



Tokenization of Money:

# e-HKD and the future of global money movement



In collaboration with



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# Foreword

## Visa

Visa is a pioneer in payments innovation, championing the transformative power of tokenization. Our paper, “Tokenization of Money: e-HKD and the Future of Global Money Movement,” showcases our cutting-edge work in this field through Visa’s Tokenization solutions. We worked with HSBC and Hang Seng Bank on a pilot project, moving from vision to action, and building toward a future where transactions are more efficient, secure and inclusive.

This initiative is a significant stride toward redefining global money movement, and Visa’s platform deployment for the Hong Kong Monetary Authority’s (HKMA) e-HKD pilot illustrates our commitment to innovation. We believe the insights shared will inform and inspire further development in the digital currencies field.

As we continue to share our findings and experiences, we invite industry leaders, partners and regulators to join us on this journey. Together, we can shape a financial ecosystem that leverages the best of technology to improve money movement for businesses, governments and consumers worldwide.

**Vanessa Colella, Global Head, Innovation & Digital Partnerships, Visa Inc.**

## HSBC

Leveraging on its strong digital and transaction banking capabilities, HSBC has actively participated in Central Bank Digital Currencies projects across different markets. We have been working with customers, business partners and central banks to explore the potential of emerging technology in shaping the future of money.

Tokenized deposits, within the evolving landscape of digital monies, have drawn interest among market participants. The concept combines the advantages of distributed ledger technologies innovation with the security of a fully regulated financial market infrastructure. In our pursuit of facilitating efficient and secure transactions for our clients, we have joined forces with Hang Seng Bank and Visa to study the viability, key design considerations and interoperability of commercial bank-backed deposit tokens.

The Hong Kong Monetary Authority’s e-HKD pilot has provided an opportunity for the industry to study the concept of a potential tokenized interbank settlement infrastructure in Hong Kong. Our pilot successfully demonstrated that tokenized atomic settlement can be achieved across banks in various hypothetical use cases. We look forward to our continued collaboration with the industry to unlock the potential benefits brought by tokenized deposits, as well as to contribute to the development of its technical standards and protocols in Hong Kong and around the globe.

**Lewis Sun, Global Head of Domestic and Emerging Payments, Global Payments Solutions, HSBC.**

## Hang Seng Bank

We are delighted to present this tokenized-deposits whitepaper in collaboration with Visa and HSBC. As a leading advocate of central bank digital currency (CBDC) across Hong Kong and mainland China, Hang Seng Bank actively contributes to CBDC research and development. In 2023, three of Hang Seng Bank’s use cases were selected by the HKMA under the e-HKD Pilot Programme, including tokenized deposits and programmable payments. Tokenized deposits, in particular, play a crucial role in the overall development of CBDC in Hong Kong. By combining the advantages of regulated bank deposits with the technical capabilities of distributed ledger technologies, tokenized deposits pave the way for future innovation in digital money and asset use cases.

This report summarizes the valuable feedback collected from the tokenized deposit pilots, showcasing its potential, and provides references for regulators, policymakers and industry players.

Moving forward, we will continue working closely with regulators and business partners to uncover new use cases for tokenized deposits, aiming to maximize their potential benefits and contribute to the development of the CBDC and the wider digital economy in Hong Kong.

**John Wong, Head of Global Payments Solutions, Hang Seng Bank.**

## Executive Summary

“The HKMA has been at the forefront in the exploration of the future of money, working closely with the industry to explore the potential applications for an e-HKD, a new form of digital money. The pilot conducted by Hang Seng Bank, HSBC and Visa under Phase 1 of the e-HKD Pilot Programme demonstrated the potential that tokenized deposits can enable access to increased liquidity and accelerate the development of innovative token-based systems within the industry. We look forward to continuing to collaborate with the industry to explore how a digital money ecosystem could look like in the future.”

**George Chou, Chief Fintech Officer, HKMA**

The movement of money is entering a new era. Innovations in payments are happening at all levels, led by the private sector alongside leading public institutions. Central banks and regulators are exploring new technological innovations and regulatory frameworks on a macro level. In parallel, solutions from the private sector continue to emerge, solving for existing pain points and innovating around previously unattainable use cases. Public-private partnerships have become an essential mechanism to unlock the feasibility of groundbreaking improvements to payments and money movement.

Visa’s ongoing work on the future of digital money explores various forms of blockchain-based currency at this nexus of public-private partnership – driving payment innovation by developing solutions that enhance and integrate with leading public-sector initiatives.

HKMA has been a longstanding leader of research into the applications of CBDC, as part of its broader “Fintech 2025” strategy. In 2023, the HKMA commenced the e-HKD Pilot Programme to explore the use case of e-HKD as a new form of digital currency in Hong Kong. In response to HKMA’s calls for industry participation, Visa approached commercial banks to pilot issuance of “tokenized bank deposits,” a form of commercial bank money issued on a distributed ledger that businesses and consumers could use to make payments and interact with other blockchain networks and their participants.

A strategic partnership between Visa, HSBC and Hang Seng Bank piloted the tokenization of bank deposits, interbank payments and settlement by wholesale CBDC (wCBDC) on Visa’s tokenization solution for digital assets. Two use cases were designed for the Hong Kong market: property payments and acquirer-merchant settlement.

Learning from the successes of the HKMA pilot and from similar projects around the world, Visa’s tokenization solution for digital assets is designed to leverage the full extent of blockchain tokenization technology as well as programmable smart contracts to enable depository institutions to provide enhanced business operations and payment experiences for their customers. Visa envisions its solution to be the engine that drives the new standard for blockchain-based payments, creating a future where customers and businesses around the world will experience improved money movement and programmable payments that are powered by blockchain tokenization technology.

In this paper, we present our collective learnings on the potential value of tokenization, including higher payment efficiency, increased transaction limits, reduced settlement risk, enhanced transaction transparency, 24/7 availability and enablement of atomic settlement for interbank payment processes. The benefits point to a future financial ecosystem that can leverage both wCBDCs and tokenized bank deposits.

Visa is actively exploring opportunities to integrate the capabilities of our platform with other major clients across various sectors and regions, aiming to foster a secure global payment ecosystem. These efforts highlight our commitment to collective action and the importance of aligning with regulatory frameworks and industry standards to ensure the global financial system’s safety, stability and integrity. As we move forward, Visa remains dedicated to transparency, open dialogue and collaboration with all stakeholders. In doing so, we aim to contribute to shaping a financial future that is not only technologically advanced but also equitable and accessible to all, acknowledging the challenges ahead and our commitment to innovation and inclusion in addressing them.

# The tokenization of money

## Multiple flavors of tokenized money have emerged

The story of money's evolution is about humanity's relentless pursuit of better ways to meet its evolving economic demands and desires. From the simple barter of goods and services to the creation of coins and paper money as tangible symbols of value, the concept of money has been in constant flux. The invention of coins and paper money revolutionized trade by providing a standardized medium of exchange, reducing the inefficiencies of barter. As economies grew ever more complex and global, the need for more efficient and secure payment methods led to the rise of electronic transactions and the advent of digital currencies, setting the stage for increased efficiency, access and global integration in financial services. Among these innovations are stablecoins, CBDCs and tokenized deposits, each a product of the ongoing, blockchain-inspired transformation of money.

### Stablecoins

These blockchain-based digital assets are designed to maintain a stable value by being pegged to fiat currencies or supported by other reserve assets. They emerged as a response to the volatility of crypto like Bitcoin and Ethereum, offering a more stable alternative for payments, transaction settlements, stores of value and use in decentralized finance (DeFi). Stablecoins have significantly grown, with a market capitalization surpassing US \$140 billion<sup>1</sup>, and they continue to evolve with technical innovations from the DeFi community while attracting regulatory attention.

### CBDCs

These are defined by the International Monetary Fund (IMF) as *"a digital representation of sovereign currency that is issued by a jurisdiction's monetary authority and appears on the liability side of the monetary authority's balance sheet."* CBDCs vary in design, notably between wCBDCs, designed for financial institutions for large-scale interbank transactions, and retail CBDCs (rCBDCs) for general-public use, aiming to modernize payments with digital "cash."

### Tokenized deposits

These are digital claims on deposits held at commercial banks, issued on a blockchain. They offer the familiarity and reliability of bank deposits combined with the advantages of blockchain technology, such as programmability, near-real time settlement and enhanced transparency.



### Stablecoins

A digital asset, often backed by a reserve asset (like a fiat currency). Typically issued and managed by private companies.



### CBDCs

A digital representation of a sovereign currency. Typically issued and managed by a central bank.



### Tokenized deposits

A digital representation of deposits held at a commercial bank. Issued and managed by commercial banks.

## What is tokenization?

Tokenization transforms real-world assets (RWAs), such as currencies, securities, artwork and real estate into blockchain-based digital tokens. Each token is assigned a unique identifier and a detailed ownership record, helping to ensure authenticity and traceability. By representing the underlying asset as a distinct cryptographic token on a blockchain, tokenization also assists with immutability and traceability. Smart contracts, which are programmable self-executing agreements, can be used to define and enforce rules and conditions governing the tokens, enhancing control.

By facilitating rapid processing, recording and exchange of digital assets across different classes, tokenization, in tandem with blockchain, leads to a more open and flexible architecture. This approach allows for improved liquidity and transferability of certain assets that were previously challenging to trade or exchange, such as due to their illiquid nature or high transaction costs. However, it is important to note that tokenization does not circumvent legal or regulatory restrictions on the underlying asset's usage.



# Arriving at the tipping point for adoption

Recent pilots have showcased the potential for stability, programmability, liquidity and efficient asset transfers, signaling a readiness for wider adoption. The Bank for International Settlements Innovation Hub (BISIH) has demonstrated significant attention to CBDCs, as evidenced by most of its projects (15 out of 26) dedicated to the exploration of CBDCs and digital currencies.<sup>2</sup> This commitment reflects a global recognition of the importance and potential of this development.

This period of concentrated innovation, collaboration and regulatory engagement suggests the financial system is ready for substantial change. The groundwork laid by these initiatives indicates a mature ecosystem, ready to embrace digital currencies on a broader scale, marking the arrival at a tipping point for adoption.

There are numerous opportunities and drivers compelling central and commercial banks to begin experimenting and exploring use cases for CBDCs and tokenized deposits. Singapore's Monetary Authority

has proposed a framework for open, interoperable digital asset networks and is conducting pilot projects in asset and wealth management, fixed income and foreign exchange.<sup>3</sup> The European Central Bank (ECB) emphasizes the need for central banks to stay technologically advanced to keep cash or central bank money appealing for transactions and stable for financial innovation. The European Commission has proposed legislation to create a legal framework for a digital euro, indicating the EU's progress toward a potential CBDC.<sup>3</sup> Hong Kong has demonstrated similar motivations with a strong focus on deriving practical use cases and exploring potential features of CBDCs, such as programmability to unlock new transaction types and development of the tokenization market. Meanwhile other markets, such as Brazil, India and Kazakhstan have been focusing on promoting financial inclusion. For example, Visa's pilot with Agrotoken in Brazil uses CBDCs to provide farmers with access to digital finance, reducing costs and risks by tokenizing crops for collateral and automating payments via smart contracts.<sup>4</sup>

## Benefits of tokenized deposits

### 01. Programmability

Tokenized deposits, like other blockchain-based assets, can be programmable. They can be configured to be used only under specific terms or conditions using smart contracts, allowing for functions such as conditional payments. This programmability empowers consumers and their depository institutions to ensure that digital money is used for its intended purpose, providing greater control and customization over financial transactions.



## 02. Efficiency

Traditional banking processes often involve manual verification processes and transaction fees. With the use of blockchain technology, transactions can be settled in near real-time due to a reduced reliance on intermediaries. **Ultimately, this leads to cost-saving and increased operational efficiency for financial institutions.**

## 03. Transparency

Blockchain technology provides a transparent and immutable record of transactions. **This is especially useful for institutional entities by enhancing auditing capabilities, regulatory compliance and risk management through new digital audit tools.**

## Identifying the pivotal use-case

Identifying impactful use cases for innovations unlocks their tangible potential. This section explores tokenized deposits, showing their versatility and efficiency in addressing financial challenges. Tokenized deposits may very well become the innovation bedrock at the application level. These cases illustrate the benefits of tokenized deposits and their role in creating a more efficient global financial ecosystem.

**Payments:** Tokenized deposits can be used as a means of payment, similar to existing methods but with faster settlement. They are designed to have 24/7 availability and a reduced reliance on third-party intermediaries. For markets without a real-time payments (RTP) system, tokenized deposits can increase domestic and cross-border transaction speed with near-real time settlement, provided there is a wholesale Central Bank Digital Currency (wCBDC) acting as the inter-bank settlement layer. The wCBDC can enable seamless and near-immediate settlement among tokenized deposits issued by different banks, allowing interoperability and improving upon traditional correspondent banking networks.

For markets with RTP, tokenized deposits can further enhance payments by enabling programmable payments through the use of smart contracts. These programmable payment features allow for the automation of complex business logic and the inclusion of third-party intermediaries when necessary, such as in the case of compliance checks or additional services. However, it is important to note that transaction limits on tokenized deposits would still be subject to the commercial decisions of individual banks, based on factors such as liquidity management and risk considerations.

For example, in a real estate transaction, a buyer can use tokenized deposits to secure a property and initiate the payment process. Smart contracts can then automate the remaining transaction steps to trigger immediately once predefined conditions are met, such as the completion of due diligence or the transfer of property title. In doing so, the use of tokenized deposits and smart contracts can minimize the need for escrow services, as the funds can be automatically released to the seller once all conditions are satisfied. This reduces transaction costs and settlement time, as the process no longer relies on manual interventions.

Moreover, the use of tokenized deposits and wCBDC can potentially improve upon current correspondent banking systems. By leveraging a common, interoperable platform facilitated by these technologies, financial institutions may be able to streamline cross-border transactions, reducing the number of intermediaries involved and minimizing the time required for settlement. However, the extent to which tokenized deposits and wCBDC can eliminate the need for multiple correspondent banking relationships would depend on the specific monetary policies and regulatory frameworks adopted by different jurisdictions.



### **Trading and settlement of tokenized assets:**

The growing industry of tokenization of real-world assets is a multi-trillion-dollar opportunity as estimated by various analysts, with one study showing tokenization presenting an estimated US \$5 trillion industry opportunity in the next five years.<sup>5</sup> Tokenized assets and programmable finance drive the demand for tokenized deposits as a source of liquidity for both retail and institutional investors.

In the traditional financial system, the trading and settlement of assets involve complex processes and multiple intermediaries. For example, when trading stocks, buyers and sellers typically rely on brokers to execute trades on their behalf. The settlement process then involves a clearing house, which acts as an intermediary between the two parties, ensuring that the buyer receives the shares, and the seller receives the payment. This process can take several days and involves various fees and costs associated with the intermediaries involved.

In contrast, the use of tokenized assets and tokenized deposits can streamline the trading and settlement process. Tokenized deposits would serve as the settlement medium for trading in tokenized assets. The settlement of trades can occur more efficiently between parties with the potential reduction of the number of intermediaries, as the transfer of ownership and payment can be processed simultaneously using smart contracts.

For instance, consider the trading of a tokenized real estate asset. In the traditional system, the process would involve intermediaries, such as law firms and banks, and could take several days to complete. Lawyers typically manage escrow accounts to hold funds during the transaction. With tokenized assets and deposits, the entire process can be automated using smart contracts. The buyer can use tokenized deposits to purchase the tokenized real estate asset, and the smart contract can automatically transfer ownership and release the payment to the seller once all predefined conditions are met.

**Cash collateral:** Tokenized deposits can also serve as a form of cash collateral, enabling banks to efficiently post collateral to counterparties or central clearing houses. The speed and efficiency of tokenized deposit transfers make them well-suited for this purpose, as collateral requirements often need to be met on short notice. By facilitating near-real time transfers of funds across jurisdictions, tokenized deposits could allow banks to reallocate internal liquidity rapidly to meet regulatory or counterparty demands.

Smart contracts can automate the collateral management process. They can be programmed to automatically release the collateral once predefined conditions are met, such as the fulfillment of contractual obligations or the expiration of a specific time period. This automation reduces the need for manual intervention and minimizes the risk of errors or delays in the collateral release process.

Tokenized deposits and smart contracts for collateral management can enhance transparency and traceability. All transactions and changes in collateral ownership are recorded on a distributed ledger, providing an immutable and auditable trail of events. This increased transparency helps banks better manage their collateral, comply with regulatory requirements, and reduce the risk of disputes with counterparties.

The improved agility in collateral management offered by tokenized deposits helps banks optimize liquidity, reduce costs, and better manage risk. By leveraging tokenized deposits and smart contracts, banks can streamline their collateral management processes, freeing up resources to focus on core business activities and improving operational efficiency.

# Global landscape

Various central banks across the globe have been working on tokenized deposits and CBDCs. Its development is influenced by economic, social, technological and regulatory factors. The global regulatory and policy landscape surrounding crypto-assets and tokenization is maturing, with jurisdictions taking steps to systematically recognize related risks and their relevant mitigation methods, including legal frameworks, regulatory approval and licensing.

## First country to regulate tokenization

France’s Blockchain Order of 2017 established a regulatory framework overseeing the representation and transmission of unlisted financial securities through Distributed Ledger Technology (DLT), including new securities (such as unlisted equity and debt securities) and made it possible to use DLTs for issuing, registering and transferring such securities.<sup>6</sup>



## First CBDC launched

CBDCs seem like a recent popular topic, but they have been around for more than three decades. In 1993, the Bank of Finland brought to market the Avant smart card. The system was dropped in the early 2000s but is regarded as the first CBDC in existence.



## Activities from leading central banks and key players

### United Arab Emirates

The Central Bank of the UAE (CBUAE) piloted two CBDC-related projects. The first project, called “Aber”, was conducted in collaboration with the Saudi Arabian Monetary Authority and explored feasibility of tokenized deposits and distributed ledger technology.<sup>7</sup> The second project, “mBridge”, was a collaboration between four central banks with a focus on cross-border CBDCs.<sup>8</sup> In February 2023, the government launched its Financial Infrastructure Transformation Programme (FIT Programme) and a CBDC strategy to accelerate digital transformation of the financial services sector. The first step of the strategy included the soft launch of mBridge to facilitate real value cross-border CBDC transactions for international trade settlement, with a proof-of-concept for bilateral CBDC bridges with India and for the domestic rCBDC and wCBDC issuance. The UAE government is aiming to complete the first phase of CBUAE’s digital Dirham strategy by mid-2024.<sup>9</sup>

### India

India is actively exploring opportunities related to the digital sector using its Gujarat International Finance Tech City (GIFT), including the preparation for the launch of its first regulated tokenization platform for real world assets.<sup>10</sup>

In December 2022, India launched its rCBDC (e-INR) pilot, which includes Person to Person (P2P) and Person to Merchant (P2M) transactions. The pilot operates through 13 banks across 26 cities. As of August 2023, there are around 1.46 million users and 0.31 million merchants involved in the pilot.<sup>11</sup>

### Singapore

The Monetary Authority of Singapore (MAS) is spearheading innovation in the financial sector with recent initiatives such as Project Guardian and Project Orchid, which focus on integrating decentralized finance (DeFi) and asset tokenization. Project Guardian was initiated in collaboration with major financial institutions to explore the potential of DeFi through pilots that involve tokenized assets and currencies, aiming to facilitate efficient transactions within a regulated framework.<sup>12</sup>

Meanwhile, Project Orchid is part of Singapore’s broader strategy to develop and implement digital currency solutions, including Central Bank Digital Currencies (CBDCs).<sup>13</sup> These efforts highlight MAS’s commitment to embracing digital transformation in the financial industry, driving advancements in digital assets, tokenization, and CBDC development to ensure the country’s financial infrastructure remains robust, efficient, and forward-looking.

### Kazakhstan

In April 2023, the law on digital assets came into force. It creates a regulatory framework for the issuance and circulation of digital assets, including tokenized assets.

The National Bank of Kazakhstan has established a separate entity, the National Payment Corporation, to lead the development and implementation of the digital tenge.<sup>14</sup> In 2022, the Digital Tenge Platform was tested with retail consumers and merchants. Features include programmability and offline transactions.<sup>15</sup> Initially the Digital Tenge project was mostly focused on developing a rCBDC. However, during 2023, while the country continued the research and development stage of the digital currency, a wCBDC was also included into the testing phase.<sup>16</sup> The full industrial implementation, integration of all market participants, and cross-border connectivity is anticipated to be achieved by 2025.<sup>17</sup>

### China

The People’s Bank of China (PBOC) initiated the e-CNY pilots in April 2020, starting with Shenzhen, Suzhou, Xiongan, and Chengdu. Over the past three years, the pilot has extended to other major cities and gained awareness through lotteries, and vouchers. As of April 2023, the PBOC reported that the pilot includes 26 areas in 17 provinces. As of July 2023, total e-CNY transactions reached 950 million with 120 million wallets. As of January 2024, crypto-asset, tokenization, and tokenized deposits are banned in Mainland China, except for the e-CNY.<sup>18</sup>

### Hong Kong SAR

Hong Kong has been proactively implementing regulatory frameworks to facilitate the growth and adoption of tokenization. In November 2023, the SFC published two circulars providing guidance to intermediaries engaging in tokenized securities-related activities. Furthermore, the HKMA issued a consultation paper on the legislative proposal to introduce a regulatory regime for stablecoin issuers in December 2023.<sup>19</sup>

In 2021, the HKMA published a “Fintech 2025” strategy for the fintech development in Hong Kong, which included the exploration of CBDCs. The HKMA together with the Bank of Thailand (BOT), the Central Bank of the United Arab Emirates (CBUAE) and the Digital Currency Institute of the People’s Bank of China (PBCDCI) conducted a six-week pilot of the mBridge platform in Q3 2022. During the pilot, 20 banks in four jurisdictions used the mBridge platform to conduct over 160 payment and foreign exchange transactions totalling more than HK\$171 million. Subsequently, Project mBridge has reached the Minimum Viable Product (MVP) stage in June 2024 with the Saudi Central Bank as the next full participant of the mBridge MVP platform.

On the retail CBDC (rCBDC) front, the HKMA continues the discussion and testing of policy and design related to rCBDC. In May 2023, the regulator commenced the e-HKD Pilot Programme involving 16 companies, including Visa, for the first round of pilots.<sup>20</sup>

The participants worked together on 14 pilots across six major categories: full-fledged payments, programmable payments, offline payments, tokenised deposits, settlement of Web3 transactions and settlement of tokenised assets.

In October 2023, the HKMA established the CBDC Expert Group, which consists of faculty members from five local universities, to conduct in-depth research on CBDC.<sup>21</sup>

#### United Kingdom

The UK is progressing towards tokenization of funds with its "Blueprint for tokenization of funds." While there is growing industry interest in fund tokenization, commercial, legal, and technological challenges may inhibit its widespread use. The Financial Conduct Authority (FCA) is participating in Singapore's Project Guardian, a collaborative initiative with the financial services industry on asset and fund tokenization and decentralized finance. In Nov 2023, the FCA set out proposals for its regulation of fiat-backed stablecoins.<sup>22</sup>

The Bank of England (BOE) piloted a project for a multi-token network to support tokenized bank deposits and CBDCs. In February 2023, the BOE published a digital pound consultation and a technology working paper, outlining its interest in the digital currency but reserving any expectations on its issuance in the near future.<sup>23</sup> Meanwhile, the Bank of England, the Bank of Canada and the Monetary Authority of Singapore (MAS) collaborated on testing the application of cross border CBDCs.

#### United States of America

In 2022, the Federal Reserve issued a discussion paper to analyse the advantages and disadvantages of a US CBDCs. The related pilots were funded by the private sector and involve financial firms, retailers, and NGOs. The aim is to generate data that could help policymakers develop a digital dollar.<sup>24</sup> In September 2023, the US House of Representative's Financial Services Committee approved a bill (referred to as the "anti-CBDC" bill) allowing research of US CBDCs but prohibiting the Federal Reserve from pursuing a CBDC pilot.<sup>25</sup>

Over the years, various regulatory bodies have played an important part in regulating ICOs, crypto-exchanges, taxation, AML, and tokenized securities. It's important to note that different US states may have differing regulations when it comes to crypto assets. Generally, banks in the United States need to demonstrate that they have adequate controls in place to offer services related to crypto assets.<sup>26</sup> This involves establishing a suitable risk management system to ensure compliance and mitigate potential risks.<sup>27</sup>

#### Brazil

In August 2023, Banco Central do Brasil (BCB) selected projects for its innovation agenda, among others it includes blockchain, asset tokenization, and crypto assets. However, the testing schedule of these initiatives has not been published yet.

Brazil's digital currency, Drex (Digitalized Brazilian Real issued by the central bank), follows a hybrid model where banks use wCBDC, and the population holds tokenized deposits in their e-wallets issued by their banks. The country already has an instant payment system called Pix, but Drex would offer additional features, such as provision of smart financial products and services like investments, financing, and insurance. Throughout 2022, the BCB conducted a detailed analysis of Drex use cases during "*LIFT Challenge Real Digital*" which brought together banks, payment institutions and fintech. In May 2023, the BCB selected 16 consortia participants, including Visa, for the Drex Platform testing. The platform utilizes DLT, smart contracts and various transactions with tokens. According to the BCB plans, the tests of Drex Pilot with the population should start by the end of 2024, pending project features maturity.<sup>28</sup>

#### European Union

The EU Commission launched the initiative "Tokenize Europe 2025," to tap into the potential of asset tokenization and distributed ledger technology (DLT). The EC is currently developing a "pro-innovation" legal framework in the areas of digital assets and tokenization.<sup>29</sup>

In October 2021, the European Central Bank (ECB) piloted research on the feasibility of issuing a digital euro. The results were published in October 2023. The EU considers a two-stage approach to mitigate risks, allow time for addressing any issues and enable step-by-step introduction of all digital euro functions to its users. The first stage may cover P2P and e-commerce payments, and the second may cover point-of-sale (POS) payments.<sup>30</sup>

The EU Commission initiated a legislative process to prepare a dedicated framework for digital euro: the legislative proposal was published in June 2023 for adoption by the EU Parliament and the Council. The European Securities and Markets Authority (ESMA) issued guidance on initial coin offerings (ICOs) and crypto assets, emphasizing the need for compliance with existing securities regulations. The Markets in Crypto Assets Regulation (MiCA) entered into force in June 2023. It focuses on balancing the existing legal framework, innovation and uptake of new digital financial instruments and providing sufficient consumer and investor protection.<sup>31</sup>

## Transnational groups

In July 2023, the Financial Stability Board (FSB) issued a plan for asset and currency tokenization. The framework is based on the principle of “same activity, same risk, same regulation” and ensures that crypto-asset activities and stablecoins are subject to consistent and comprehensive regulation. In November 2023, the International Organization of Securities Commissions (IOSCO) published a final report on policy recommendations for crypto and digital asset markets. The recommendations provided in this report are designed to support consistency of the regulatory frameworks and oversight of crypto-asset activities in IOSCO member jurisdictions, to address concerns related to market integrity and investor protection.<sup>32</sup>

Bank for International Settlements (BIS) had been actively involved in exploring the feasibility of CBDCs.

Some of the key BIS projects are Project mBridge, Project Aurum and Project Sela. Project mBridge involves BISIH Hong Kong Centre and five central banks (HKMA, PBCDCI, BOT, Saudi Central Bank and CBUAE). It studies how central bank digital currencies (CBDCs) and innovative solutions can be applied to solve the key pain points in cross-border payments. Project Aurum involves the BISIH, the HKMA and the Hong Kong Applied Science and Technology Research Institute (ASTRI), and it focuses on the high-level technical design of rCBDC. Project Sela involves the BISIH, the HKMA and the Bank of Israel. The focus of this project is to test the feasibility of a cyber-secure rCBDC. According to Atlantic Council, 130 countries are exploring CBDCs in June 2023. 19 of the G20 countries are now in the advanced stage of CBDCs development.<sup>33</sup>





# Actively exploring the future of money movement

## e-HKD pilot

In May 2023, the HKMA commenced Phase 1 of the e-HKD Pilot Programme. Visa, along with HSBC and Hang Seng Bank, was selected to participate in the first phase of the pilot programme, focusing on exploring the feasibility of tokenized deposits. This pilot programme is a key component under the HKMA's "three-rail approach" to prepare for the possible e-HKD implementation in Hong Kong. The pilot programme goes under Rail 2, which involves the exploration of the use cases and application of the e-HKD. The Rail 2 takes deep dives into potential use cases, and implementation and design issues relating to an e-HKD. Rail 1 aims to lay the technology and legal foundations for supporting the future implementation of an e-HKD, and Rail 3 is concerned with the actual launch of e-HKD.

## Visa, HSBC and Hang Seng Bank

Visa collaborated with HSBC and Hang Seng Bank to explore the atomicity and interoperability of intra-bank, inter-bank and cross-chain payments using tokenized deposits, specifically focusing on two key interbank B2B payment flows: property payments and acquirer-merchant settlement. Visa provided technical and engineering expertise for this pilot, including creation of a simulated central bank ledger. HSBC and Hang Seng Bank provided invaluable insight into their client needs and expectations. The participating banks used an early stage build of Visa's tokenized deposit technology solution to accomplish end-to-end testing of the use cases identified. The pilot aimed to explore the potential future benefits of using e-HKD with the proposed flows and its value-add to relevant stakeholders.

## The Hongkong and Shanghai Banking Corporation Limited (HSBC)

HSBC serves around 42 million personal, wealth and corporate customers world-wide in 62 countries and territories. With assets of US\$3,001bn at 31 March 2024, HSBC is one of the world's largest banking and financial services organisations.

## Hang Seng Bank Limited (Hang Seng)

Founded in 1933, Hang Seng has continually innovated to provide best-in-class, customer-centric banking, investment and wealth management services for individuals and businesses. It is widely recognized as the leading domestic bank in Hong Kong, currently serving more than 3.9 million customers.



# The path to tokenizing bank deposits

## Building platform capabilities

The Visa tokenization solution for digital assets provides a comprehensive solution that allows for minting, burning and transfer of tokenized deposits. This functionality can be integrated with a wholesale asset settlement system, enabling seamless end-to-end processes for the settlement of wholesale assets.

### Minting

This process involves creating new tokens that represent real deposit values in a bank's system. When a bank customer makes a deposit, the Visa tokenization solution for digital assets generates an equivalent amount of digital tokens, effectively "minting" new tokens. These tokens can then be used within the platform for various transactions, acting as a digital representation of the customer's deposit.

### Burning

This refers to the process of permanently removing digital tokens from circulation. It occurs when tokens are redeemed or withdrawn by the bank customer. The equivalent value of the tokens is returned to the bank customer in their chosen form (e.g., transferred to a traditional bank account), and the corresponding tokens are "burned." This ensures the total supply of tokens accurately reflects the current value of deposits within the bank.

## Key technical capabilities



### Tokenization

Visa's tokenization solution for digital assets enables tokenization of assets and liabilities using a common set of technical standards and API-based interfaces. Tokenization capability relies on Visa-developed smart contracts and off-chain services.



### Privacy & identity

Visa is engaging with institutions focused on privacy research, including research and development related to the Zether protocol (a privacy preserving mechanism for Ethereum). Leveraging blockchain technology, Visa is working to develop KYC and Verifiable Credential solutions designed to enhance data privacy and ease-of-access for users, while supporting AML / CFT processes.



### Interoperability

Platform interoperability standards between DLT and non-DLT-based systems enable multi-currency, multi-network money movement, while interchain protocol enables cross-chain interoperability across multiple blockchain networks.



### Programmability

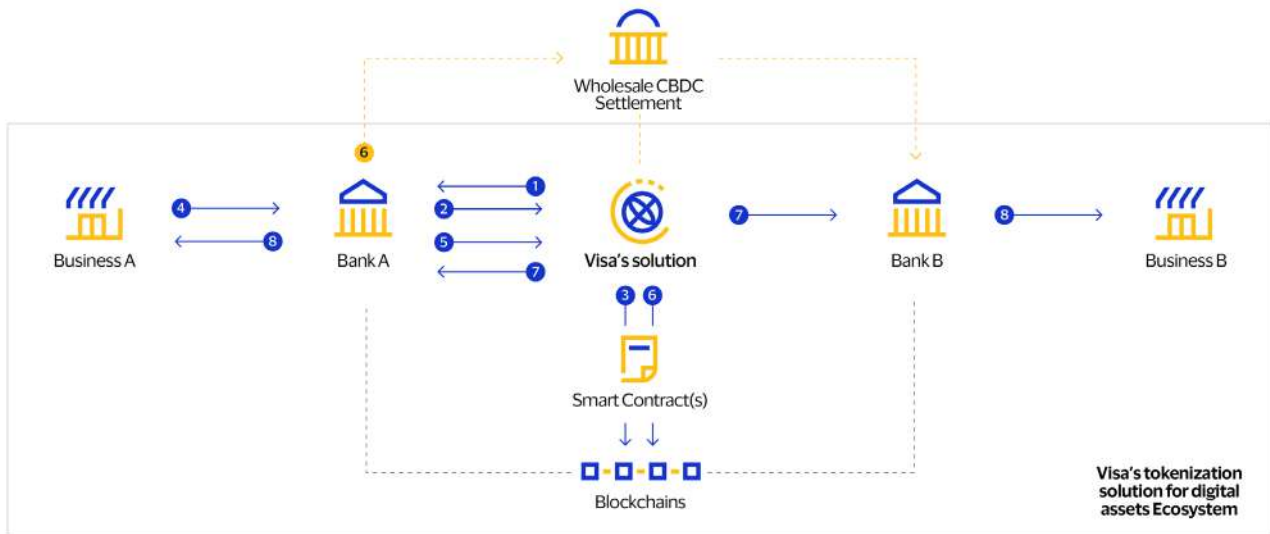
Standard smart contracts enable the automation of finance processes, including Delivery versus Payment (DvP) for securities and lending, to utilize atomic settlement to help reduce risks and increase speed of payments. Visa's tokenization solution for digital assets enables atomic settlement between counterparties using an infrastructure that is designed to be "always-on" and programmable.



### Potential flow for interbank settlement

The Visa tokenization solution for digital assets utilizes an atomic settlement model for interbank transfers. Figure 1 demonstrates how upon a payment occurring from a customer at Bank A to a customer at Bank B, the Visa tokenization solution for digital assets simultaneously burns the original customer's deposit, mints a new deposit for the receiving customer, as well as moves the wholesale CBDC between Bank A and Bank B to accomplish final settlement.

### Visa's tokenization solution for digital assets Interoperability Example - Interbank Settlement using CBDC



### Example Workflow of a B2B Interbank Transfer

- 1 Visa onboards Bank A into Visa's solution and issues access credentials to mint and manage tokenized deposits
- 2 Bank A requests to mint tokens for Business A
- 3 Visa's platform mints tokens into Business A's wallet
- 4 Business A initiates a transfer request to pay Business B
- 5 Bank A submits transfer request to Visa's platform
- 6 Atomically, Visa's solution executes 3 instructions for the transfer using the Bridge Protocol:
  - A Visa's solution triggers burn transaction for Business A's wallet
  - B Visa's solution triggers a mint transaction into Business B's wallet
  - C Bank A is instructed to send wholesale CBDC to Bank B in order to settle on the central bank ledger
- 7 Visa's solution sends confirmation of transfer completion to Banks A and B via APIs
- 8 Businesses A and B receive notification of payment

Figure 1: See annex 1



# Identification of use cases

## Introduction

The Visa pilot was focused on testing interbank B2B payment flow using tokenized bank deposits between customers of HSBC and Hang Seng Bank.

Two key use cases were identified for this scenario:

01.

**Property purchase**

02.

**Acquirer-to-merchant card settlement**

Visa identified other use cases for tokenized assets utilization:

- Internal bank money movement for liquidity and treasury management
- Intra-bank B2B payment for streamlining the accounts payable process.

## 01. Interbank use-case (Property Purchase)

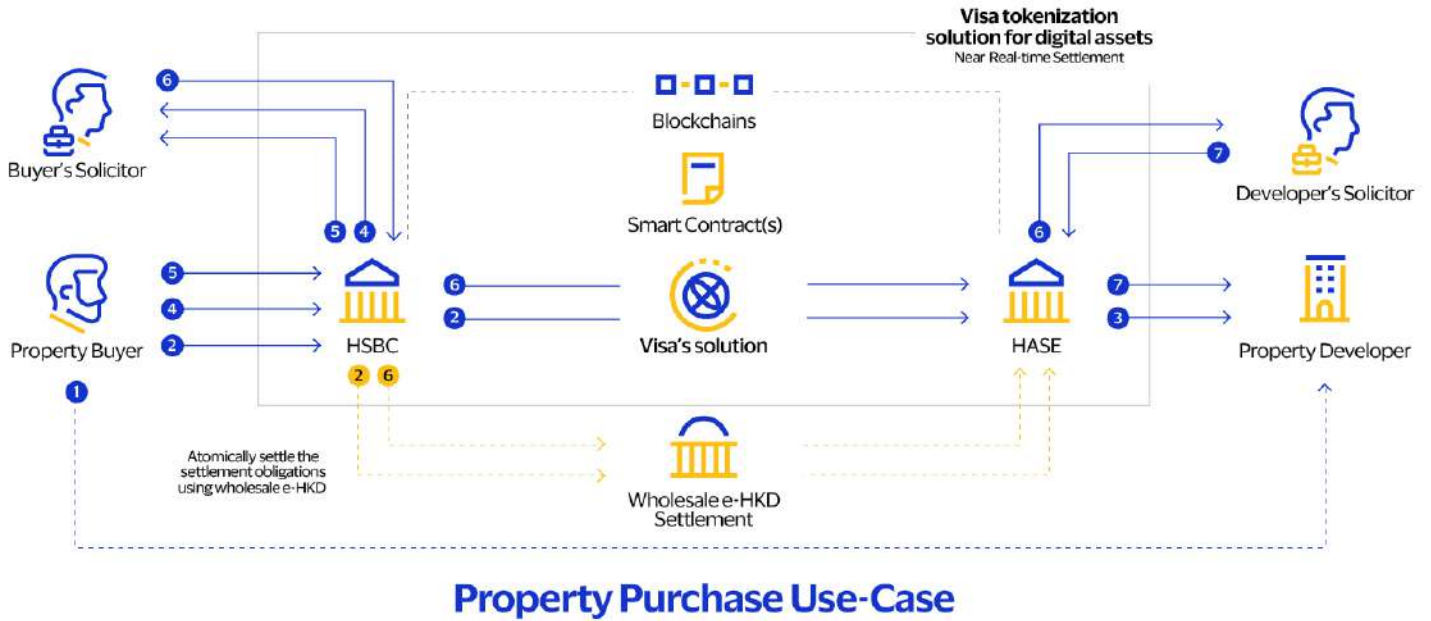
A large property developer in Hong Kong is exploring the use of tokenized deposits for the payment of high-value transactions for legal and loan purposes, as part of the property development process.

In the existing interbank workflow, the property purchase process involves several steps and intermediaries. Initially, the property buyer and developer agree on the price. The buyer then pays a preliminary deposit, usually via cheque, which takes approximately two business days to settle. The property developer periodically checks their bank account for the deposit. Next, the buyer appoints a solicitor, pays the stamp duty and applies for a mortgage loan. As the mortgage doesn't cover the entire purchase price, the buyer transfers the remaining amount to the solicitor's firm via RTGS (Real-Time Gross Settlement), which can take a few

hours to a day to settle. On the completion date, the buyer's solicitor transfers the remaining funds to the developer's solicitor via RTGS. Finally, the developer receives the remaining balance and hands over the property to the buyer.

This existing workflow presents challenges such as transaction limits, transparency and settlement delays and other challenges due to certain business processes, which can hinder the efficiency of high-value transactions in the property development process.

### Proposed Workflow for Property Purchase (Inter-Bank)



### Workflow for Property Purchase Interbank Transfer

- 1 Property Developer advertises a first-hand property for sale. An interested buyer contacts them, and they agree on the price of HK\$10M.
- 2 Property Developer signs the preliminary agreement for sale and purchase (PASP) with Buyer. Buyer initiates the transfer of 15% preliminary deposit (HK\$1.5M in token) using the HSBC banking app which is settled in near real time.
- 3 Property Developer receives notification from the Hang Seng's banking app in near real time that preliminary deposit of HK\$1.5M has been deposited into their account.
- 4 Buyer appoints a solicitor to enter sales and purchase ("ASP") with the Property Developer. Buyer pays the stamp duty within 30 days from the signing of ASP using the Visa tokenization solution for digital assets. This is done via the Buyer's solicitor.
- 5 Buyer applies for Mortgage Loan of HK\$7M with HSBC and prepares the differential amount (HK\$1.5M) that the mortgage doesn't cover. Buyer and HSBC transfer HK\$1.5M and HK\$7M to Buyer's solicitor firm before the completion day, such transfer will be received in near real time. This can be done in a just-in-time fashion due to the near instant settlement nature of the tokenized deposit.
- 6 On the completion date, Buyer solicitors' firm transfers remaining HK\$8.5M in e-HKD tokens to Property Developer's solicitor firm.
- 7 Property Developer receives the remaining purchase balance of HK\$8.5M in their Hang Seng's banking app and then hands over the keys and the property to Buyer. Buyer inspects the property. For all Tokenized Deposit transfers, banks will atomically settle the settlement obligations using wholesale e-HKD.

Figure 2: See annex 2

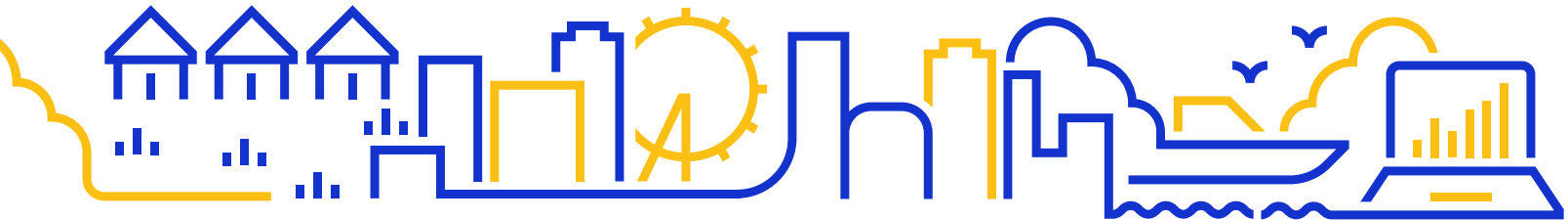
The proposed workflow using Visa’s tokenization solution for digital assets, as shown in Figure 2, addresses the limitations of the current workflow. Tokenized deposits enable high-value transactions due to reduced settlement risk while maintaining the speed of real-time payment systems.

## Differentiator of proposed flow

The existing property purchase workflow involves several manual processes and intermediaries, leading to inefficiencies and delays in settlement. The property developer lacks real-time visibility into the status of the payments, as they need to periodically check their bank account to confirm the receipt of funds. This lack of transparency can lead to uncertainty and delays in the overall property purchase process.

The proposed workflow using tokenized deposits and Visa’s tokenization solution for digital assets improves the efficiency and transparency of the property purchase process. By leveraging blockchain technology and smart contracts, the proposed solution enables near real-time settlement of funds, reducing the time taken from days to seconds in most cases.

Pilot testing of the proposed workflow has consistently shown that the transfer of funds takes less than 90 seconds, an improvement compared to the current system. Furthermore, the proposed solution enhances transparency by providing near real-time notifications to banks, buyers and sellers. All parties involved in the transaction have more immediate visibility into the status of payments, enabling better decision-making. The use of blockchain technology can also help ensure that all transactions are recorded on an immutable ledger, providing a tamper-proof audit trail.



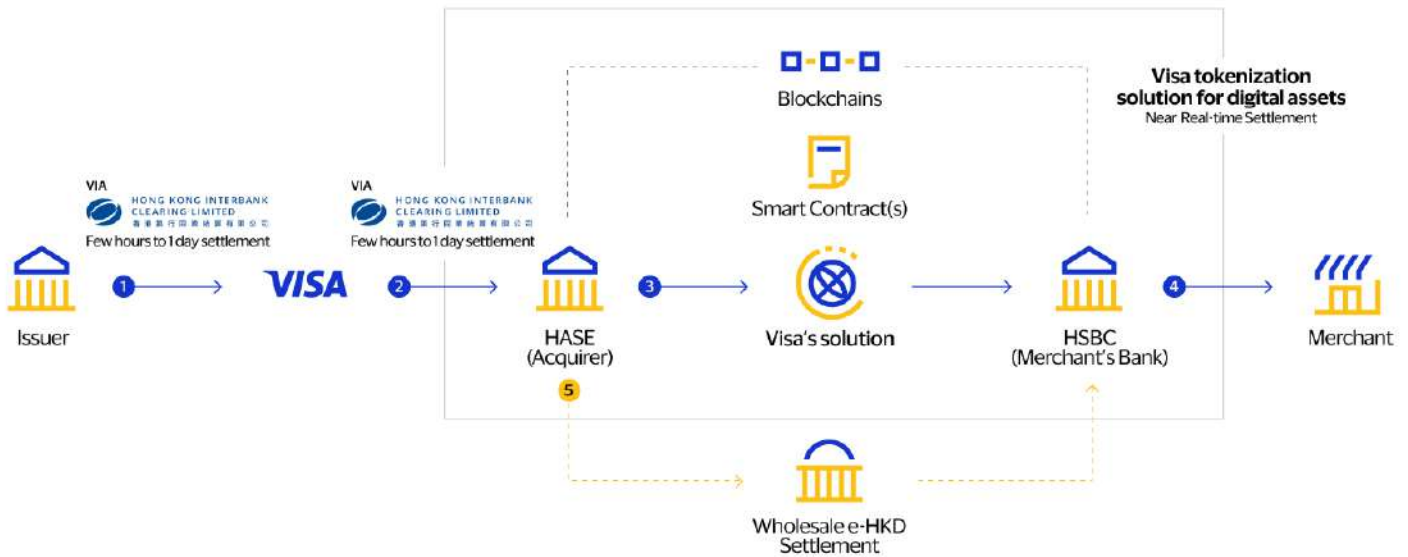
## 02. Interbank use-case (Acquirer-Merchant Settlement)

**Acquirer is interested in facilitating the settlement process to their merchants using tokenized deposits, making it more transparent and seamless.**

In the existing interbank workflow, the acquirer, usually a financial institution, processes credit and debit card transactions on behalf of a merchant. After a customer completes a transaction, the acquirer initiates the settlement process to transfer funds to the merchant’s account.

The acquirer then initiates a transfer to the merchant’s bank account, which can take an additional few hours to a day to settle. Throughout this process, the merchant lacks real-time visibility into the status of the settlement, making it difficult to manage cash flow and reconcile transactions.

### Proposed Workflow for Card Merchant Settlement (Inter-Bank)



## Card Merchant Settlement Use-Case

\* Diagram for illustration purposes only

### Workflow for Acquirer Merchant Settlement

- At the end of each settlement day, Visa calculates the daily settlement amounts based on the received transactions from the issuer. Issuer makes transfer of HK\$1M to Visa using RTGS (through HKICL), which can take between a few hours to 1 day to settle.
- Acquirer's Hang Seng account receives notification of a successful deposit of HK\$1M from Visa (through HKICL).
- Acquirer's Hang Seng account transfers HK\$1M using Visa's tokenization solution for digital assets to the merchant's HSBC bank account, which is received near real time.
- Merchant receives near instant notification of a successful deposit of HK\$1M in their HSBC account.
- Hang Seng bank and HSBC to atomically settle the settlement obligations using wholesale e-HKD of HK\$1M.

Figure 3: See annex 3

The proposed workflow, as shown in Figure 3, eliminates several pain points associated with the current workflow. By using tokenized e-HKD and the Visa's tokenization solution for digital assets, the settlement between the acquirer and the merchant occurs in near real time.

The merchant receives near real-time notifications of the settlement, enabling better transaction reconciliation and reducing the risk of disputes. The immutable nature of the blockchain also provides a tamper-proof audit trail, enhancing the overall transparency and trust in the settlement process.

## Differentiator of proposed flow

Similarly with the first use case, near real-time settlement for merchants was achieved, which can significantly improve working capability. There is also increased transparency of the onchain payments to banks, government entities and users. Finally,

there is potential to reduce the reconciliation time and expense due to the near real-time settlement of transactions. This significantly reduces the settlement delay from days to seconds in most cases, improving the merchant's cash flow management and liquidity.

## Comprehensive review

The pilot testing was conducted in a sandbox environment under a strictly controlled environment. While the use cases demonstrated positive results, it is important to acknowledge that the application and viability of tokenized deposits in Hong Kong require further exploration and validation. Payment speed, although improved in the pilot, may not be the sole driving factor for the tokenization process, given the existence of fast payment systems like FPS in Hong Kong. Moreover, the existing RTGS speed is influenced by legacy processes within the end-to-end payment process, rather than infrastructural issues.

# Key Findings

01.

**Transaction speed and cost**

02.

**Settlement risk reduction**

03.

**24/7 Availability**

04.

**Privacy of transactions**

## Transaction speed and cost

The pilot testing involved an interbank settlement process where tokenized deposits were burned on the sending bank's ledger and minted on the receiving bank's ledger. Simultaneously e-HKD was moved as the settlement asset on the simulated HKMA ledger. This process demonstrated the potential for a robust settlement mechanism that achieves settlement finality. The faster settlement finality observed in the pilot setting suggests that this technology may be suitable for high-value, time-sensitive payments, such as a commercial property purchase use case where a delay in deposit receipt could result in lost opportunities. Further testing with the upcoming

wCBDC sandbox will be necessary to validate these findings in a more realistic environment.

Visa's tokenization solution achieved end-to-end atomic settlement for payment processes, enabling participating banks to credit payment recipients in near real-time with lower settlement risk. This atomic settlement mechanism also helps improve liquidity availability by reducing the need for collateral and minimizing end-to-end settlement time.

## Settlement risk reduction

All transfers in the pilot were completed using an atomic settlement process where all three legs of the transaction occur (mint, burn, CBDC settlement) or no legs occur, thereby reducing settlement risk. Near real-time payment crediting by banks minimizes the risk of non-receipt of settlement funds, improving liquidity by reducing collateral requirements and settlement time.

## 24/7 availability

Tokenized deposits are expected to be available 24/7, enabling round-the-clock transactions and settlement. During the pilot testing, Visa's platform was accessed by personnel in various time zones, including time slots that would be after hours for traditional payment

systems. The blockchain instances utilized during this pilot ran without failure for the duration of the internal User Acceptance Testing (UAT) testing phase of three-plus weeks, demonstrating the potential for a 24/7 available payment rail.

## Privacy of transactions

The testing conducted with banks demonstrated how all onchain transactions can remain encrypted when attempting to review onchain transactions using block explorers. This showcases that tokenized deposits can be fully transacted while remaining encrypted, without revealing information about identity, balances or transaction amounts to non-bank users. This setup allows for transparency and auditing of transactions by using zero-knowledge proofs, while not revealing any private customer information.

## Challenges and areas for further exploration

While the pilot testing yielded promising results, several challenges and areas requiring further exploration were identified:

- **Interoperability and standardization:**

To facilitate widespread adoption, tokenized deposit systems must be interoperable with existing payment infrastructures and adhere to industry standards. Further work is needed to establish common protocols and standards for tokenized deposits.

- **Scalability and performance:**

Although the pilot testing demonstrated the feasibility of the technology, the scalability and performance of tokenized deposit systems in real-world scenarios with high transaction volumes need to be evaluated further.

- **User adoption and acceptance:**

The success of tokenized deposits will depend on user adoption and acceptance. Further research is required to understand user preferences, concerns and behaviors related to tokenized deposits and to develop user-friendly interfaces and educational initiatives to promote adoption.



## Participant reflections

Tokenized deposits allow commercial institutions to bring efficiency to existing settlement processes and innovate new use cases. Realizing these benefits will require further development of interoperability between tokenized deposits from different banks. Our collaboration with Hang Seng Bank and Visa in the hypothetical e-HKD Pilot Programme marks a first step for the Hong Kong financial industry to study the necessary conditions for an interbank infrastructure based on wholesale e-HKD to support programmable, atomic and tokenized settlement.

**Vincent Lau, Global Head of Digital Money, Global Payments Solutions, HSBC.**

We are delighted to partner with the HKMA, Visa and HSBC on this pioneering tokenized deposit pilot in Hong Kong. As the largest local bank in Hong Kong, Hang Seng Bank has been actively involved in CBDC research and pilot programmes. The e-HKD Pilot Programme has provided us with a valuable platform to explore the potential of various forms of digital money, including tokenized deposits and retail CBDC. Our collaboration with various industry partners, such as Visa, has allowed us to develop new CBDC use cases and provide essential references for regulators, policymakers and other industry players.

**Nancy Cheng, Head of Partnership and Innovation, Hang Seng Bank.**

The HKMA pilot programme provided a great opportunity for Visa to continue doing what we do best: working with partners to drive payment innovation and experiment with new forms of money movement. It has highlighted the vast applicability of Visa solutions in enabling secure money movement that could bring benefits to a larger number of people, businesses and places. We are immensely thankful for the collaboration with the HKMA, HSBC and Hang Seng Bank, and we are excited to continue our work in bringing forward the future of digital payments in Hong Kong.

**Paulina Leong, General Manager for Visa Hong Kong and Macau**

Through the pilot programme, Visa has highlighted various potential benefits for the deployment of CBDCs, such as quicker settlements, a more seamless payment experience for high-value transactions, better transparency, as well as other benefits that come with a designed to be “always-on” infrastructure. Our involvement in piloting actual use cases delivered pivotal learnings that are not only paramount to the possible implementation of the hypothetical e-HKD but can also help shape the future of the payment ecosystem.

**Nischint Sanghavi, Head of Digital Currencies, Asia Pacific, Visa.**



# Key considerations and risks



## Evolving regulatory landscape

There are on-going developments as regulators focus on the legal status, taxation, consumer and investor protection, and cross-border regulations and the implications of tokenization; for example, in a bankruptcy process. As such, some questions still remain about the potential integration of digital currencies into the existing financial market. Regulatory sandboxes and consultation papers can help assure the public and markets about the approach chosen by governments and regulators. By creating controlled environments for testing and experimentation, regulatory sandboxes enable the exploration of digital currency applications while managing potential risks. Performed in tandem with public consultations ensures a transparent and inclusive decision-making process.



## Newly emerging financial infrastructure

A significant commitment and considerable investments into infrastructure is required for the tokenization opportunity to be adequately designed, tested and implemented. Just like traditional payment systems, blockchains also require the standardization of data and protocols. Without standardization, achieving interoperability and scalability between different networks and products becomes extremely challenging or even impossible. Constructive and open dialogue with regulators and among financial market leaders should determine the path to a suitable infrastructure acceptable by the stakeholders. By fostering a shared understanding and consensus, the development of a robust and effective infrastructure for tokenized opportunities can be achieved.



## Privacy protection

The current debate surrounding tokenized fiat money revolves around the concerns related to privacy and the level of control exerted by financial market infrastructures. While physical cash allows untraceable payments, programmable digital solutions can be potentially accessed and controlled by various parties including central banks, and other parties with or without malicious intent. Addressing these privacy concerns requires careful consideration of solution architecture. By designing robust and secure architectures, it is possible to mitigate some of the privacy-related issues associated with tokenized fiat money.



## Education gap

Despite the increasing popularity of blockchain technology, many average citizens still have limited knowledge and understanding of these concepts. Certain news only supports distrust in digital assets of the general public. This may hinder the rapid widespread adoption of tokenized retail solutions. To address this issue, regulators and market participants should conduct outreach programs to enhance public understanding of digital finance.





## Conclusions

Across the world today, governments and financial institutions are exploring how blockchain technology can improve financial services and their user experiences. Blockchain-based bank deposits, along with other emerging forms of digital assets, can provide greater trust, control and operational efficiency in a multitude of B2B, B2C, C2B and P2P use cases. With Visa's platform, it is our vision to directly support commercial banks in enabling unique tokenization solutions and a secure gateway into a broad spectrum of blockchain technology for their customers.

The first phase of e-HKD Pilot Programme demonstrated that further research and testing are required to bring the technology and governance models to maturity. Visa plans to continue its work on the use cases by developing programmability capabilities to automate various steps in property purchase and merchant card settlement use cases. Cross-border capabilities and multi-currency transactions for the use cases could help tokenization to evolve. Additional use cases for DvP of tokenized assets and expansion to retail solutions should be considered as well.

In future phases, Visa can support the development of the governance model for tokenized assets, assisting the HKMA's testing and integration of e-HKD, if required. Visa can also support a complete analysis of the best architecture for responsibilities of banks, the HKMA and Visa, and comprehensive regulatory analysis of tokenized deposits based on Hong Kong frameworks that would support the governance proposal. Looking ahead, the scope of use cases that can be enriched by tokenized currencies is wide. For large corporations, B2B payments for supplier invoices are often delayed due to inefficiencies in cross-border payments. With blockchain tokenization and payments, it is possible to cut down the delays with a near real-time settlement

model that substantially reduces settlement time and risk for these large value payments. Considering another use case on payrolls, blockchain tokenization can reshape and offer more options for employers with the way they pay their employees in the future. Finally, blockchain tokenization can be utilized by banks to offer new P2P payment products. For example, by taking advantage of tokenized deposits, atomic settlement and programmability features embedded in smart contracts, blockchain tokenization may effectively address high-costs inherent in cross-border payments, offering users faster and cheaper services, expanded product solutions and more inclusive financial products.

We see great potential in leveraging the power of programmability. From end-to-end conditional payments to programmable finance for local SMEs, to streaming micro-payments in a gig economy, to linking composable rules across different regulated entities to ensure proper compliance and KYCs across jurisdictions, smart contracts present amazing potential. With programmability, not only can we envision more automation and efficiency gains, but we can also look to unlock many more business opportunities by building new money movements capabilities that are not yet fully realized today.

Looking ahead to the next phase for Visa's platform, we are committed to extending the benefits of digital currencies to an even greater number of people and places around the world. Collaboration will be crucial to work with cutting-edge banks and Fintechs, alongside our public sector partners, to build the next generation of digital solutions necessary to transform the world of payments. We look forward to hearing from you and your partnership in charting the future of money together.

## About Visa

Visa (NYSE: V) is a world leader in digital payments, facilitating payments transactions between consumers, merchants, financial institutions, and government entities across more than 200 countries and territories. Our mission is to connect the world through the most innovative, convenient, reliable, and secure payments network, enabling individuals, businesses, and economies to thrive. We believe that economies that include everyone everywhere, uplift everyone everywhere and see access as foundational to the future of money movement.

Learn more at [Visa.com](https://www.visa.com)

## Acronyms and abbreviations

Abbreviation	Definition
AML / CTF	Anti-money Laundering and Counter-terrorism Financing
ASTRI	Hong Kong Applied Science and Technology Research Institute
B2B	Business-to-Business
BCB	Central Bank of Brazil (Banco Central do Brasil)
BIS	Bank of International Settlements
BISIH	BIS Innovation Hub
CBDC	Central Bank Digital Currency
CBUAE	Central Bank of the United Arab Emirates
DLT	Distributed Ledger Technology
DvP	Delivery versus Payment
ECB	European Central Bank
ERC	Ethereum Request for Comments
EU	European Union
FATF	Financial Action Task Force
FCA	Financial Conduct Authority (UK)
Fed	Federal Reserve System (USA)
Fiat	Governmental Issued Legal Tender
FINMA	Swiss Financial Market Authority
FPS	Faster Payment System
FSB	Financial Stability Board
Hang Seng	Hang Seng Bank
HKMA	Hong Kong Monetary Authority
HSBC	The Hongkong and Shanghai Banking Corporation
ICO	Initial Coin Offering
IMF	International Monetary Fund
KFIU	Korea Financial Intelligence Unit
KYC	Know Your Customer
MAS	Monetary Authority of Singapore
MiCA	Markets in Crypto-Assets Regulation
NFT	Non-fungible Token
NGO	Non-governmental Organization
OECD	Organization for Economic Co-operation and Development
P2M	Person to Merchant
P2P	Person to Person
PBOC	People's Bank of China
POS	Point of Sale
RBI	Reserve Bank of India
rCBDC	Retail Central Bank Digital Currency
HKD	Hong Kong Dollar
RTGS	Real-Time Gross Settlement
RTP	Real-Time Payments
SCA	Securities And Commodities Authority (UAE)
SECB	Securities and Exchange Commission of Brazil, or CVM
SFC	Securities and Futures Commission (Hong Kong)
SME	Small and Medium Enterprise
wCBDC	Wholesale Central Bank Digital Currency



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## Annex: Description of all figures

### Figure 1: Simplified workflow of a B2B interbank transfer via Visa's platform

The image depicts the streamlined process of an interbank business-to-business (B2B) transfer within the Visa's tokenization solution for digital assets, involving Business A, Bank A, Bank B and Business B. It begins with Visa onboarding Bank A into Visa's platform and progresses through minting of tokens, initiation of a payment transfer by Business A and the execution of the transfer across banks using blockchain technology. The transfer employs smart contracts and includes a wholesale Central Bank Digital Currency (CBDC) settlement between Bank A and Bank B. The workflow concludes with Visa's platform confirming the transaction to both banks and both businesses receiving a payment notification.

### Figure 2: Real estate transaction workflow using tokenized e-HKD and Visa tokenization solution for digital assets

This figure illustrates the streamlined workflow for a property purchase utilizing an interbank transfer system with tokenized electronic Hong Kong Dollars (e-HKD). The process begins with the property developer and the buyer agreeing on a sale price, followed by the signing of a preliminary sale and purchase agreement. The buyer then transfers a 15 percent deposit through the HSBC app, with the funds being tokenized and settled in near real time. The property developer is promptly notified of the deposit via the Hang Seng app, marking a significant improvement over the traditional system where such notifications are typically not provided. The buyer's solicitor is then engaged to finalize the sales agreement, and the buyer pays the required stamp duty through the Visa's tokenization solution for digital assets. For the mortgage and payment of the remaining balance, the buyer secures a loan and transfers the funds alongside their own contribution to the solicitor's firm, leveraging the near real-time settlement capability of tokenized deposits. On the completion date, the remaining balance is transferred to the developer's solicitor's firm in e-HKD tokens. The transaction concludes with the property developer receiving the final balance through the Hang Seng app and handing over the property to the buyer. The entire process is facilitated by blockchain technology, ensuring secure, efficient and atomic settlements of the tokenized funds.

### Figure 3: Acquirer merchant settlement workflow using tokenized e-HKD and Visa tokenization solution for digital assets

The figure delineates a sophisticated workflow for the settlement of transactions between acquirers and merchants within the Visa network, emphasizing the use of tokenized Hong Kong Dollars (HKD). The process initiates with Visa's calculation of daily settlement amounts from transactions provided by the issuer. Subsequently, the issuer transfers the settlement amount, HK\$1M in this instance, to Visa via the Real-Time Gross Settlement system (RTGS) through HKICL, with the process duration ranging from a few hours to a full day. Following the initial transfer, the acquirer's Heng Seng account is notified of the successful deposit from Visa, after which Heng Seng facilitates the transfer of the tokenized HK\$1M to the merchant's HSBC account. This transfer leverages Visa's tokenization solution for digital assets, allowing for near real-time receipt by the merchant. The merchant is apprised of the deposit in near real time, and the final phase of the process involves Hang Seng and HSBC automatically settling the obligations through wholesale e-HKD, thereby completing the transaction loop.

# Disclaimer

## As-Is Disclaimer

Case studies, comparisons statistics, research and recommendations are provided "AS IS" and intended for informational purposes only and should not be relied upon for operational, marketing, legal, technical, tax, financial or other advice. You should consult with your legal counsel to determine what laws and regulations may apply to your circumstances. The actual costs, savings and benefits of any recommendations or programs may vary based upon your specific business needs and program requirements. By their nature, recommendations are not guarantees of future performance or results and are subject to risks, uncertainties and assumptions that are difficult to predict or quantify. Visa is not responsible for your use of the information contained herein (including errors, omissions, inaccuracy or non-timeliness of any kind) or any assumptions or conclusions you might draw from its use. Visa makes no warranty, express or implied, and explicitly disclaims the warranties of merchantability and fitness for a particular purpose, any warranty of non-infringement of any third party's intellectual property rights. To the extent permitted by applicable law, Visa shall not be liable to a client or any third party for any damages under any theory of law, including, without limitation, any special, consequential, incidental or punitive damages, nor any damages for loss of business profits, business interruption, loss of business information, or other monetary loss, even if advised of the possibility of such damages.

## Product/Ideas in Development Disclaimer

This document is intended for illustrative purposes only. It contains depictions of a product currently in the process of deployment, and should be understood as a representation of the potential features of the fully-deployed product. The final version of this product may not contain all of the features described in this presentation.

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30. [A stocktake on the digital euro](#)
31. [Markets in Crypto-Assets Regulation \(MiCA\)](#)
32. [Policy Recommendations for Crypto and Digital Asset Markets Final Report](#)
33. [Central Bank Digital Currency Tracker](#)

## Additional Reading Material

1. [Regulatory Approaches to the Tokenisation of Assets](#)
2. [THE ASCENT OF CBDCS](#)
3. [Luxembourg Passes Bill to Give Blockchain Securities Legal Status](#)
4. [SEC Publishes Framework for "Investment Contract" Analysis of Digital Assets](#)
5. [What the OCC Interpretive Letter on Cryptocurrency Custody Means for Banks and Digital Assets Firms](#)
6. [Digital finance: Council adopts new rules on markets in crypto-assets \(MiCA\)](#)
7. [An overview of the cryptocurrency regulations in Switzerland](#)
8. [The 5 Main Changes Made by the 5th AML Directive \(5AMLD\)](#)
9. [Singapore: New Payment Services Act Takes Effect](#)
10. [China is Doubling Down on its Digital Currency](#)
11. [FACT SHEET: White House Releases First-Ever Comprehensive Framework for Responsible Development of Digital Assets](#)

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