all participants, a technical infrastructure, and a specialized risk-management framework appropriate to the risks they incur. FMIs provide participants with centralized clearing, settlement, and recording of financial transactions among themselves or between each of them and a central party to allow for greater efficiency and reduced costs and risks. Through the centralization of specific activities, FMIs also allow participants to manage their risks more efficiently and effectively, and, in some instances, eliminate certain risks. FMIs can also promote increased transparency in particular markets. Some FMIs are critical to helping central banks conduct monetary policy and maintain financial stability.

The BIS has laid out 17 principles by which FMIs should operate safely and soundly to promote financial stability. If an RLN FMI is created, it would operate in strict adherence to these principles.

1. **Legal Basis:** The RLN would have a well-founded, clear, transparent, and enforceable legal basis for each material aspect of its activities in all relevant jurisdictions. An RLN Legal Whitepaper will be developed to articulate this legal structure.

2. **Governance:** The RLN would have governance arrangements that are clear and transparent through the RLN Board and Charter; promote the safety and efficiency of the scheme; and support the stability of the broader financial system, other relevant public interest considerations, and the objectives of relevant stakeholders.

3. **Risk Management:** The RLN would have a risk-management framework for comprehensively managing legal, credit, liquidity, operational, and other risks.

4. **Credit Risks:** The RLN would measure, monitor, and manage its credit exposures to participants and those arising from its payment, clearing, and settlement processes.

5. **Liquidity Risk:** The RLN would measure, monitor, and manage liquidity risk across the network.

6. **Settlement Risk:** The RLN would offer clear and final settlement in real time, based on the availability of central bank money in the RLN Partitions operated by participating central banks.

7. **Money Settlements:** RLN Institutions would conduct money settlements in central bank money where practical and available— that is, through wholesale CBDC represented in the system. If central bank money is not used, RLN Institutions would minimize and strictly control the credit and liquidity risk arising from the use of commercial bank money.

8. **Exchange of Value Settlement Systems:** When RLN effects transactions that involve the settlement of two linked obligations, it would eliminate principal risk by making the final settlement of one obligation conditional on the final settlement of the other.

9. **Participant Default Rules and Procedures:** The RLN would have effective and clearly defined rules and procedures to manage RLN Institution defaults. These rules and procedures would ensure that the RLN could take timely action to contain losses and liquidity pressures and continue to meet its obligations.

10. **General Business Risk:** The RLN would identify, monitor, and manage general business risk and hold sufficient liquid net assets funded by equity to cover potential general business losses, so that it could continue operations and services as a going concern if those losses materialize.

11. **Operational Risk:** The RLN would identify sources of operational risk (both internal and external) and mitigate their impact using appropriate systems, policies, procedures, and controls. The RLN would ensure a high degree of security and operational reliability and have adequate, scalable capacity. Business continuity management would deliver timely recovery of operations and fulfilment of obligations, including during a wide-scale or major disruption.

12. **Access and Participation Requirements:** The RLN would have objective, risk-based, and publicly disclosed criteria for participation, which permit fair and open access. All direct participants in the RLN would be central banks, regulated financial institutions, and regulated non-bank Institutions.

13. **Tiered Participation Arrangements:** The RLN would have clear rules and arrangements for indirect participation in the scheme and manage any risks associated with indirect participation.

14. **FMI Links:** The RLN would be connected to other FMIs to deliver interoperability and offer cash settlement services to other FMIs. The risks of these links would be identified, monitored, and managed.

15. **Efficiency and Effectiveness:** The RLN would meet the needs of RLN Institutions and the markets it serves, in particular, regarding choice of clearing and settlement arrangement; operating structure; scope of products cleared, settled, or recorded; and use of technology and procedures.

16. **Communication Procedures and Standards:** The RLN would adopt the ISO20022 data model to facilitate payment, clearing, settlement, and record keeping.

17. **Disclosure of Rules, Key Procedures, and Market Data:** The RLN would have clear and comprehensive rules and procedures and present sufficient information to enable RLN Institutions to have an accurate understanding of the risks, fees, and other material costs they incur by participating in the RLN. All relevant rules and key procedures would be publicly disclosed.

APPENDIX D: RLN COMPLIANCE FEATURES

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RLN would be designed from the ground up to ensure compliance with all relevant domestic and international regulations and best practices:

- **Onboarding of RLN Users:** This would be conducted only by RLN Institutions that are regulated entities. All users of the scheme will be KYC'd.

- **Data Privacy:** Records and operations would be conducted in the partition operated by an RLN Institution are intended to be private to that institution. Only the parties involved in a transaction would have transaction visibility.

- **FATF Recommendations:** RLN payments would include necessary information of the parties involved in the payments chain through the messaging layer that carries the information associated with each settlement.

- **Sanctions:** The RLN and participating institutions would sanctions check all transactions according to the applicable lists through the messaging layer.

- **Anti-Money Laundering:** The RLN and participating institutions would conduct AML monitoring through the messaging layer.

- **Fraud:** All customer instructions would be authenticated using Strong Customer Authentication (SCA) to reduce the likelihood of fraud.

- **Transaction Limits:** These would be maintained by each participating institution and may be enforced through smart contracts.

APPENDIX E: RLN TECHNOLOGY CHOICES

RLN is a conceptual proposal for a new kind of FMI that delivers finality of settlement in a computer system that contains the liabilities of regulated participants. The rationale for this is to create a system where the sovereign money is directly represented on a network that is 24*7, programmable, and extensible to other regulated asset classes.

The hypothesis of RLN is that the combination of existing legal instruments and new shared ledger technology could come together to create a more powerful substrate for national currencies.

At this stage of RLN development, the concept is **technology neutral** and **vendor neutral.** The RLN concept could be implemented several ways:

- One or more private/permissioned DLTs.
- One or more public DLTs.[35]
- Traditional database technology.

The RLN Community encourages technical contributions from multiple vendors to explore RLN's technical feasibility on different architectures. An example of one investigation into the technical feasibility of creating an RLN technical architecture can be found here:

- **SETL/AWS Technical Paper:** https://setl.io/the-regulated-liability-network-rln-whitepaper- on-scalability-and-performance/

> " *We have been excited about contributing to the concept of RLN by providing design and engineering expertise to bring it to life. We all rely on a network of promises to give value to our money and our savings, and to finance our businesses and governments. Our freedom to use those promises without constraint or interference depends on an open and interoperable network for their exchange. RLN provides the framework for such a global settlement network that could become the most important infrastructural innovation to emerge in finance for generations.*
>
> **Anthony Culligan,** CEO, SETL

APPENDIX F: RLN RESOURCES

The RLN Concept was developed as a possible way to upgrade national currencies in the face of competition from non-sovereign forms of money. It is an alternative to the fragmented efforts of the regulated sector that includes "narrow" CBDC projects, individual bank "coins," and a host of nascent industry consortia that compete for resources and adoption. RLN posits that there is a joined-up way for the regulated sector to rise to the challenge, while delivering a new multicurrency settlement platform that can drive responsible industry innovation.

Various useful resources are available to learn more about RLN:

- **Origin of the RLN concept: "Regulated Internet of Value" article, 2021:** https://www.citibank.com/tts/sa/insights/articles/article191.html

- **Presentation at CordaCon, 2021:** https://youtu.be/gMOaIMNtYPs

- **Presentation to Digital Euro Association, 2021:** https://youtu.be/_0TuueMRXvo

- **Regulated Liabilities and the Internet of Value Podcast, 2021:** https://rollcall.com/podcasts/fintech-beat/regulated-liabilities-and-the-internet-of-value/

- **Regulated Liabilities and the Future of Digital Money Podcast, 2022:** https://open.spotify.com/episode/3BtWeKzFZ6Yr3NPGifJ9cB?si=8QVh9XmOQHmtk5eEmgf4rQ

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NOTES

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[1] In this paper, the terms "national currency" and "sovereign currency" are used interchangeably to express the same idea: the unit of account authorized by the nation state. This unit of account is issued by different kinds of entity: the central bank, commercial banks, and regulated non-banks. The concept of "sovereign currency" in this paper is not limited to the liability of the central bank.

[2] https://www.ussc.gov/sites/default/files/pdf/training/annual-national-training-seminar/2018/Emerging_Tech_Bitcoin_Crypto.pdf

[3] https://www.bis.org/cpmi/publ/d154.htm

[4] https://www.swift.com/standards/iso-20022/iso-20022-programme

[5] https://www.swift.com/our-solutions/swift-gpi

[6] https://www.swift.com/about-us/our-future/swift-platform-evolution

[7] https://www.ebaclearing.eu/news-and-events/media/press-releases/28-april-2022-eba-clearing-swift-and-the-clearing-house-to-deliver-pilot-service-for-immediate-cross-border-payments/

[8] https://www.ecb.europa.eu/pub/pdf/scpwps/ecb.wp2693~8d4e580438.en.pdf

[9] https://www.fatf-gafi.org/publications/fatfrecommendations/documents/fatf-recommendations.html

[10] https://www.eba.europa.eu/regulation-and-policy/payment-services-and-electronic-money/regulatory-technical-standards-on-strong-customer-authentication-and-secure-communication-under-psd2

[11] https://www.wearepay.uk/what-we-do/overlay-services/confirmation-of-payee/

[12] https://www.openbanking.org.uk/

[13] https://www.bis.org/about/bisih/topics/cbdc/dunbar.htm

[14] https://www.bis.org/about/bisih/topics/cbdc/mcbdc_bridge.htm

[15] https://www.jpmorgan.com/onyx/coin-system.htm

[16] https://www.fnality.org/home

[17] https://www.partior.com/

[18] https://www.usdfconsortium.com/

[19] https://tassat.com/

[20] This is true in most cases. There are exceptions such as bank notes in Hong Kong, which are liabilities of commercial banks.

[21] https://digitaldollarproject.org/exploring-a-us-cbdc/

[22] Deployment of "cash-like" instruments such as "offline" or "private" CBDCs is likely to be constrained to low-value transactions.

[23] https://www.kansascityfed.org/documents/6861/Sanford_JH93.pdf

[24] https://www.bis.org/cpmi/publ/d199.pdf

[25] Instant payment systems are the exception that prove the rule, but they are limited to relatively low-value payments and currently operate domestically. Connections between instant payment schemes are emerging.

[26] An existing FMI may be capable of housing the RLN as an alternative to creating a new vehicle.

[27] https://www.cls-group.com/about/oversight-committee/

[28] Enhancing Cross-border Payments: Stage 3 roadmap - Financial Stability Board (fsb.org)

[29] See: https://finance.ec.europa.eu/capital-markets-union-and-financial-markets/financial-markets/post-trade-services/settlement-finality_en

[30] https://www.bis.org/cpmi/publ/d101a.pdf

[31] The terminology "two-tier CBDC" is used in the literature to describe a scheme where the CBDC can be distributed by third parties. From an RLN perspective, the true nature of the two-tier system is about maintaining the roles of the public- and private-sector balance sheets. Two-tier CBDC has the effect of concentrating balances into the central bank balance sheet, even though the instruments are distributed by private-sector entities. Two-tier RLN is about maintaining the role of risk-taking, regulated, private-sector balance sheets in the economy.

[32] It is likely that commercial banks in the future will be authorized to issue "stablecoins" that are collateralized instruments. This is not dissimilar to the current ability for banks to issue "stored value" instruments that are distinct from deposit accounts. Therefore, it is possible that a commercial bank could issue a "stablecoin" in RLN once these instruments are enshrined in law.

[33] The possible exception is a form of retail CBDC that might be intended to exhibit cash-like characteristics. The issuance of this form factor would be the prerogative of the central bank.

[34] https://www.bis.org/cpmi/info_pfmi.htm

[35] Public blockchains may need further iteration before they could support a regulated FMI. See: DARPA-Funded Study Provides Insights into Blockchain Vulnerabilities

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