accenture

Discussion paper

Exploring central bank digital currencies: How they could work for international payments

Contents

1.0 **Introduction**

The emergence of central bank digital currencies (CBDCs) is gathering speed, with more than half of the world's central banks actively considering their introduction. The reasons are varied: to compensate for the reduced use of physical notes; to improve payments in digital retail; to respond to private cryptocurrencies that could threaten the role of fiat money; and to improve resilience and reduce risk in wholesale markets – among many others.

Whatever the motivation, the momentum toward CBDCs seems clear and growing. Some central banks are already conducting live experiments, and the potential for currency evolution is being framed by some as a possible revolution in how value is exchanged.

Indeed, CBDCs could have profound implications for the global financial system that need to be thoroughly assessed and worked through – not least of which is to understand how a new form of central bank money could be used in payment systems. Among the many questions: What payments infrastructure would be required for CBDCs? Is this a new parallel world based on distributed ledgers and portable digital tokens? Or is it an integrated world fully interoperable with existing forms of money? Or is it a hybrid of both? Equally important are the many possible impacts at a business level that need to be considered, in particular how CBDCs will impact the rest of the financial market.[1]

This paper seeks to advance the dialogue around the impact of CBDCs on payments, exploring various topics from the perspective of the SWIFT community with a particular focus on cross-border payments – a topic that is only beginning to be examined closely. Many of the complexities in making a payment based on CBDCs will be the same as for existing payment solutions, but there will be other challenges and opportunities to consider as well. For example, what would it mean to have a CBDC, perhaps represented by a digital token, move from one jurisdiction to another? How might it be stored or used outside its own domain? And, conversely, once CBDCs exist how will they integrate seamlessly into the cross-border world?

CBDCs will present new challenges and new opportunities, requiring new solutions. At the same time, there is little advantage in reinventing the wheel. The smart approach will be to build new solutions where needed and pragmatically combine them with existing solutions to derive maximum benefit. As a global, neutral cooperative, SWIFT is an integral part of the global financial system and critical provider of network and mutual services domestically and internationally. We know and understand today's solutions well and have an ambitious strategy to ensure the future is defined by instant and frictionless transactions internationally.

As part of our innovation agenda, we are investigating roles SWIFT could play in a world with CBDCs so we can seamlessly support our community. SWIFT stands ready for the next generation of money and has designed and is building experiments to demonstrate that we have the potential to orchestrate CBDC payments in an international setting. The goal is to provide thought leadership, standards and solutions to rapidly meet future needs and scale quickly if CBDCs should be introduced in multiple jurisdictions. This paper, and the experimentation described, is a next step in that journey.

[1]See also Bank for International Settlements (BIS) paper No 114, *Ready, steady, go? – Results of the third BIS survey on central bank digital currency*, January 2021, available at https://www.bis.org/publ/bppdf/bispap114.html.

Fiat currency, central bank money and commercial bank money – what's the difference?

To unpack the discussion here we define fiat currency as being central bank money (notes in general circulation and reserves held by financial institutions) and commercial bank money (mostly bank deposits) whose scale and usage is regulated by central banks to ensure practical equivalence with central bank money. Numbers vary by country but the majority (often around 80%) of total fiat money is commercial bank money.

A CBDC is a new form of digital money issued by a central bank in addition to notes and reserves. CBDCs are primarily intended as a new medium of exchange in the wider economy with a number of possible benefits, most obviously enabling instant settlement between two parties remotely, using fiat currency issued by the central bank.

In normal usage, consumers and corporates do not need to be aware of these distinctions but they have different risk and cost profiles. All central bank money sits on a central bank balance sheet as a liability and is generally acquired in exchange for 100% quality asset. Commercial bank money, on the other hand, is a commercial bank liability and requires around 10% collateralisation. This is the basis of fractional reserve banking that has developed over many years. As a result, EUR 10 of central bank money can underpin around EUR 100 of commercial bank money, making this multiplier effect an important catalyst for economic activity and a major factor in any debate about CBDCs.

[2]Bank of England, *How is money created?*, 3 December 2020, available at https://www.bankofengland.co.uk/knowledgebank/how-is-money-created.

2.0
Why are CBDCs generating so much interest?

The rise of the digital economy with the emergence of new financial technologies, combined with long-term changes in the use of money by individuals and commerce, is presenting new challenges and opportunities to both traditional money as well as payment infrastructures and processes. Central banks around the world are responding by researching and exploring how to adapt to such disruption. They have already begun to revamp domestic payment systems with innovation to improve efficiency, while enabling more access and competition by expanding access to new entrants.

CBDCs are an increasingly hot topic in the industry. As of late 2019, central banks covering 75% of the world's population and 90% of its economic output are exploring CBDCs through research, experimentation, and/or development.[3] Some are moving beyond experimentation and a few have already been issued in a live environment, for example in select locations in China.

Drivers for CBDC exploration and adoption include:

- **Reducing use of physical money —** In many places, physical money is gradually being substituted with electronic payments in commercial bank money. This has many advantages but also leads to a reduced use of central bank money in the retail space and potential difficulties for certain parts of the community who rely on cash. Cash (coins and bank notes) usage has been declining for years, and with the Covid pandemic it has plummeted.[4]
- **A drive for financial inclusion —** In less developed markets, CBDCs could provide a means to expand financial access for the unbanked population. The combination of low bank account penetration and ubiquitous access to mobile phones with the growth in mobile payments, may offer new approaches to the distribution of central bank money.

  Countering the risk of private 'currencies' being used for transactions — New entrants and private 'cryptocurrencies' lead to a risk of substitution of fiat currency with privately issued 'cryptocurrencies' for certain transactions. In turn, according to the European Central Bank (ECB) for example, this potentially weakens the role of central banks' in the economy, their ability to manage monetary policy and potentially financial crime compliance.[5]
- **Enabling innovation in wholesale applications —** Opportunities for innovation in wholesale markets (e.g. enabling instant remote settlement for securities transactions or FX) are also widely discussed drivers. A securities platform might be able to use CBDCs to form an end-to-end solution to settle trades, while in the retail market a CBDC might enable new ways of doing business particularly in an e-commerce setting.
- **Improving payment efficiency to reduce cost and risk —** Some central banks are looking to diversify the payment landscape to improve resilience and provide greater competition. In the drive to improve international payments, CBDCs have also been proposed as a way to provide faster payment mechanisms with immediate settlement.[6] This is likely to be one of the most important areas to address in the near future and one in which SWIFT will be engaging in.

Given the central banks' stated aim of avoiding undermining the financial system, it seems likely that CBDCs will be issued by central banks and distributed via a two tier model through financial institutions (like cash is today). Otherwise, central banks would have to operate individual accounts themselves. Early examples of pilot systems (e.g. Sweden) are indeed pursuing this approach.

[3]BIS paper No 114, *Ready, steady, go?* – Results of the third BIS survey on central bank digital currency, January 2021, available at https://www.bis.org/publ/bppdf/bispap114.html.

[4]Atlantic Council, *Advanced economies under pressure in the central bank digital currency race*, Barbara C. Matthews and Hung Tran, 25 August 2020, available at https://www.atlanticcouncil.org/blogs/new-atlanticist/advanced-economies-under-pressure-in-the-central-bank-digital-currency-race/.

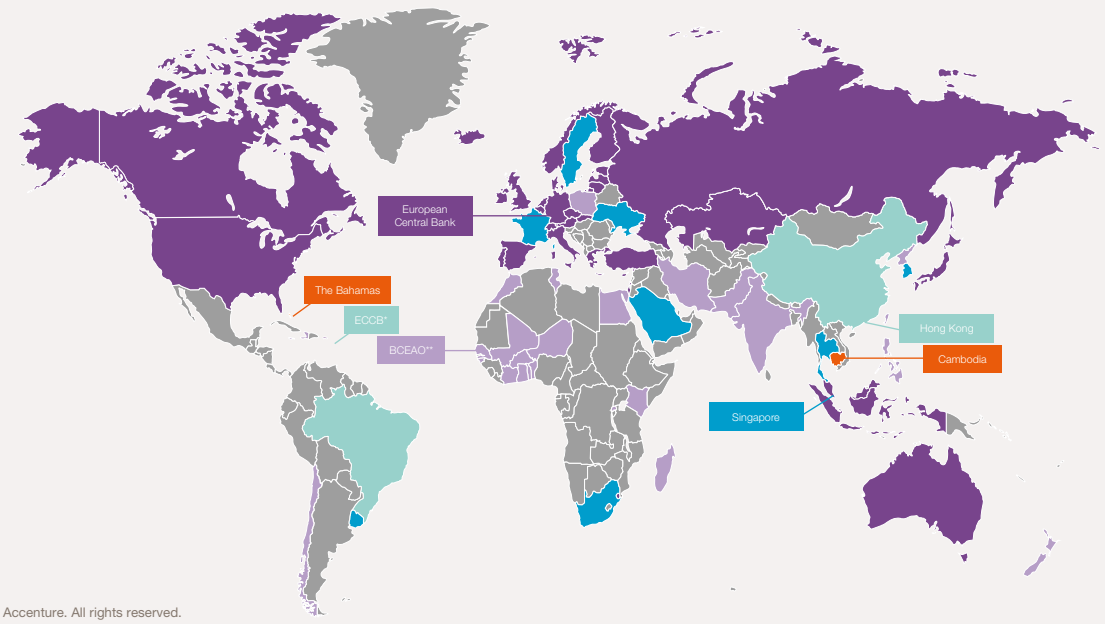
[5]European Central Bank, Report on a digital euro, 2 October 2020, available at https://www.ecb.europa.eu/euro/html/digitaleuro-report.en.html.

[6]BIS, Introductory remarks by Agustín Carstens, General Manager of the BIS, at the Asia School of Business Conversations on Central Banking webinar, *Finance as information*, 21 January 2021, available at https://www.bis.org/speeches/sp210121.htm.

Weighing all these trends together our current working assumptions are that CBDCs will be:

1. Issued by many central banks over the next few years as a new form of central bank money to facilitate digital transactions and payments on a domestic and potentially international level tackling a range of applications, most obviously the new digital economy but potentially extending to wholesale and other transactions.
2. Issued in relatively lower quantities in practice compared to commercial bank money. In today's market, the liquidity cost of central bank money naturally inhibits the amount held and we would expect that to continue with CBDCs in normal times. Issuance of CBDC will be subject to the liquidity preferences of the relevant financial system. Central banks may also choose to limit the amount held to avoid significant holdings being built up by individuals or corporates.
3. Distributed via authorised institutions (typically financial institutions) in a two tier model in either token or wallet/account to avoid central banks having to replicate the full account holding and management infrastructure that already exists.
4. The roles of commercial banks will not radically change in the two tier model. They would provide wallets or accounts for their customers and would distribute CBDC to both retail and institutional clients.

Central banks worldwide have actively been launching CBDC research and assessment initiatives



32	**Interest**	Countries declaring interest and doing initial internal research to explore CBDC feasibility.
35	**Research**	Countries that published CBDC research reports and/or conducted early PoCs.
19	**Experimentation**	Countries that started experimenting and piloting CBDC with limited number of parties.
2	**Implementation**	Countries preparing their CBDC for a full-scale launch.
2	**Launched**	Countries that officially launched a CBDC.

*Eastern Caribbean Central Bank
**Banque Centrale des Etats de l'Afrique de l'Ouest

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Essential characteristics of a payment solution based on CBDCs

In the development of payment solutions based on CBDCs, there are several key characteristics of a domestic solution based on what we see today. These include:

- **Infrastructure —** The infrastructure and technology required are likely to be at a minimum some form of cryptographic ledger and network to access this. Solutions include: distributed ledgers, with the extensive requirements that implies for users; account-based solutions or digital wallets; and stored value cards downloaded from accounts as the most retail focused solution. Regardless of selection, the resilience of CBDC infrastructure will need to match that of existing payment systems.[7]
- **Rich data and standards—** ISO 20022, especially, will be essential. The ability to carry data about the payment in a standardised form which can be readily understood and reported is crucial. Payments are for things, and increasingly consumers and corporates only see payments as part of a broader transaction, which requires the necessary data to make that easy. Rich data is also a key requirement for financial crime compliance and dramatically increases with international payments.
- **Digital identity —** If fraud is to be combatted, then secure identity is crucial. Token and account-based models would likely require the same identity requirements and checks, although some central banks and governments may allow the user to transact anonymously up to a certain limit.
- **Core payment system requirements —** The core requirements of a payment system have little to do with the underlying currency form. The vast majority of these requirements can be expected to continue to apply, such as fraud prevention, Know Your Customer (KYC), Anti-Money Laundering (AML), security, integrity, transparency, data privacy, and, internationally at least, Financial Action Task Force (FATF) recommendations and sanctions screening.
- **Interoperability and integration within domestic infrastructure —** CBDC-based systems must co-exist and be integrated with other payment systems. Different types of money are used in different payment systems today and these systems interoperate in a flexible way to support the flow of payments and the efficient use of liquidity. The form of money does not need to be maintained throughout a payment's journey. An end-to-end payment will often cross different systems, for example an invoice might be paid in as cash (central bank money) at the start and then be transmitted as commercial bank money later. This is a vital part of making different forms of money useful in practice.
- **A distribution mechanism —** A distribution mechanism will be required including the central bank itself, financial institutions and other authorised institutions – around which financial institutions may be able to build business models.
- **Privacy and access —** Transactions will need to be confidential but the trade-off between privacy and financial crime compliance (e.g. money laundering, taxation, etc.) will have to be thought through carefully. Different uses will likely require different levels of privacy.[8]

[7]BIS, *Central bank digital currencies: foundational principles and core features*, 2020, available at https://www.bis.org/publ/othp33.pdf.

[8]BIS Working Papers, No 880, *Rise of the central bank digital currencies: drivers, approaches and technologies*, August 2020, available at https://www.bis.org/publ/work880.pdf.

For cross-border payments an additional range of essential characteristics apply:

- **A scalable interchange mechanism —** The concept of CBDCs moving cross border is complex. It is technically achievable with various technologies, but the meaning and usage of a CBDC outside its native jurisdiction is unclear. It may simply become a foreign currency asset in the same way as a foreign currency note or government bond is. To be practical, some form of interchange mechanism with local currency must exist. A bilateral solution between two countries will work but is not scalable and quickly becomes unmanageable if applied globally. What will be required is a multilateral interchange mechanism that enables payments to be made end to end in a frictionless form.

  As with domestic integration, it is not necessarily the case that the international exchange must always be CBDC to CBDC – it could also be CBDC to other local fiat currency, for example. It is normal for an international payment today to cross different payment systems and be based on different forms of money on its path. Various models are possible and examination of these is beginning.[9] This is an area SWIFT plans to contribute to extensively.

- **Strong governance —** Any interchange mechanism must have a strong governance model to clearly define the roles and responsibilities of the various parties as well as the business and technical operating rules. Neutrality is important and the different jurisdictions involved internationally need to be respected.

- **Institutions that can provide interoperability cross-border —** Enabling two CBDC systems to interoperate will require institutions that act as intermediaries between them in some form. This could be formalised in a rigid approach with limited commercial scope (for example, a central bank could nominate one or two institutions to do this) or be based on an open market approach allowing more room for competition. These institutions could act in partnership (as correspondent banks do), or be single institutions present in both systems, or a new arrangement with a new platform or institution carrying out that function.

- **A foreign exchange mechanism —** CBDCs will not remove the need for foreign exchange. We assume that one or more parties will buy and sell CBDCs in a free market as happens today with currencies. There might be different FX rates for CBDCs (as there are for notes). These institutions could be the same as the ones providing the interoperability but they don't have to be.

- **Standardised interoperable rich data —** The ability to pass rich data through an international payment end to end is crucial. We know from extensive analysis that in today's world this is one of the main causes of friction. In designing a CBDC interchange there is an opportunity to design this problem out from the beginning.

- **Financial crime compliance —** International payments have tighter compliance controls, for example, with sanctions screening and FATF requirements. These exist today and are widely understood. Presumably they will apply to the interchange of CBDCs as well.

- **Compatible local infrastructure with overlapping operating hours —** Typically a cross-border payment will pass through one or more local payment systems. To avoid friction, these systems will need to have long and overlapping operating hours. CBDC-based systems will ideally operate 24/7 to facilitate cross-border payments in different time zones.

[9]BIS Papers, No 115, *Multi-CBDC arrangements and the future of cross-border payments*, 19 March 2021, available at https://www.bis.org/publ/bppdf/bispap115.htm.

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How SWIFT could play a role

Many of the issues and challenges in making a payment based on CBDC are the same as for existing payment solutions, together with some new challenges. As an integral part of the global financial system and as one of the critical providers of network and mutual services, both domestically and internationally, SWIFT knows and understands today's solutions well.

Payments using CBDCs will involve new challenges and there will be different needs and opportunities. We believe there is little advantage in reinventing the wheel. The smart approach is to get the best of both worlds: to take the parts of today's solutions that work well and pragmatically combine them with solutions for the new needs and opportunities.

In cross-border payments, the financial community has already made significant strides towards large-scale transformation with the global adoption of SWIFT gpi. Payments have become fast, traceable and transparent – completely changing the end-customer experience. Every day, banks send the equivalent of over USD 400 billion in value via gpi, with most payments being made in minutes and nearly all being received within a day.

Over the next two years and beyond, SWIFT will deliver an exciting strategic roadmap with our global community that will expand SWIFT capabilities beyond financial messaging to provide comprehensive transaction management services. The next-generation digital platform will use APIs and cloud technology to provide a set of common processing services that banks have historically invested in individually, saving the industry time and money. Rich, end-to-end data capabilities will enable the pre-validation of essential data, fraud detection, data analytics, transaction tracking, digital identity and exception case management.

The fundamental premise of SWIFT's transaction management vision is that it allows interoperability between different standards, channels, protocols and across currencies, whilst embedding adjacent services to make the payment safe, secure and complete. This, at its essence, is exactly what is needed to make CBDCs a practical proposition on an international scale.

We expect central banks will launch CBDCs with differing design decisions and objectives. For example, some CBDC models would be account based while others would be token based. SWIFT is agnostic to different types of CBDC models and aims to support and orchestrate transactions involving the full range of models. Some central banks may elect to keep their CBDC domestic, while others will allow for it to be held offshore. There is a need for a trusted party to orchestrate transactions internationally, and through our research, experimentation, and extension of our current role, SWIFT aims to fulfil that need.

Reliable infrastructure and network reach

We provide secure, reliable and efficient messaging solutions for over 200 Financial Market Infrastructures and their communities today. SWIFT technology also powers the underlying infrastructure for payments market infrastructures such as Australia's New Payment Platform, and Europe's TARGET Instant Payment Settlement. We support over 80 Central Securities Depositories and more than 35 Central Counterparties in the securities space as well as critical market infrastructures such as CLS. This expertise and technology is an invaluable asset when designing the financial market infrastructures of the future. SWIFT's record of 99.999% service availability is integral to our value proposition to the more than 11,000 entities on our network.

Rich data and interoperability

ISO 20022 is an emerging global and open standard for payments messaging. It creates a common language and model for payments data across the globe. One that provides higher quality data than other standards, which means higher quality payments for all. One that can adapt to new needs and new approaches. One that's not controlled by a single interest. One that can be used by anyone in the industry and implemented on any network.

By 2025, all reserve currency high-value payments systems (HVPS) will have fully transitioned to rich ISO 20022, and more than 90% of HVPS value worldwide will move on ISO 20022 rails. We are committed to making this transition as easy as possible for our community. Part of our commitment to help the market infrastructure community is the ISO 20022 Harmonisation Charter, which specifies standard implementation templates and conventions, to which a majority of market infrastructures have signalled their commitment to align.

We are building new capabilities that will maintain complete transaction data and provide status information for these transactions centrally, relieving institutions in a payment processing chain of the obligation to pass on complete data and eliminating the problem that intermediaries may 'break the chain.' Centralised orchestration, translation and protocol mediation services will also enable institutions to continue with the formats and protocols they use today, and to implement ISO 20022 at their own pace without impacting the rest of the community.

These capabilities that enable interoperability and backward compatibility across data standards and protocols, without compromising data integrity, can be a key asset in the development of token-based solutions to facilitate their integration into the existing payment ecosystem.

Digital identity and financial crime compliance

Linked to data is the question of managing identities. A very strong identity framework is required to guarantee the identity of the parties involved in a particular business service, and to support non-repudiation of activities performed by the various participants. This is essential to provide trust in the system, ensure accountability and support any claims process. It is also a prerequisite to be able to perform KYC and compliance checks. The identities of both the participant organisation and those employees instructing the transactions will need to be traceable in a controlled fashion, that is to say, only by those who should have access. Many identity solutions are widely used by financial institutions today, supported by existing infrastructures and processes, compliant with security industry standards such as Federal Information Processing Standard (FIPS) level 2 or 3 and have a proven track record in terms of performance, security and operability.

For example, SWIFT Public Key Infrastructure, a pervasive security infrastructure based on public-key cryptography, provides digital signatures and supporting certification services to entities, typically end users, applications, and SWIFT interfaces, enabling them to securely authenticate and/or to digitally sign transactions.

We have also developed a number of solutions to address the growing financial crime and cybersecurity challenges that our industry faces such as sanctions screening, the SWIFT KYC Registry, and powerful compliance analytics and fraud control tools. In order to protect the global financial system from money laundering and financing of illegal and criminal activities, token-based systems should learn from, and potentially leverage, many of these existing capabilities.

5.0
SWIFT's CBDC exploration

As SWIFT is constantly exploring innovations and finding new ways to support its members, we set up a CBDC and digital asset innovation project in November 2020 working with Accenture to understand the impact of CBDCs and digital currencies on SWIFT and its members, as well assessing what roles SWIFT could play in a future CBDC ecosystem.

During the experimentation design first phase, we prioritised and designed two experiments. We are now building those two experiments and have begun the first phase of experimentation. The following sections discuss the process we used to identify potential roles SWIFT could play in a world with CBDC, as well as detail the experiments we developed. As part of the next phase we will continue to identify and refine CBDC and wider digital asset use cases, roles and associated experiments.

Since starting the project, we have embarked on a journey to look at the opportunities and challenges presented by CBDCs and a wider digital asset ecosystem on our business and our members, as well as the practical implications and ways to minimise disruption.

To that end, as described above, the digital payment asset that has gained the most steam in the last few years has been CBDCs. It thus made sense for us to begin our exploration in this space by defining and identifying instrumental roles for SWIFT in supporting CBDCs.

Use case categorisation

To begin with, we categorised existing CBDC initiatives into three distinct payment use cases:

1. **Retail payment —** A general purpose CBDC for retail applications enables real time person-to-person (online and offline) transfers with instantaneous settlement.
2. **Cross-border payments —** A CBDC network could facilitate direct cross-border monetary relationships to be established under the central bank's supervision. Here there are different approaches such as multiple networks, e.g. cross network, settlement corridors and/or foreign network deployment.
3. **Wholesale payments —** A CBDC can serve as a settlement medium in high value payments system and on digital financial markets infrastructures.

SWIFT's current position as a trusted party in the cross-border payments space makes the second use case the most aligned to our strategic market position and potential future focus. Hence, we have prioritised this use case for experimentation. The cross-network experiment will facilitate interoperability between CBDC networks and other value (currencies, securities, etc.) networks for corporate and financial market cross-border payments

The financial community has already made significant strides towards large scale transformation, exemplified by the global adoption of SWIFT gpi, a new standard for global payments. However, there is great need for more payment efficiency. The world has seen an increased demand for cross-border payments and a rising flow of trade in goods and services, as well other financial instruments, over the past decade (totaling USD 2 trillion in 2019). Regardless of whether payments transact with fiat currency or CBDC, the SWIFT community's goal is to deliver ubiquitous availability of instant cross-border payments globally.

Beyond these experimentations, we will continue to use our convening power and reach to form partnerships and accelerate innovation. As a cross-border platform with a global forum, this encompasses developing the necessary standards to prepare ourselves and the global community for the different CBDC paradigms that may emerge both in the near and long term.

Role selection

We identified and analysed a number of different roles SWIFT could fulfill and categorised these into four types:

- **Cross-network support —** Today, SWIFT's existing role is as a trusted third party facilitating cross-border transfers. For CBDCs, we can facilitate interoperability between CBDC and non-CBDC payment networks, which will be necessary. In this scenario SWIFT would act as the orchestration layer between networks, enabling interoperability between CBDC networks and other currency and asset networks. We could also support the issuance and redemption process of CBDCs, orchestrating the transfer of reserves between real-time gross settlement (RTGS) and CBDC networks.
- **Provide CBDC application offerings —** Central banks are likely to build the core CBDC functionality upon which the private sector can develop applications with this foundation. SWIFT can leverage its suite of interfaces and services to interact with CBDC payments applications, reducing the cost of CBDC adoption.
- **Deliver critical network services —** In addition to the role of identity manager, SWIFT can leverage its position as a trusted authority to provide a range of critical services for CBDC networks. This can range from providing transaction confirmation and notary services to defining token structure.
- **Act as a central technical operator —** SWIFT could leverage its existing network and infrastructure to provide the Distributed Ledger Technology (DLT) network upon which CBDCs are built. While changes would be required to the SWIFT platform and infrastructure to act as a CBDC Network(s) as a service, we will consider and evaluate this potential role, as the CBDC ecosystem evolves.

These are the areas we plan to explore in collaboration with our members and wider community moving forward.

Experimentation selection

Cross-network support will be the initial role where we will place our focus and experimentation. Building on our linkage capabilities and emerging transaction orchestration and management offerings, the emphasis of our experiment will be on enabling interoperability across networks, payment systems, and borders for SWIFT customers. The remaining three roles will be explored and assessed as CBDC implementation matures for both SWIFT and our customers.

Cross-Network Support

Cross-Network Transaction Orchestration

Cross-network Transaction Facilitation (HTLC etc.)

Liquidity Distribution

Interoperability Bridge

DvP Securities Settlement Orchestration

CBDC Issuance and Destruction

CBDC Applications

CBDC Payment Applications

Integration between CBDC Networks & Payment Systems

CBDC Payment Transaction Orchestration

Provide Ancillary Services (KYC, AML etc.)

Critical Network Services

Identity Manager

Trusted Directory Service

On-Boarding Service

Network Map Provider

Transaction Confirmation/ Notary

External Information Provider (Oracle)

Define Token Structure

Central Technical Operator

CBDC Network(s) as a Service

DLT Node Operator

Resilient, Trusted Network Infrastructure Provider

6.0 **SWIFT's CBDC experimentation**

The following section provides an overview of the experimentation we performed and discusses relevant technological as well as business-related considerations.

Context

For the purposes of our experimentation, we have assumed that some CBDC networks will be powered by DLT. The world of DLT is still developing. As with many nascent technologies prior to it that attempted to change the basis of how things are done today, the DLT ecosystem is very fragmented. There are not one, two or three platforms that are used by stakeholders to experiment with and build on – there are a litany. Central banks across the world, as a result, have used a variety of DLT platforms for their pilots: Riksbank, developing the Swedish e-Krona, has used R3's Corda platform, while the Hong Kong Monetary Authority (HKMA) is building on the Quorum platform.

At this point, it is unclear which of these platforms will come out on top in the next 10 or 20 years. As a result, the concept of enabling transactions between the different platforms will play a central role in the near future. The ideal of a digital payment ecosystem based on the principles (and technology) of DLT will not be realised soon unless a solution is devised for this impending problem. It will be integral to stitch together various actors across the financial spectrum to successfully design a digital payment ecosystem with seamless transactions across networks and platforms, and this is where SWIFT comes in.

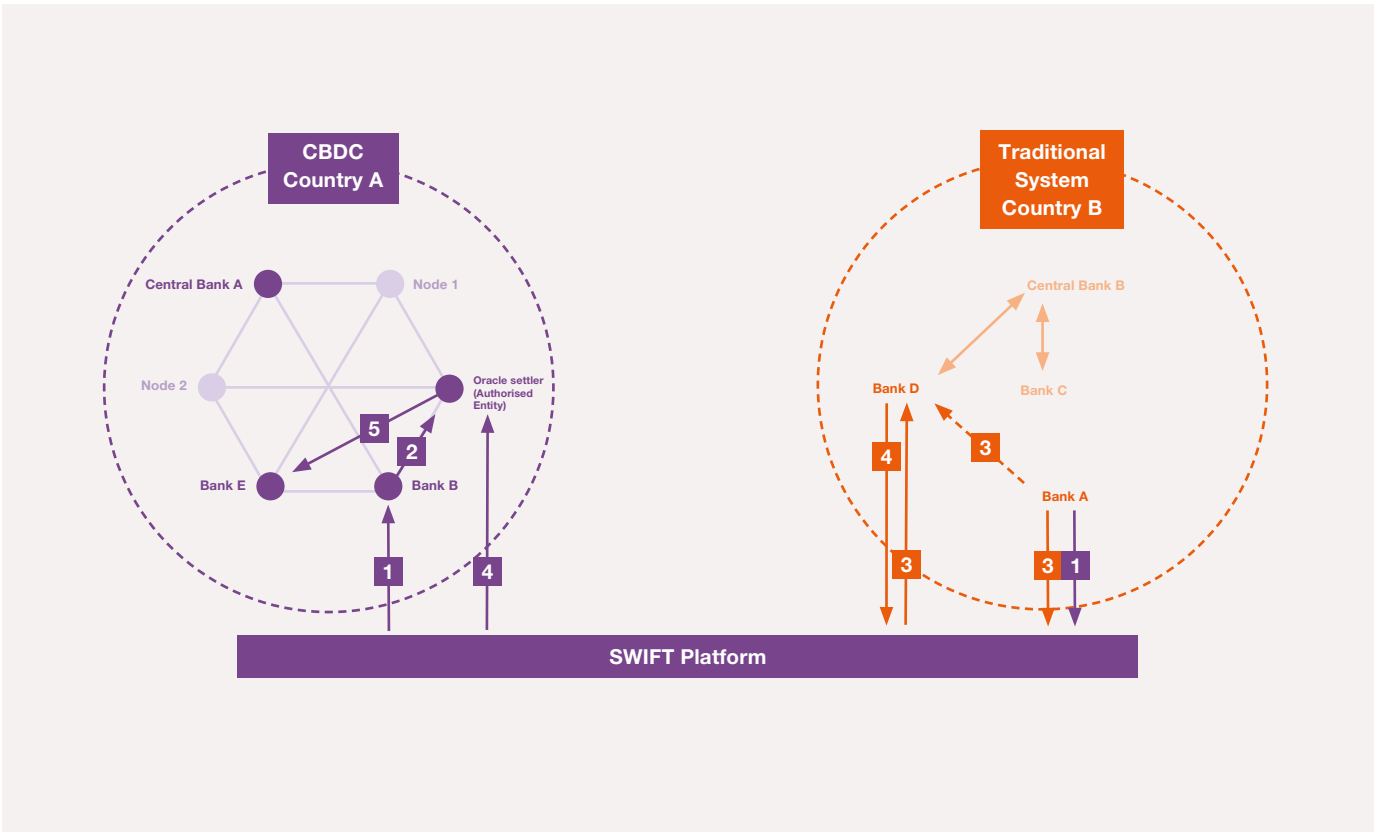
SWIFT's role as an orchestrator of the current financial system, and the relationships it has developed with parties within the system, places it in a unique position to tackle this problem. As a trusted party overseen by central banks, SWIFT is well placed to orchestrate these transactions via its wide-ranging network infrastructure and connectivity, current platform, and breadth of relationships.

The first step in exploring this problem is, therefore, to conduct experiments that prove how SWIFT can orchestrate cross-border transactions between entities on two different networks (DLT and non-DLT), and then between entities on two different DLT networks (one network built on Corda, and the other on Quorum).

Experiment A1 description

This experiment seeks to showcase SWIFT's ability to utilise innovative features provided by DLT to orchestrate a cross-border transaction between two entities on two different networks: a traditional payment system (e.g. an RTGS system) and a DLT-based CBDC system. Using a settler on the DLT network, funds are locked until settlement on the DLT. The settlement of the transaction is triggered by a successful transfer of funds on the traditional payment system. In doing so, the technology eliminates counterparty risk, exposure of default by the involved parties or a third-party escrow.

For this purpose, we simulated a transaction between two economies/countries, in which Country A has already implemented a CBDC infrastructure, while Country B operates a traditional wholesale network. In doing so, a dedicated DLT network will be set up to simulate a central bank issuing CBDC. An additional network simulating a traditional wholesale payment system in Country B, as well as the SWIFT platform orchestrating the transaction, will be created using appropriate tools (such as a BPMN tool).



An overview of the experiment is shown in the diagram above.

Accordingly, Bank A acts as a member of the traditional wholesale network, intending to transfer funds to Bank E, which is a member of the DLT CBDC network. Bank B and Bank D function as the liquidity providing intermediaries for the cross-network payment, while the settler on the DLT network is operated by a trusted, authorised entity whose role is to confirm payment on the traditional network and release the funds on the DLT CBDC network. In doing so, the authorised entity will at no time take possession of any value.

The proposed experiment will include the following high-level steps to explore and showcase the cross-network transaction:

1. Bank A requests a transaction to Bank E at Bank B in the DLT network.
2. Bank B prepares the transaction and sends the request for confirmation to the settler, conditional to a successful deposit / transfer of funds on the traditional wholesale network of Country B.
3. Bank A performs the payment to Bank D on the traditional wholesale network.
4. Bank D sends a SWIFT confirmation to the settler after the successful payment by Bank A on the traditional wholesale network.
5. The settler cross-signs the transaction prepared by Bank B and releases the funds to Bank E concluding the settlement of the transaction.

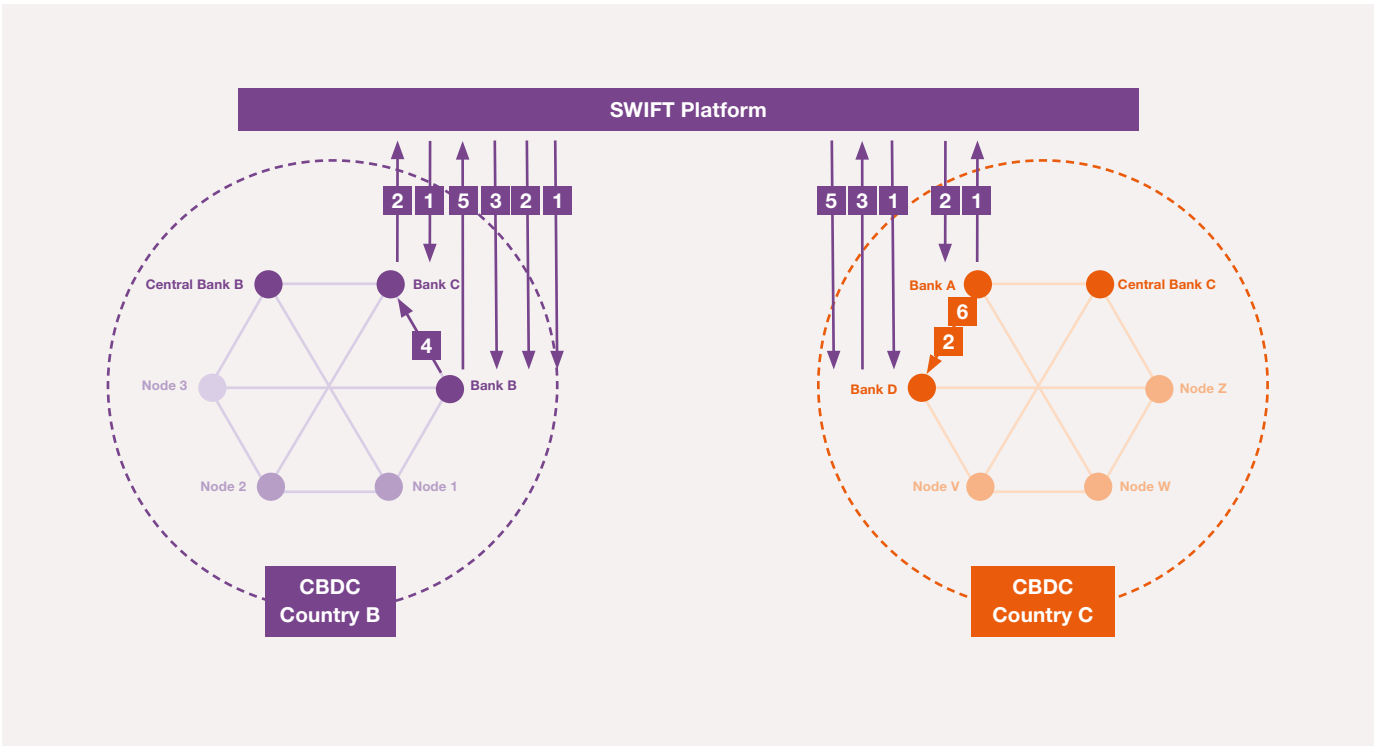
Experiment A2 description

This experiment aims to showcase how a cross-border transaction between two parties on different DLT networks relies heavily on SWIFT's ability to orchestrate a cross-border, multi-currency transaction through the correspondent banking system.

To highlight how a cross-border transaction through the corresponding banking system takes place, a sample transaction was executed across two DLT networks (Corda and Quorum). The transaction was executed using smart contracts, specifically hash time lock contracts to ensure an atomic transaction, eliminating counterparty and Herstatt risk. This does not require a third party to act as arbiter or otherwise approve the release of held funds. The SWIFT platform's transaction management capabilities were critical in facilitating the transaction, orchestrating agreement between parties and securely transferring information critical to initiating and settling the transaction.

Bank A as a member of CBDC network C (Quorum network), intends to fund their nostro account/wallet at Bank C, a member of CBDC network B (Corda network):

1. Bank A communicates through the SWIFT network with Bank C (recipient), and Banks D and B, (correspondents) to align all parties and agree transaction details.
2. Bank C generates the pre-image and hash required to create and release the Hashed Timelock Contracts (HTLCs). Bank A acts on this information to create the first HTLC transaction.
3. Bank D instructs Bank B to create the second conditional transaction, which would enable Bank C to access funds.
4. Bank B sets up the second HTLC transaction, allowing Bank C to sign it with the pre-image and release funds to itself, revealing the pre-image on the ledger to Bank B.
5. Bank B extracts the pre-image from the ledger and communicates it to Bank D.
6. Bank D uses the communicated pre-image to sign the first HTLC transaction, releasing funds to itself and completing the transaction.
7. Bank B extracts the pre-image from the ledger and communicates it to Bank D.



7.0
Conclusion

New technologies, changing customer expectations, emerging players and evolving business models are driving tectonic shifts in the payments landscape – and a potential outgrowth of this disruptive force is a new take on the form of traditional money itself. CBDCs are drawing strong interest as central banks explore ways to improve digital commerce, reinforce systemic resilience and preserve the foundational role of fiat money in global finance.

There are many complex issues to be considered with care, and as the topic of CBDCs evolves over the next few years SWIFT will engage closely in the debate. As a trusted party overseen by central banks, that is neutral and currency agnostic, with a reach across over 11,000 institutions in more than 200 countries, we are well placed to provide solutions to meet both the challenges and opportunities that CBDCs may present.

We have already embarked on an ambitious platform evolution to enable instant and frictionless end-to-end transaction management – equipping the financial community with robust, resilient and secure mutualised infrastructure that can flex and scale at pace with the speed of change in the industry. It will be able to adapt to facilitate the exchange of value across borders, around the world, no matter the form that value takes.

Indeed, we are starting to engage in trials to show how we can bring our transaction management vision to bear on the specific issues of cross-border use of CBDCs. And we intend to explore that role deeper both as a carrier of authenticated information about CBDC transactions as we do today for other forms of fiat currency, and as a carrier of actual CBDC value in whatever form it is issued in, for example, in the form of a token. We have begun CBDC experimentation aimed at enabling the transfer of cross-border payments for our members between CBDCs and traditional payment systems.

SWIFT will continue working with financial institutions to help them develop innovative new solutions based on CBDCs, and in doing so provide ever better end-to-end payment services for consumers and corporates.

About SWIFT
SWIFT is a global member-owned cooperative and the world's leading provider of secure financial messaging services. We provide our community with a platform for messaging, standards for communicating and we offer products and services to facilitate access and integration; identification, analysis and financial crime compliance. Our messaging platform, products and services connect more than 11,000 banking and securities organisations, market infrastructures and corporate customers in more than 200 countries and territories, enabling them to communicate securely and exchange standardised financial messages in a reliable way.

As their trusted provider, we facilitate global and local financial flows, support trade and commerce all around the world; we relentlessly pursue operational excellence and continually seek ways to lower costs, reduce risks and eliminate operational inefficiencies. Headquartered in Belgium, SWIFT's international governance and oversight reinforces the neutral, global character of its cooperative structure. SWIFT's global office network ensures an active presence in all the major financial centres.

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