



Visa Crypto Thought Leadership

Visa's Journey Through Tokenization

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Visa's Journey Through Tokenization

From card tokenization to blockchain tokenization, explore the diverse applications of tokenization in the digital realm.

Tokenization has emerged as a powerful safeguard for online payment security, earning the trust of businesses across various industries. One of its primary functions is to help protect customers' card information during transactions, providing a shield against potential threats. This year, Visa announced in its Fiscal Third Quarter 2024 Financial Results that there are more than 10 billion network tokens issued worldwide through the Visa Token Service (VTS), marking a major milestone in its proprietary offering to help secure digital payments and further accelerate e-commerce innovation and acceptance.² This achievement is noteworthy, considering that there are now more Visa tokens than physical Visa cards in circulation.

Tokenization has been a well-known concept, standardized by EMVCo, a consortium that includes major payment networks like Visa. This concept involves replacing sensitive static payment data with a derivative payment credential that is dynamic in nature. In this process, a unique cryptogram accompanies each token transaction, making it virtually impossible to replay the same data in a subsequent transaction. This innovative approach is designed to not only conceal and devalue sensitive payment data but also enhance security by helping to ensure that each transaction is unique and cannot be easily replicated. The increase in issuers, acquirers, merchants and consumers all transacting with Visa tokens reinforces that the future of money is truly digital, and digital money must be built on trust.

Visa has paved the way for Tokens

Tokens are 200+ markets today with over 90% issuer coverage (by PV)

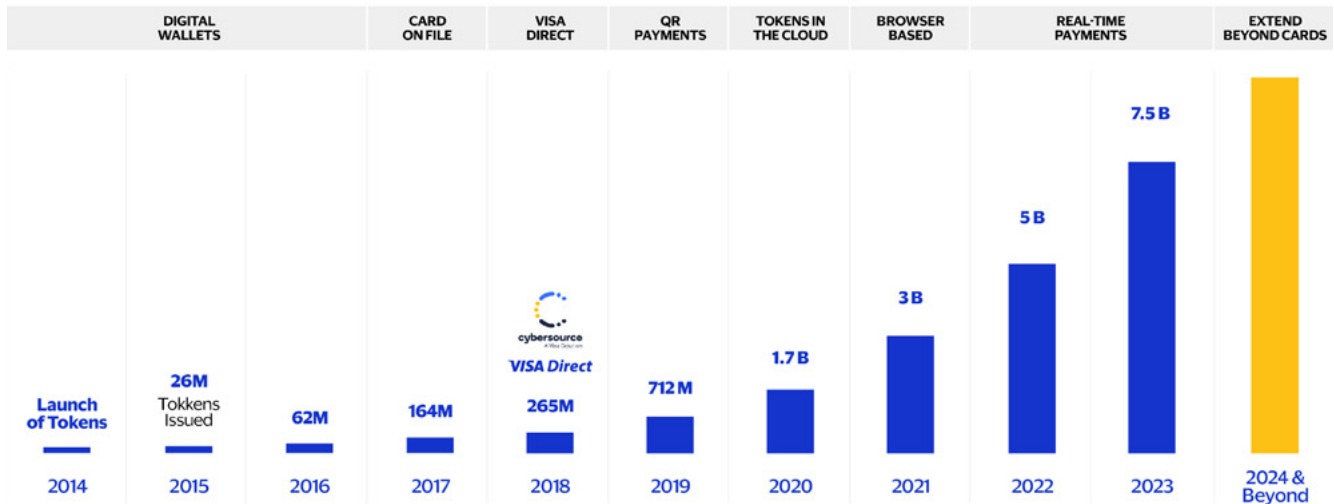


Figure 1: Visa's token journey. Source: VisaNet Data 2014-2023

At Visa, our usage of tokenization to date has mostly related to payment credentials, manifesting as a network token that can be used to help protect sensitive data within a specific ecosystem but offers no value to cybercriminals. However, as we look into the future of money movement and the digital assets realm, we expect tokenization to encompass a broader, more versatile meaning. Blockchain tokenization refers to the digital representation of any asset, such as fiat currencies, government bonds, stock certificates, securities or even tangible assets like real estate deeds or vehicle titles, on a blockchain. Each tokenized asset is assigned a unique digital identifier, enabling near real-time tracking and monitoring. The adoption of blockchain tokenization in managing digital assets could lead to significant advancement in commerce and capital markets, offering benefits such as enhanced transparency, programmable risk management, and significant efficiency gains.

What is tokenization in payments today?

In the realm of payments, tokenization replaces sensitive card details, such as the card number, with an alternate credential known as a token. These tokens are designed to be secure, fortified by dynamic digital codes, and they possess domain restrictions regarding their usage and designated locations. It plays a vital role in helping to uphold global payment security. It helps reduce fraud, enhance the likelihood of successful transactions, and improve the online shopping experience for consumers. Notably, since a token does not itself contain any personal information, in the case of a security breach, it would have little value to unauthorized individuals.

Visa's network token value proposition

By the numbers

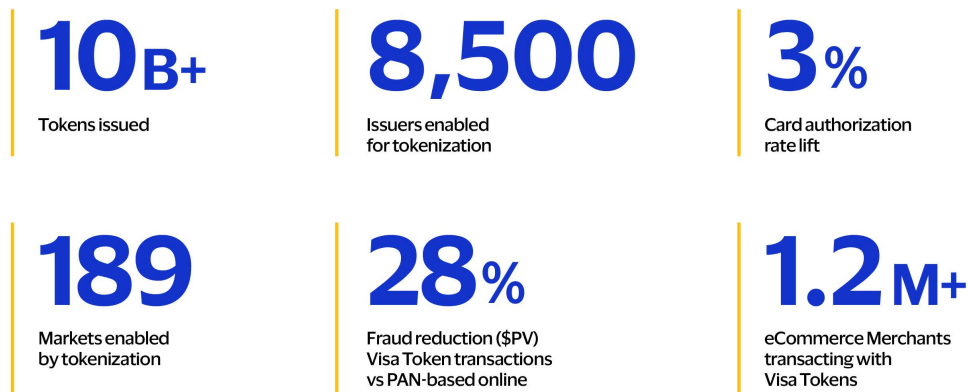


Figure 2: Visa's network token value proposition. Source: VisaNet Data, 2022-2024

Visa: A pioneer in payments tokenization since 2010s

Visa, as a pioneer within the payments industry, is actively enhancing the landscape of digital transactions through its tokenization technologies. It empowers network participants to integrate, construct and manage token services that help enrich and personalize user experiences.

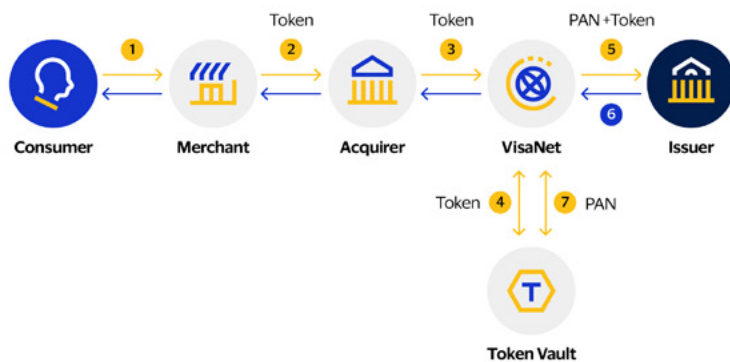
Visa today offers key token services including Visa Token Service, Token ID and Token Management Service by Cybersource. Each is unique, offering clients flexibility and choice in how they integrate, build and manage token services to enable the creation of richer, more personalized user experiences.

01.

Visa Token Service

A key Visa offering known as the Visa Token Service (VTS), is a robust platform designed to augment the security and convenience of online transactions. Central to VTS is the EMV Payment Tokenization Specification, a standard created in 2014 through collaborative efforts involving major payment card brands, including Visa. This innovation underscores Visa's pioneering role in the payments industry and emphasizes the importance of adhering to standards, rules and specifications in order for payments to work seamlessly and efficiently.

Visa Token Service: How it works



- 1 Consumer initiates a purchase at a merchant, in-store or online
- 2 Merchant submits the network token received from the consumer's device to their acquirer
- 3 Acquirer passes the network token to Visa
- 4 Visa exchanges the network token with the Primary Account Number (PAN), which is stored in the token vault, and validates rightful use of the payment token
- 5 Visa passes the PAN and the network token to the issuer for authorization
- 6 Issuer or their processor authorizes or declines the transaction and returns the result to the Visa
- 7 Visa exchanges the PAN back to the network token in the token vault and sends a response and the network token to the acquirer and on to the merchant.

Figure 3: Visa Token Service: How it works. Source: Visa

The Visa token specification replaces the primary account number (PAN) with a unique digital token, enhancing security across various payment scenarios. Specifically, every token transaction also includes a unique cryptogram or signature that is specifically generated for that transaction. Visa validates the authenticity of those cryptographic signatures. Without these signatures, a network token cannot be used to initiate authorized transactions. VTS offers versatile supplementary token services for specific business needs, fostering innovative use cases aligned with partners' operations. This adaptability also helps drive transformative applications like secure contactless payments via wearables and integration into emerging tech like the Internet of Things (IoT), enhancing convenience and security.

02.

Token ID

Visa's Token ID offering assists financial institutions, merchants, regional networks and clearinghouses in building, managing and controlling their own tokenization capabilities. By extending beyond card payments and enabling account details to be tokenized, Token ID unveils new opportunities with ACH and real-time payment use cases. The Token ID product portfolio includes Token Service Provider (TSP), Payment Account Tokenization (PAT) and Secure Element in the Cloud Host Card Emulation (HCE).

Token ID Product Portfolio

Offering	Description	Benefits
Token Service Provider (TSP)	A SaaS that enables providers of proprietary, private label, and domestic payment cards to enhance security and user experience by replacing card numbers with unique digital tokens.	<ul style="list-style-type: none"> Enables payments without revealing sensitive account details. Simplifies token provisioning into digital wallets, even those with restricted access to new connections. Helps providers create a seamless omnichannel experience for their customers.
Payment Account Tokenization (PAT)	Aids clearinghouses and central banks in extending tokenization to account-based transactions.	<ul style="list-style-type: none"> Helps reduce fraud for real-time and ACH payments by substituting sensitive account data with unique tokens. Lays the groundwork for a secure and swift payments framework.
Secure Element in the Cloud Host Card Emulation (HCE)	A service that facilitates the Host Card Emulation (HCE) use cases across major networks.	<ul style="list-style-type: none"> Allows payment card issuers and third-party wallets to manage their own mobile wallet Enables issuers and wallets to maintain control over customer relationships.

03.

Token Management Service

To simplify the management of tokens in the dynamic digital marketplace, Cybersource, a Visa subsidiary, offers the Token Management Service (TMS). TMS merges payments, customer data and network tokens into a unified 'super token', providing a comprehensive overview of customers' purchasing behavior across various channels and payment types. By linking tokens from different networks, issuers, and channels, TMS simplifies complex payment environments. It accommodates alternative payment methods, such as eChecks, ACH and other debit products, thereby enhancing versatility.

Visa Token Management Service: Super token

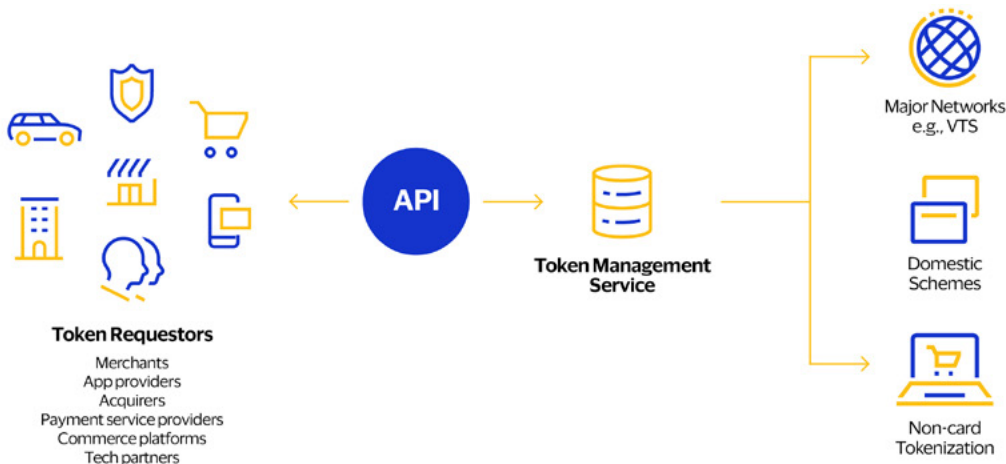


Figure 4: Visa Token Management Service: Super token. Source: Visa

Serving as a brand-agnostic platform, TMS processes network tokens for Visa, Mastercard, Amex, and JCB (Japan Credit Bureau). TMS sets itself apart from other solutions by efficiently streamlining payment processes and fortifying security while providing a holistic solution for all stakeholders involved in a transaction.

The Emergence of Blockchain Tokenization

Looking beyond tokenizing payment credentials, imagine if tangible and intangible assets, such as property or financial instruments, could be tokenized. Blockchain tokenization is driving this next wave of innovation, by representing real world assets (RWAs) - tangible or intangible assets that have value in the physical world - as blockchain-based digital tokens that can represent ownership rights in the underlying real world assets.

Forecasts by Citi suggest an 80-fold increase in private market tokenization, potentially reaching nearly \$4 trillion by 2030.³ Predictions by the Boston Consulting Group suggest that the global tokenization of illiquid assets could develop into a \$16 trillion industry by 2030, making it a trend worthy of close observation.⁴ This growth is already evident in the successful tokenization of assets in various financial markets, such

as onchain private credit loans (\$8.7 billion)⁷ and U.S. Treasuries (\$ 1.92 billion).⁷

Tokenization of RWAs may help solve several challenges in the current state of investing. These challenges include high minimum investment amounts, long holding periods, limited liquidity, underdeveloped secondary markets, fragmented asset discovery, complex investment processes, and a lack of investor awareness. Asset managers are launching tokenized funds with significantly lower (~95 percent) minimum investment sizes,⁵ and investment firms are providing global investors with access to tokenized U.S. money-market funds.⁷ Over the next five years, tokenization has the potential to unlock around \$2 trillion in assets, with an additional \$3 trillion expected from tokenizing just 2% of the global money supply (M2), resulting in a \$5 trillion industry opportunity.⁶



Figure 5: Tokenizable assets. Source: Visa

Alongside the tokenization of RWAs, money itself may also be tokenized on blockchains. Stablecoins emerged in the mid-2010s as representations predominantly of the US dollar to be used on blockchains for cryptocurrency trading. New use cases for stablecoins have since emerged, including cross-border settlement and remittances. Starting in the late 2010s, the concept of CBDCs was introduced and explored through public-private partnerships with central banks. CBDCs are a new digital form of public money authorized by a central bank, representing central bank liabilities recorded digitally on some form of ledger system. Now, we are seeing commercial banks also actively leveraging blockchain technology in the tokenization of commercial bank liabilities. Tokenized bank deposits have emerged as a way for commercial

banks to issue fiat-backed tokens directly on the blockchain, reinforcing the existing structure of banking while introducing new ways for the future economy to transact. Over time, we expect banks to explore different legal constructs and designs for fiat backed tokens including stablecoins and tokenized deposits.

To achieve the full extent of blockchain technology's advancements, banks need infrastructure to help them mint, burn, and transfer these assets seamlessly across the many emerging tokenization platforms in a fast, secure, and compliant manner. Visa is enabling these processes with the development of new products, furthering our tokenization offering to extend to blockchain technology.

Visa Tokenized Asset Platform (VTAP)

Visa thinks of blockchains as a new set of payment rails, with potential to allow for easier operation, faster payments, more automation, and enhanced resiliency. Tokenization of payment credentials and RWAs such as fiat currency can enhance the transfer of value by enabling cash transfers as well as asset transfers. These possibilities allow us to rethink the future of money movement, can help streamline both domestic and cross-border payments, and introduce the power of programmability into digital payment flows to enable new types of global capital markets. To serve these needs, Visa is proud to announce the Visa Tokenized Asset Platform (VTAP), a solution that is designed to help financial institutions issue fiat-backed tokens on blockchain networks. VTAP is available on the Visa Developer Platform for select financial institution partners to use to create their own fiat-backed tokens in a test environment.

Payments rely heavily on a set of commonly accepted standards, an area where Visa offers value to its nearly 15,000 financial institution (FI) clients. By actively working to develop solutions and standards for tokenized payment credentials and now assets tokenization, Visa aims to work alongside central banks and our FI clients to help ensure that money can move seamlessly and efficiently.

VTAP aims to address three key factors by utilizing blockchain tokenization technology to meet the requirements of financial institutions:

1. Privacy

Customer data and transaction details must be protected and made available only to necessary parties, especially in countries that require specific protections of customer data or use cases that demand privacy due to sensitivity of transactions. Blockchain technology can achieve privacy preserving transactions by relying on encryption techniques and permissioned smart contracts.

2. Atomicity

Atomicity refers to transactions that occur either in full with all actions taken, or not at all. With tokenization, end-to-end transactions can occur that include final settlement and near real time availability of funds to the end user, a process that in today's world often takes multiple days after the initial transaction occurs to authorize and settle a payment. This means that complex financial operations such as multi-leg cross-border transactions can benefit from reduced settlement risks for the parties involved.

3. Interoperability

Tokenization can enable ledgers and networks to talk to each other and make transfers of money and assets interoperable, rather than building the ecosystem in a fragmented way. Both private and public blockchains can be built to interoperate, as long as certain standards are adhered to.

It is our vision to work with partners to build the ecosystem in a way that adheres to these criteria. VTAP represents a first step towards achieving this goal. We believe that the concept of tokenization will continue to expand and be applied across and beyond payments and financial services, and Visa is committed to helping our clients benefit from this technology.

To learn more about VTAP, contact our team at <https://globalclient.visa.com/vtap>. We will be happy to provide you with further information and discuss how we can support your needs in this evolving ecosystem. This article is part of a series of articles on blockchain ecosystem developments. Head over to [Visa Crypto Thought Leadership](#) for more consumer insights, best practices and innovative works.

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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.

Notes

1. Visa Inc. (2023, September 30). [Fiscal Year 2023 Annual Report](#). Accessed August 15, 2024.
2. [Visa Inc. Fiscal Third Quarter 2024 Financial Results](#), Visa Inc. [\(NYSE: V\) Q1 2024 Earnings Call Transcript](#). Accessed August 15, 2024.
3. [Citi GPS: Global Perspectives & Solutions \(MONEY, TOKENS, AND GAMES\)](#). Accessed August 15, 2024.
4. [Visa: In crypto, asset tokenization is big business, 5 payments trends to watch in 2023](#). Accessed August 15, 2024.
5. [Hamilton Lane Offers Polygon-Based Tokenized Access to a Second Fund](#). Accessed August 15, 2024.
6. [Tokenization might unlock \\$5 trillion in assets](#). CoinDesk. Accessed August 15, 2024.
7. [Rwa.xyz](#), as of Sept. 2023. Accessed August 15, 2024.

Further reading suggestions

1. [Visa Token Page](#). Accessed August 15, 2024.
2. [A guide to network tokenization by Visa](#). Accessed August 15, 2024.
3. [The tokenization continuum by BIS](#). Accessed August 15, 2024.

Annex 1: Text descriptions of figures

Figure 1: Visa's token journey

The image illustrates Visa's significant role in helping to drive network token adoption globally. Visa Token Services are now available in more than 200 markets, providing coverage for 90 percent of Visa issuer transactions by purchase volume (PV). The provisioning of network tokens continues to accelerate. As of the end of fiscal year 2023, Visa has/had provisioned more than 7.5 billion network tokens, surpassing the number of physical cards in circulation and demonstrating the unstoppable momentum of secure digital payments.¹ This year, we announced in our Fiscal Third Quarter 2024 Financial Results that Visa has issued more than 10 billion network tokens worldwide through the Visa Token Service (VTS), marking a major milestone in its proprietary offering to help secure digital payments and further accelerate e-commerce innovation and acceptance.² This growth is expected to continue with the expansion of token services into new payment domains. The image also depicts the historical growth trajectory, driven by diverse use cases such as Card on File, QR payments, and real-time payments.

Figure 2: Visa's network token value proposition

The image highlights Visa's commitment to enhancing digital user experiences through secure means. Visa's value proposition in the network token space is showcased with key statistics: more than 10 billion tokens issued,² 8,500 issuers enabled for tokenization, a 3 percent increase in card authorization rates, presence in 189 markets, a 28 percent reduction in fraud by purchase volume (PV) and more than 1.2 million merchants conducting transactions using Visa tokens.

Figure 3: Visa Token Service: How it works

The image illustrates the role of VTS in fostering trust within digital commerce innovation. VTS replaces Visa card numbers with tokens, enhancing the security and quality of digital payment experiences for millions of Visa cardholders daily. Visa is a leader in token transformation, actively contributing to and implementing industry standards worldwide through VTS. The image also demonstrates the token's usage in the payment process. When Visa cardholders initiate a transaction, the network token is employed by the merchant. The transaction then proceeds to the acquirer, followed by routing through VisaNet. The network token is subsequently converted into the PAN (Primary Account Number) by the token vault, providing both PAN and token details to the issuers. This seamless process helps the issuer make secure approval decisions regarding the transaction.

Figure 4: Visa Token Management Service: Super token

The image depicts Cybersource's Token Management Service (TMS), a versatile card-agnostic token solution that seamlessly handles various payment scenarios for merchants. TMS stands out by creating a unique token that interconnects payments, merchant customer data and other network tokens, forming a super token. It serves as a centralized hub for token requests, whether before, during or after a transaction. TMS simplifies intricate payment ecosystems by linking tokens across different networks, issuers and channels. This adaptability extends to alternative payment methods like eChecks, ACH and various debit products, enhancing overall versatility.

Figure 5: Tokenizable assets

The image showcases the wide-ranging applicability of blockchain asset tokenization technology, which can be harnessed in diverse domains. These applications span the payments sector, the tokenization of intangible assets, collectibles, financial instruments and more. The image also presents illustrative use cases for each industry.