eCurrency

DSC³ - Digital Symmetric Core Currency Cryptography

DSC³ technology enables central banks to create and issue a safe, secure and non-counterfeitable Central Bank Digital Currency (CBDC) as a digital bearer instrument, which meets the scale, interoperability, instant settlement and other operational and policy requirements for use as legal tender alongside notes and coins.

Introduction

DSC³ is a central bank security technology for operationalizing CBDC. At its core, DSC³ utilizes symmetric key cryptography along with layers of digital security to ensure that the resultant cryptographic objects, i.e. digital bearer instruments in the form of a cryptogram, are protected from counterfeiting. It supports a two-tier architecture and public-private partnership in which the central bank is the sole issuer of CBDC, while private sector payment networks enable its distribution, storage and transaction. DSC³ is highly scalable, capable of supporting high volume retail CBDC usage in even the largest economies. It is energy efficient and environmentally 'green.' It requires minimal energy for creation, distribution and processing of transactions.

Key Characteristics of the DSC³ Technology

Bearer Instrument

DSC³ allows CBDC to be issued as a true bearer instrument, like notes and coins, which settles instantly and with finality. There is no subsequent backend settlement, RTGS transfer, consensus or ledger reconciliation needed. DSC³ technology allows central banks to issue a digital form of M0, a digital object (or bearer instrument), comprised of layers of security that prevent it from being modified or counterfeited. This instrument can then be put into circulation through commercial banks, payment services and electronic wallet providers. It can be stored by these private sector participants and passed from one wallet to another to settle transactions. The instrument itself is independent from the digital wallets and payment systems that store or transact with it.

As it is another form of M0, the digital instrument is, by law, legal tender and universally accepted. This is supported by the DSC³ technology which decouples the instrument from the wallets and payment systems. This is analogous to notes and coins being stored in physical wallets or safes. While they are moved from one holder to another, they themselves remain unique central bank security instruments. A true digital bearer instrument, as created by DSC³ technology is a unique security instrument regardless of the companies providing the electronic wallet or participating in a transaction, thus, allowing it to be universally accepted.

Two-tier Architecture via a Public-Private Partnership

In deploying CBDC, central banks will continue their role as sole providers of currency to the public. Central banks will continue to create and issue currency, while relying on private sector participants, such as commercial banks and mobile money operators, to distribute it to the public in line with the current practice.

The DSC^3 technology was specifically designed to leverage existing, and future, payment rails built by private sector participants. DSC^3 de-couples the wallets and payments from the instruments. As such, existing digital wallet and payment systems are able to store and transact in the new CBDC instruments while retaining their user interfaces and functionalities. The user experience remains the same, and user authentication, support and KYC continue to be the responsibility of the private sector service providers. The central bank is not required to create new payment systems, drive adoption by the public, or be responsible for customer-facing interfaces and support. The private sector will support this approach over approaches that contemplate replacing these financial intermediaries with centralized CBDC systems. The latter could be through accounts at the central banks or DLT platforms run by the central bank, which suffer from inherent weaknesses. Such approaches require the central bank to drive public adoption, create or leverage national identity systems, authenticate all members of the public, and support them when their logins fail. Concurrently, these approaches jeopardize privacy, compromise private sector support and stifle innovation.

Single-tier, centralized option

DSC^3 can also be implemented as a single-tier solution, should central banks want to do so. This is accomplished simply by the central bank providing the payment system(s). The currency appliances can be centralized or decentralized to best meet country-specific operation and policy requirements.

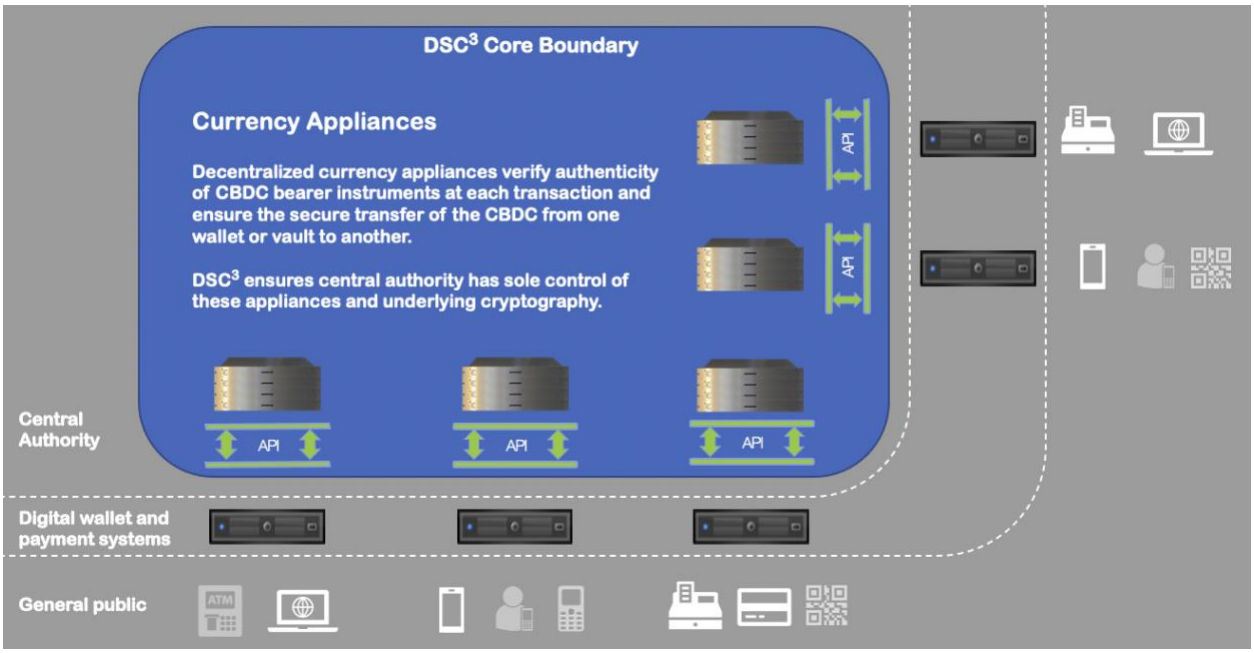
Fully Secure

A true bearer instrument must contain layers of security to prevent counterfeiting. Furthermore, those security layers must be verified locally. A digital bearer instrument means layers of cryptography that can be verified in a decentralized manner.

DSC^3 achieves this, in part, by creating a symmetric key cryptographic core specific to the central authority and then extending that core throughout the economy to purpose-built appliances. These appliances could be at banks, payment services providers, in the cloud and optionally to appropriately-secured end-user devices, such as phones and smart cards. The appliances in the core transact with, and verify the authenticity of, the bearer instruments. The creation and subsequent extension of this core is a critical component of DSC^3.

DSC^3 also enables the secure distribution and transaction of CBDC within this core. The core remains under the control of the central bank.

Users access this core through authorized payment systems, e-wallet systems and apps provided by banks, mobile operators, fintech and optionally the central authority. These authorized systems interface with the core through an open API. This allows the private sector to innovate, bolstering user functionality and security, while at the same time ensuring the integrity of bearer instruments and their transactions through the central bank-protected core.



Only DSC³ Technology Meets Central Banks' Operational and Policy Requirements

Avoiding Original Sin

DSC³ was designed and created specifically for CBDC, in which the central bank provides the trust. This allowed the technology to be built without the inefficiencies, risks and challenges inherent in the original sin of a distributed trust approach, such as blockchain/DLT.

By contrast to DSC³, blockchain/DLT was created for Bitcoin to eliminate reliance on central banks. Blockchain/DLT attempts to replace trust in a central authority with trust through a community of replicated ledgers and chains of signed transaction records that are later authenticated through a consensus process. These precepts make blockchain/DLT inefficient. While DLT providers have sought various workarounds, the original sin of distributed trust and consensus makes these systems inherently ill-suited for CBDC.

	DSC³ - Digital Symmetric Core Currency Cryptography	**DLT** - Distributed Ledger Technology/ Blockchain
Technology Origination	Created to enable central banks to issue digital currency	Created to eliminate reliance on central authority (e.g. Bitcoin)
Architecture	Digital bearer instrument; value based	Ledger entries, distributed and replicated
Deployment	Leverages existing financial systems	Replaces existing financial systems
Settlement	Instant and final	Probabilistic convergent
Offline use	Bearer instrument can be stored and transacted offline	Online only
Security	Central bank-controlled symmetric cryptography core with layered security protected in hardware	Participant-managed asymmetric keys, only stored in software
Privacy/ Anonymity	Fully supports the policy choice	Dependent on implementation
Interoper-abilty	Interoperable with all digital wallet and payment systems	Closed system
Scalability	Highly scalable; '000s transactions per second	Limited to a few transactions per second
Efficiency	Minimal energy consumption (standard computational requirements)	Exorbitant energy and power requirements, which can exponentially increase with usage

Providing Final and Instant Settlement

A bearer instrument by definition settles instantly. When the instrument is passed to an individual or organization, they are then the bearer of that instrument. There is no subsequent backend bank settlement, RTGS transfer, consensus settlement or ledger reconciliation needed. A digital bearer instrument, as enabled by DSC³, therefore also settles instantly with finality.

Benefitting from Continuing Private Sector Innovation

DSC³ allows the central bank to continue the public-private partnership. By doing so, the central bank leverages digital wallet and payment systems already being used by the public and paves the way for future innovations by the private sector.

Providing Offline Capability

Natural disasters, remote and rural access, and power and network outages drive the need for CBDC to operate, at least occasionally, in an offline manner. A DSC³-enabled bearer instrument can be stored and transacted offline. DSC³ accomplishes this by extending the central bank

security and cryptography to offline devices so that they can verify the authenticity of the bearer instruments during transactions.

At the same time, there is concern that offline transactions can impede AML, CFT and anti-corruption efforts. Therefore, DSC^3 technology also allows the central bank to establish value and volume limits for offline transactions.

Incorporating the Highest Security Standard

DSC^3 is a central bank security technology for implementing CBDC. At its core, it utilizes symmetric key cryptography along with layers of digital security to ensure that the resultant cryptographic objects, i.e. digital bearer instruments in the form of a cryptogram, are protected from counterfeiting. Symmetric key cryptography has many advantages over the asymmetric key cryptography utilized in DLT, especially in currency applications. Symmetric keys are not susceptible to quantum computing attacks. The DSC^3 technology establishes a symmetric core cryptography in a hermetically isolated environment at the central bank and then extends the core to currency-specific decentralized hardware security appliances through multichannel threshold cryptography key distribution. This core protects the integrity and authenticity of each CBDC instrument at each use and enables the central bank to issue CBDC as a true digital bearer instrument.

Preserving Privacy and Anonymity

Anonymity and privacy are important for CBDC to truly behave like paper money. Concurrently, CBDC should not be exploitable for money laundering, funding of terrorism and corruption. DSC^3 enables the identity information to be managed by private sector intermediaries but not central banks. Accordingly, DSC^3 technology provides the flexibility necessary to support the appropriate and necessary policy choices relative to anonymity and privacy. For example, it is possible to set thresholds based on policy to permit anonymity for small- and low-volume transactions, but with full visibility for the central bank into the largest and most frequent transactions.

Being Fully Interoperable

As DSC^3-enabled CBDC are common universal bearer instruments, they are interoperable with any and all e-wallet or payment systems including those provided by banks, mobile operators and optionally the central bank itself. Additionally, payment from one e-wallet or payment system to another is enabled by this common universal instrument.

Being Highly Scalable

DSC^3 technology makes decentralized transactions possible by securely extending the central bank cryptography to appliances in the field. Appliances are stacked vertically allowing for multiple load-balanced appliances in a single location that achieve thousands of transactions per second. Deploying these appliances at multiple locations permits horizontal scalability. This combination of horizontal and vertical scaling means that the technology can achieve tens of

thousands of transactions per second, enough to support the largest economies now and in the future.

Delivering Energy Efficiency

Because DSC^3 was designed specifically with a single central authority in mind, the technology allows for the creation of digital currency stock without mining, settlement without consensus, and a bearer instrument that does not grow in size and complexity with every use. As such it is a highly efficient and energy-friendly 'green' technology. When compared to blockchain/DLT solutions, this efficiency translates into hundreds of times greater performance and merely fractions of a percent of energy use.

Retail, Wholesale and Cross-Border CBDC

DSC^3 enables central banks or another similar state authority to issue CBDCs for retail and wholesale use. At the national level, the central bank is the issuing authority. For cross-border transactions, the issuing authority could also be a regional or multilateral organization, with central banks or sovereign states as members.

Summary

DSC^3 is the only technology that meets the operational and policy requirements of CBDCs. It enables central banks to create and issue a safe, secure and non-counterfeitable CBDC, which fulfills the scale, interoperability, instant settlement and other operational and policy requirements for use as legal tender alongside notes and coins.

---

eCurrency, a pioneer in Central Bank Digital Currency (CBDC) technology, developed Digital Symmetric Core Currency Cryptography (DSC^3) specifically for the successful operationalization of CBDCs. The eCurrency solution, built on DSC^3, enables central banks to securely and efficiently create, issue, distribute and supervise CBDC, to operate alongside notes and coins as legal tender in digital form. eCurrency has been working with central banks since 2012 to define and build the DSC^3 solution. The eCurrency CBDC solution is proven in large scale retail deployments around the world and also satisfies wholesale and cross border CBDC needs.

Contact us for more information:

https://www.ecurrency.net
info@ecurrency.net