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Transforming Financial Services: The Impact of Asset Tokenization

February 2025

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Executive Summary

Tokenization refers to the process of representing an asset as a digital record or token on a common programmable platform using distributed ledger technology (DLT) or similar technology, according to the Financial Stability Board (FSB, 2023) **and the Bank for International Settlements** (Iñaki Aldasoro, 2023). Asset tokenization has emerged as a transformative force in the financial industry, fundamentally reshaping how assets are structured, owned, and exchanged. By converting real-world assets—such as real estate, stocks, and fixed income—into digital tokens on a blockchain, tokenization provides unprecedented efficiency, transparency, and accessibility. It enables fractional ownership, allowing investors to participate in markets that were traditionally restricted to high capital barriers. This approach has opened opportunities for broader investor participation and has increased liquidity across markets. Furthermore, tokenization leverages smart contracts to streamline processes, reduce the need for intermediaries, and enhance security, ultimately driving down costs and enabling seamless transactions across digital platforms.

Key discussions from the Singapore FinTech Festival (SFF) 2024 emphasise the importance of commercial viability alongside technological advancements, with initiatives like Project Guardian showcasing successful pilot programs across various asset classes. The findings indicate that while challenges remain, particularly regarding regulatory frameworks and industry collaboration, the industry is starting to move to commercialisation and realising the potential benefits of asset tokenization, including lower costs, higher liquidity, and improved transaction security.

"I think everyone sees the potential of asset tokenization," said Chia Der Jiun, Managing Director at the Monetary Authority of Singapore, speaking at the Singapore FinTech Festival (SFF) 2024. In Project Guardian, "where we've worked with a variety of global financial institutions, also those in Singapore. They've experimented and piloted across different kinds of assets. They've tokenized them, they've settled them, they've exchanged them across fixed income, foreign exchange, funds, and so on. The economic benefits are also clear to all the participants, it is going to cut into intermediation, cut costs, increase speed. The use cases are also very clear across multi-currency payment settlement, treasury management, collateral management, and of course, security settlement."

MD Chia explained that the challenge now is to achieve that potential, which is where MAS collaborative approach with industry comes into play. "There's an industry consortium, there's Project Guardian, there's also a Global Layer One (GL1 initiative). The idea is to inform us what are the problems that need to be solved in order to scale this, and to get this to commercial scale."

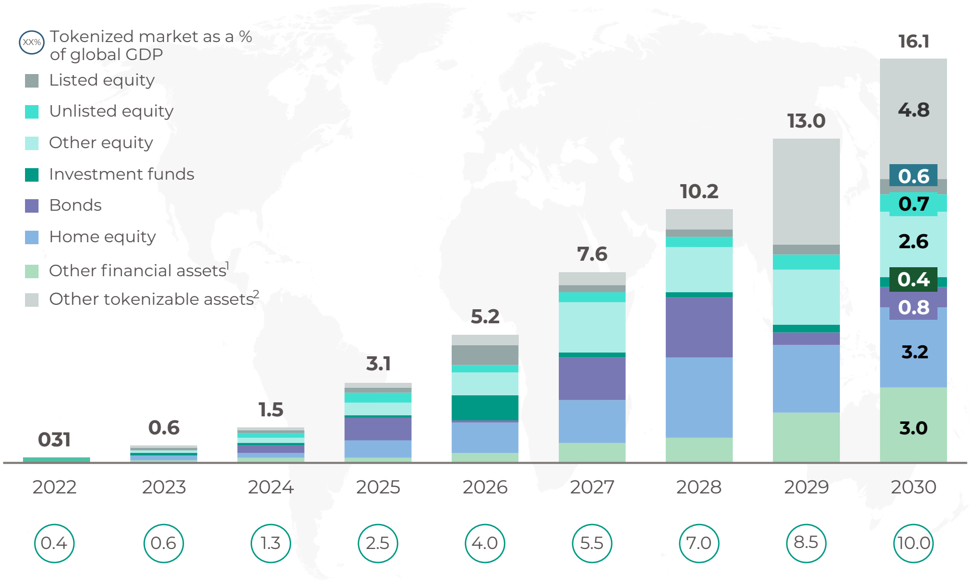
Chia Der Jiun, Managing Director,
Monetary Authority of Singapore

Asset Tokenization: Current State of Play

The financial industry has undergone significant transformation as new technologies are reshaping traditional processes and opening up opportunities in asset and wealth management. A recent study by UBS highlights that global wealth, including assets such as real estate, stocks, and shares, is expected to surge 38% by 2027 (UBS, 2023), driven predominantly by emerging markets. As wealth grows, investors are increasingly demanding more efficient, transparent, and diversified investment opportunities.

Asset tokenization is one of the most promising developments. Virtually any asset can be tokenized, whether tangible like real estate or intangible like corporate shares and intellectual property. This lowers barriers to entry for a wider range of investors, making the markets for such assets more liquid and accessible. Tokenized assets are projected to reach USD 16 trillion, or 10% of global GDP by 2030 (BCG, 2022), with the potential to reshape industries such as healthcare, education, real estate, and finance.

Figure 1. Asset Tokenization Estimates (USD trillions)



Tokenized assets are projected to reach USD16 trillion, or 10% of global GDP by 2030

Source: BCG, ADDX (2022).

Asset tokenization involves creating digital tokens that represent ownership of an asset on a blockchain or distributed ledger technology (DLT). This process ensures that, once tokens are issued, ownership records are immutable and cannot be altered by any single authority (PWC 2021). The technology helps democratize access to investment opportunities by allowing fractional ownership, which can increase liquidity in traditionally illiquid markets such as real estate and art (Chainalysis 2024).

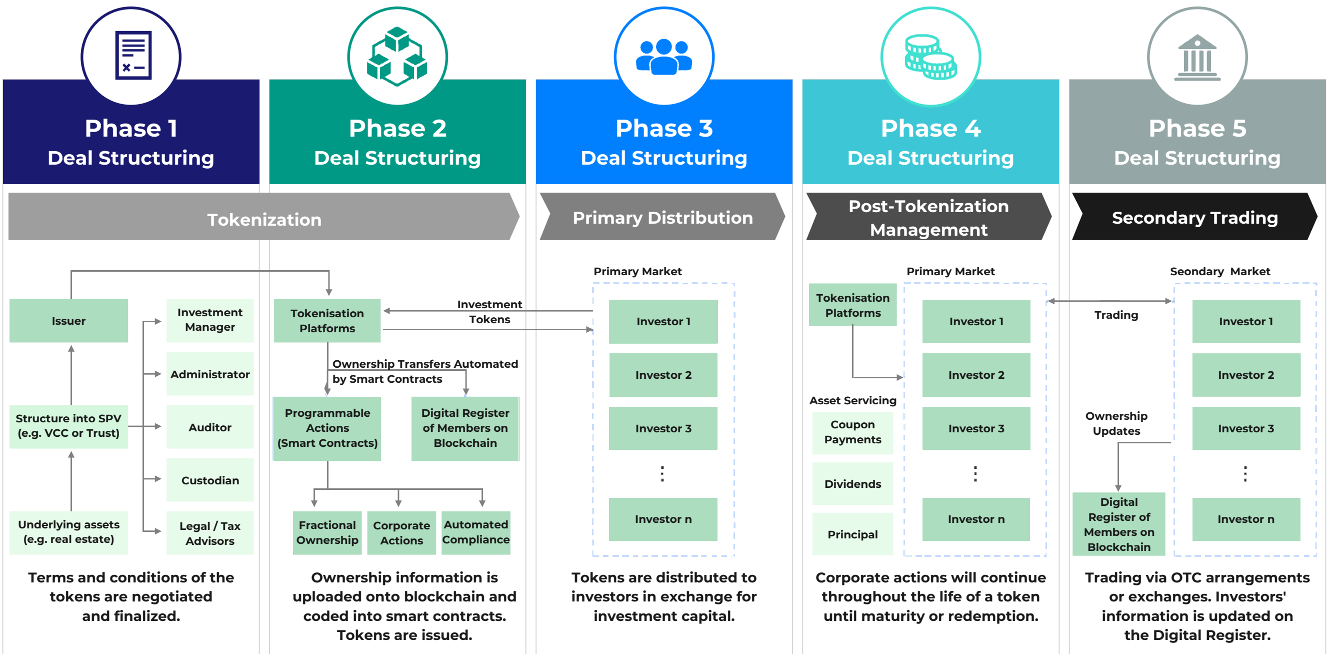
Tokenized money market funds have attracted over USD 1 billion in assets under management, signalling demand from investors with on-chain capital in a high interest rate environment (McKinsey, 2024a).

Blockchain-enabled/tokenized lending by Web3 natives such as Centrifuge and Maple Finance, together with Figure and others, have facilitated the issuance of over USD 10 billion of loans involving blockchains (McKinsey, 2024a).

depending on market conditions and economic factors. Similarly, bond markets typically grow at a modest pace aligned with interest rates and economic growth.

“We must recognise that (the) tokenization market is still quite nascent,” said Steven Hu, Head of Digital Assets, Trade and Working Capital, Standard Chartered Bank. It is worth “about 30 billion dollars according to the online data and if you compare that with even the overall crypto market, it is still about 0.6 %,” he said. “And in the entire financial universe that we have, it is still tiny, it is still very young, it needs to grow, and we do see the technology is playing this role, the technology works.” Hu added that “we see the efficient gain, we see that, actually, the user experience is improving. But at the same time, the question will be, really, how we scale up. And, to me, it is to improve the cost of revenue ratio.”

Figure 2: Asset Tokenization Process



OTC = Over the counter, SPV = Special Purpose Vehicle, VCC = Variable Capital Company.
Source: KPMG in Singapore Research, Real Estate Tokenization Paper 2023

Globally, the notional value of tokenized bonds issued totals over USD10 billion in the last decade, compared with USD 140 trillion outstanding globally (McKinsey, 2024a).

Projected Growth Rate

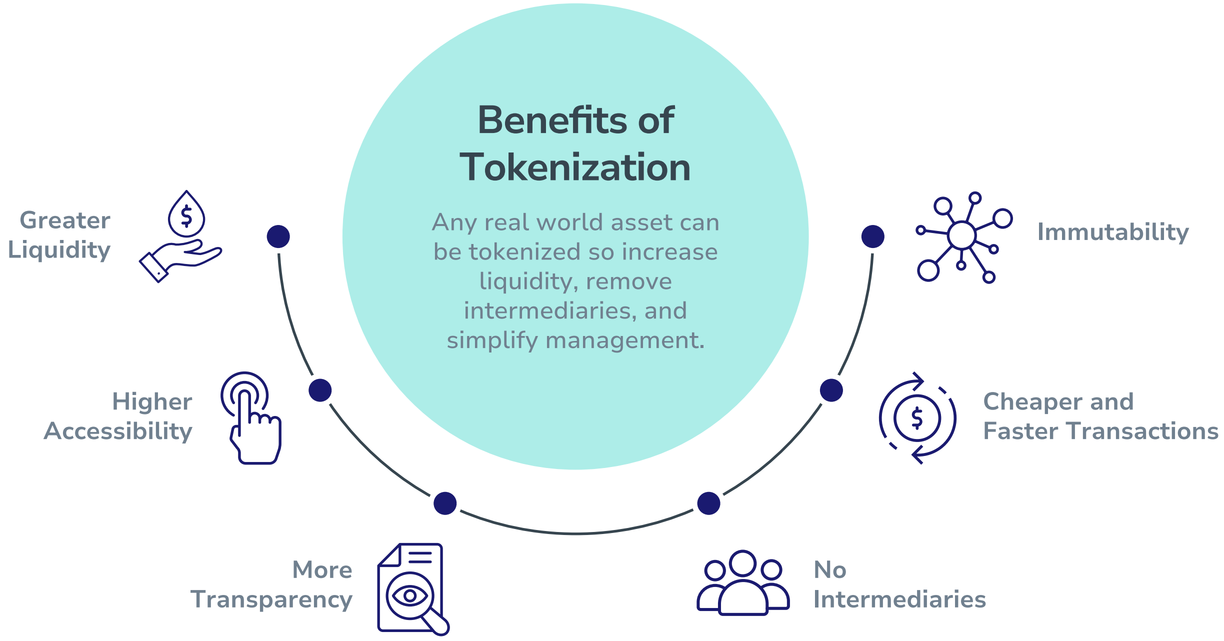
The asset tokenization market is expected to grow at a compound annual growth rate (CAGR) of **about 75%** across various asset classes (McKinsey, 2024a). This rapid growth is driven by the increasing adoption of blockchain technology and the benefits it offers, such as enhanced liquidity, lower operational costs, and greater transaction efficiency.

By comparison, growth in traditional financial markets historically has been slower. The global stock market, for example, has grown an average of about **7–10%** annually,

Key Benefits of Asset Tokenization

The advantages of asset tokenization extend far beyond just liquidity and accessibility. Blockchain technology enables the creation of immutable records of ownership and transactions, significantly reducing the risk of fraud while enhancing security. Furthermore, smart contracts—self-executing contracts with terms embedded directly in code—can streamline processes, automate and enforce contractual terms, reduce reliance on intermediaries, and lower operational costs (GFTN, 2024).

Figure 3: Benefits of asset tokenization



Source: Asset Tokenization, Asset and Wealth Management (GFTN, 2024).

"In allowing for the simultaneous exchange of two assets in real time and enabling the exchange of information and value to happen in a single step, this can help eliminate settlement risk, duplicative reconciliation, and increase the efficiency of transaction processing." So said Leong Sing Chiong, Deputy Managing Director (Markets &Development), Monetary Authority of Singapore at the Layer One Summit, Insights Forum 2024.

He noted further that "with a programmable platform that allows for pre-determined conditions to be encoded with the tokenized asset(s), this can also facilitate greater straight-through processing in capital market transactions, and greater efficiency in asset servicing."

Leong Sing Chiong, Deputy Managing Director (Markets & Development), Monetary Authority of Singapore

Tokenization holds the power to lower costs and enhance user experience, especially for underserved populations. Its role in finance is poised to streamline transactions, broaden access, and expand the range of digital financial products.

Immutability: As noted, DLT provides an immutable record of ownership and transaction history on a single blockchain. Once the data is recorded on a blockchain, it cannot be altered or deleted, ensuring asset information remains accurate and reliable over time. This feature is critical for maintaining trust in tokenization and protecting investor interests.

Lower Costs: Tokenization reduces transaction costs by addressing frictions in existing financial market structures, specifically by enabling streamlined end-to-end processes for issuing, trading, and settling various asset types. The automation and conditionality capabilities inherent in token arrangements can lower operational costs, lessen dependence on intermediaries, and support efficiency improvements across transaction workflows (BIS, 2024).

Streamline Transactions: Tokenization supports the integration of multiple asset types and functions on a single programmable platform. This can consolidate functions traditionally separated across systems, such as pre-trade and post-trade services, into unified processes that execute complex transactions more efficiently, potentially at lower cost (BIS, 2024).

Han Kwee Juan, Group Executive and Country Head, DBS Singapore, DBS Bank.

> *"Is it possible for us to create a DeFi (decentralised finance) market for current securities that are being traded? Could we tokenize fixed income and have that trade in a decentralised pool? Because to know today, the trading is done on an OTC basis. And we said, could it be done where the use case was really about atomic trading, settlement, and custody all happening at the same time. That was the vision because we said with blockchain technology, this is something that is very possible."*

Broadened Accessibility: By lowering market entry barriers, tokenization broadens access to traditionally illiquid or less accessible assets. The capacity for fractional ownership and shared investment models under tokenized arrangements allows new investor groups to engage in markets previously constrained by liquidity and accessibility (BIS, 2024).

Programmability: Tokenization fosters the development of innovative digital financial products through programmability. This flexibility enables creation of new types of assets and financial services on tokenized platforms, such as tokenized bonds, deposits, and other financial products that leverage automated processes and smart contract capabilities to enhance functionality and market responsiveness (BIS, 2024).

"Our thesis is that as the world goes on chain, assets get tokenized, money gets tokenized, it will become composable, it will become programmable." Salim Dhanani, Chief Executive Officer, Pave Bank.

"We can build on each other's work. Programmability basically gives you that ability and when you put programmability into assets, certain functions of that particular asset life cycle can be easily extended. So, I can build on what other members of the network have put out on the network. I can sort of extend it and put it back. And someone else can take our work and then extend it. In a way, it truly makes a difference for the multi-member network." Rajeev Tummala, Head of Digital & Data, Asia and MENA, HSBC Securities Services, HSBC.

Composability: Refers to the ability to integrate and combine various tokenized assets and financial protocols seamlessly. This concept enhances functionality and utility of tokenized assets, allowing innovative financial applications and products.

Deepak Mehra, Head of Digital Assets and International Lead for Strategic Investments, Markets, Citi, with Marita McGinley, Head of Digital Asset Strategy, Schroders.

> *"I think of composable finance in terms of Lego bricks. You get them in different shapes, different colours, different sizes, and you can put them together to either recreate existing shapes that you see in the world or use your creativity and come up with something completely new. I think composable finance is the same paradigm used in finance where, for example, what we did in the Guardian Wholesale Network is we brought foreign exchange swaps, we brought digital money market funds, and we married them together and created a new Lego block," said Deepak Mehra, Head of Digital Assets and International Lead for Strategic Investments, Markets, Citi."*

Enhanced User Experience: Token arrangements improve the transparency of post-trade operations by providing real-time updates on ledger states. This synchronization reduces need for manual interventions in transaction reconciliation and supports enhanced security, enabling a more seamless and reliable user experience (BIS, 2024).

Transparency: Transactions on a DLT / blockchain are transparent and traceable, providing higher security levels compared to conventional systems. Each transaction is recorded on the DLT / blockchain, making it easy to verify ownership and transaction history, which reduces fraud risks and enhances trust among investors.

Liquidity: Moreover, tokenization's ability to create liquidity for traditionally non-liquid assets has significant appeal. By enabling fractional ownership, blockchain allows traditionally illiquid assets to be divided into smaller, tradable tokens. This increases market liquidity, as investors can easily buy or sell fractions of an asset on secondary markets.

Dr Steven Hu, Head of Digital Assets, Trade and Working Capital, Standard Chartered Bank.

"Composable finance is also about breaking the silos and connect the digital elements that we have today. So, I think there's quite a number of conversations talking about really interoperability. To think about that, all those fragmented liquidity pools can be actually concentrated. And there can be concentration if we have a truly programmable securities, but also programmable money. And on the platform, that is truly interoperable across the multiple organisations." Dr Steven Hu, Head of Digital Assets, Trade and Working Capital, Standard Chartered Bank"

The tokenization of financial assets including cash, securities, and central bank digital currencies (CBDCs) could expedite payments, clearing, and settlement processes, with profound implications for remittances and financial inclusion.

Sarah Pritchard, Executive Director of Supervision, Policy and Competition - Markets and Executive Director of International, Financial Conduct Authority

"I do think that 2025 will be the year of product launches, not just pilots, but I think pilots and use cases are so instructive in that learning. I think focusing on outcomes is really important and if we can agree on a framework and a set of principles that allows us to do this then that's how we scale this business quickly". Sarah Pritchard, Executive Director of Supervision, Policy and Competition—Markets and Executive Director of International, UK Financial Conduct Authority."

Applications of Asset Tokenization

Charles Cascarilla, Co-founder & Chief Executive Officer, Paxos.

> *"I really believe that the point of stablecoin is you have 24/7 instantaneous movement of money basically for free and (it) is programmable and operating on the internet. And, so, you can get to a billion wallets no problem."*

Asset tokenization can be applied across various sectors, and we explore use cases below.

Real Estate: Tokenizing real estate allows investors to buy shares in properties rather than whole assets, making real estate investment more accessible and liquid. Some platforms have successfully tokenized multiple residential properties in cities like New York and San Francisco, allowing investors to purchase fractional ownership, starting at just USD50. This democratizes access to real estate investments, making it more affordable for a wider audience (Synodus, 2024).

The real estate tokenization market is anticipated to exceed **USD 16.5 billion** by 2033, growing at a compound annual growth rate of **19.5%** from 2023 (Spherical Insights, 2024).

"How many of us are owners of a building, private equity fund, or private debt fund? Not many of us are going to say we own this, because one has limited access to those asset classes today. With tokenization, you will. With tokenization, you do today, in some cases. And that is a real revolution. More than half of the assets in the world are illiquid. And they're going to become liquid with tokenization." So said Eric Piscini, Chief Executive Officer, at Hashgraph.

Art and Collectibles: Non-Fungible Tokens (NFTs) represent ownership of unique artworks or collectibles, allowing artists and collectors to monetize their work more effectively while providing buyers with proof of ownership (Chainalysis, 2024).

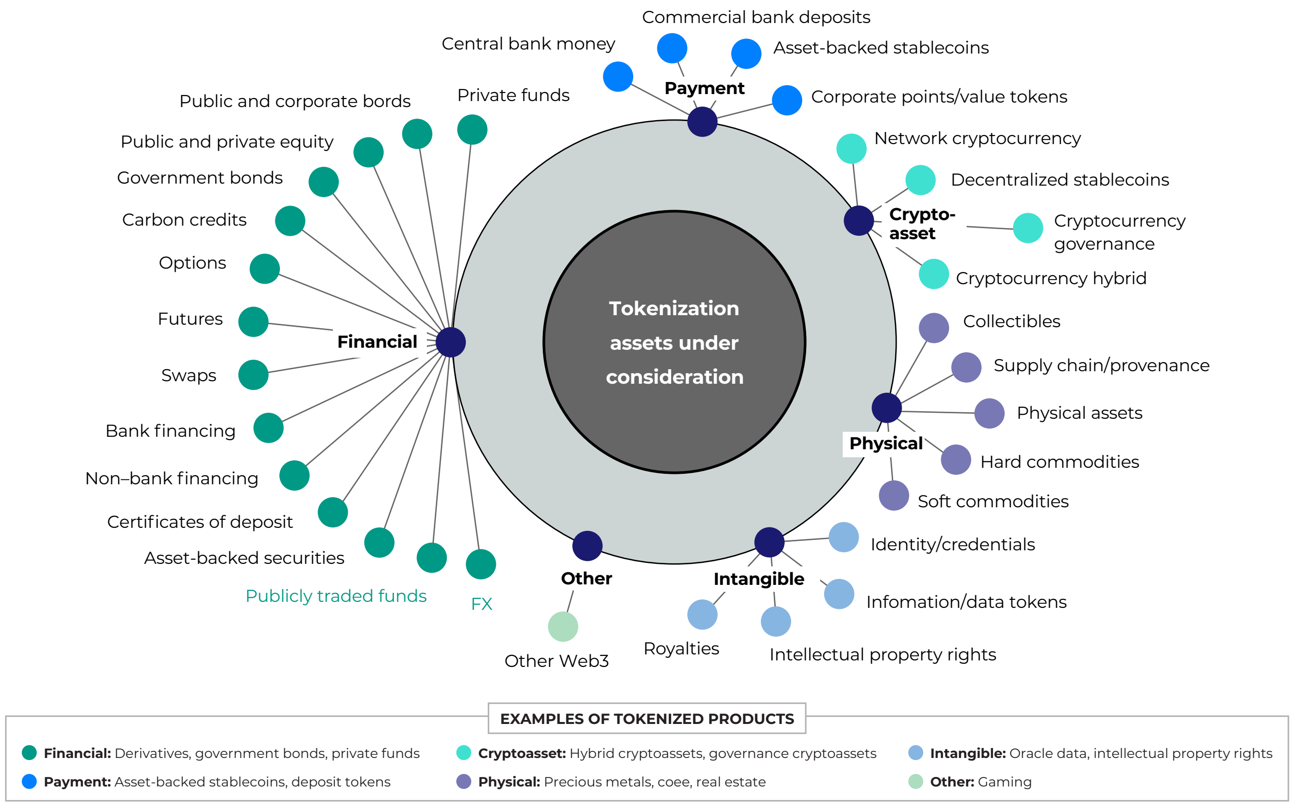
Although it faced challenges, Maecenas attempted to tokenize fine art, including pieces by Andy Warhol, enabling fractional ownership of high-value artworks. A successful example includes the tokenization of Pablo Picasso's "Fillette au Beret," allowing art enthusiasts to invest in a fraction of this iconic piece (Algorand Foundation, Oct 2024).

The anticipated global art market value is projected to reach USD 7 billion by 2025 (Verified Market Reports, 2024).

Precious Metals: Companies such as Pax Gold (PAXG), Tether Gold (XAUT), and SDAX have tokenized gold, allowing investors to buy and sell tokens that represent physical gold

(Left to Right) Abigail Ng, Executive Director, MAS; Charles Moussy, Head of Innovation and Digital Finance, Autorité des Marchés Financiers; Dr Nopnuanparn Pavasant, Assistant Secretary-General, SEC Thailand; Dr Rhys Bollen, Senior Executive Leader, Digital Assets, ASIC.

Figure 4: Potential Universe of Asset Instruments under Consideration for Tokenization



Source: Oliver Wyman, Shaping Tomorrows Digital Asset Landscape Together 2023.

stored in vaults. This innovation provides a secure method for investing in precious metals without the need for physical storage.

The global precious metal tokenization market is projected to grow from USD 2.8 billion in 2023 to USD 13.2 billion by 2032 (Fortune Business Insights, 2023).

Intellectual Property: Tokenization extends to intangible assets like patents and copyrights, allowing creators to digitize and fractionalize their intellectual property for investment purposes (Fortune Business Insights, 2023). This innovation enhances the management, trading, and monetization of intellectual property rights.

IBM and IPwe: This collaboration tokenized 25 million patents into NFTs, facilitating easier trading and management within a blockchain framework.

TokenTraxx: A platform where musicians can tokenize their songs as NFTs, enabling them to sell ownership shares and raise capital while retaining control over their work.

Molecule: Focused on funding biomedical research by allowing researchers to tokenize their intellectual property rights, creating a decentralized marketplace for scientific innovation (Hyperglade, 2024).

“When the real use case occurred in Thailand, it's the tokeniza-tion of assets. That's the first case, it's tokenization of the real estate,” said Dr Nopnuanparn Pavasant, Assistant Secretary-General, SEC Thailand. She said “And then recently, we introduced green token regulation (allowing) tokenization of green projects or sustainability projects (so) that it can be in the form of investment token. This would allow the token holder to receive revenue from the green project, or in the form of utility token in that token represent the green product itself such as the tokenization of the carbon credit. We also introduced some regulations on the tokenization of real-world asset, such as movies or songs.”

A deep dive into asset tokenization in financial services comes in the later part of this report.

Challenges of Asset Tokenization

Despite its potential, asset tokenization faces several challenges. At SFF 2024, Mathias Imbach, Co-founder & Group Chief Executive Officer, Sygnum, discussed the global regulatory landscape and emphasised the importance of clarity and consistency. He noted “the need for traditional finance to learn from blockchain's efficiency, while also applying robust governance and compliance standards.”

Darko Hajdukovic, Chief Executive Officer, Digital Market Infrastructure, London Stock Exchange Group.

> *"Legacy infrastructure issues need addressing before digital or tokenized assets can significantly scale."*

Consistency between On-Chain and Off-Chain Assets

Ensuring consistency between on-chain tokens and off-chain assets remains complex. The challenge lies in maintaining accurate records of ownership and ensuring that any changes in the status of the off-chain assets are reflected on-chain. Additionally, issues such as transaction speed and governance models need to be addressed to facilitate broader implementation (Hedera, 2024).

Interoperability

The technical challenges associated with linking multiple blockchain systems include security, synchronization, and resilience.

The lack of standardised protocols across different blockchain platforms creates interoperability challenges. Different blockchains may operate on distinct protocols, making it difficult for tokenized assets to be seamlessly transferred or traded across platforms. This fragmentation can limit liquidity and the overall utility of tokenized asset (Merkle Science, 2024).

"While end clients may not directly see the benefits of interoperability, practitioners need to ensure that they can operate across multiple chains, similar to how the internet evolved with different browsers and protocols," noted Chetan Karkhanis, SVP Strategic Ventures, Franklin Templeton, on tokenization and the role of interoperability.

Kevin Barr, Head of Digital Cash and Innovation, BNY, observed that "there's very few corporates that use a single bank and a corporate may have as many as over 100 different banking partners. It's critical to be able to go across chains and transact for our clients, because they are looking for that just in time funding, for that more efficient use of working capital."

Fragmentation and Lack of Standardisation

As the tokenization landscape evolves, fragmentation across different blockchain networks has become increasingly apparent. Each network operates within its own parameters, leading to challenges in connectivity and data exchange. The absence of standardised protocols exacerbates these issues, making it difficult for various platforms to interact effectively. This fragmentation can also confuse regulatory frameworks, as differing standards complicate compliance efforts (OMFIF, 2024).

At SFF 2024, Tommaso Mancini-Griffoli, Division Chief, Payments, Currencies, and Infrastructure Division, International Monetary Fund outlined different settlement models for digital assets and the macro-financial implications of these platforms. He noted the importance of policy guidance to mitigate risks such as currency substitution and ensure market stability.

- **Single Ledger Model**: Offers benefits like greater liquidity and lower search costs but comes with complex governance issues.
- **Multiple Ledgers Model**: Requires technology to facilitate communication between ledgers, raising questions about interoperability.

Tommaso Mancini-Griffoli (right), Division Chief of the Payments, Currencies, and Infrastructure Division, International Monetary Fund; Tom Duff Gordon (left), VP of International Policy, Coinbase.

> *"We're trying to think about (the) long-term policy implications of these platforms in order to hopefully give some guidance to these industry players, and, if not them, their regulators, as to (the) different routes to follow," emphasised Tommaso.*

- **Large Intermediary Model**: Involves settling assets on an intermediary's balance sheet, a common practice today.

Daniela Barbosa, General Manager, Decentralized Technologies, Linux Foundation and Executive Director, LF Decentralized Trust, also discussed the need for universal technical standards, such as cross-chain messaging, token standards, and atomic swaps. She highlighted "the importance of collaborative efforts among developers and institutions, even among competitors, to drive these standards forward."

Investor Education and Protection

With the rise of decentralised platforms for trading tokenized assets, regulators are concerned about ensuring adequate investor protection. Unlike traditional financial markets, these platforms may lack oversight, increasing the risk of fraud and market manipulation. In 2021 alone, it is estimated that crypto-currency scams and theft in the DeFi sector totalled over USD 12 billion in crypto assets stolen (from user wallets, as well as exchange holdings) (Cointelegraph, 2024). Regulators such as Thailand's SEC and Singapore's MAS are balancing investor protection with fostering innovation. Specific regulations for green tokens, regulatory sandboxes, and consultation schemes allow industry players to voice concerns while ensuring safe market practices.

Investors need to understand the implications and benefits of asset tokenization to engage effectively with this new financial paradigm (McKinsey, 2024b).

"Consumer education and consumer protection is very important for us to scale" noted Eric Anziani, President and Chief Operating Officer, Crypto.com.

Regulatory Barriers and Challenges

The lack of clear regulatory frameworks in many jurisdictions poses significant hurdles for widespread adoption. As regulations evolve, they may impact how tokenized assets are treated legally (Chainalysis, 2024).

Additionally, the lack of well-defined legal and regulatory guidelines for different blockchains further complicates interoperability efforts. Many financial institutions still rely on traditional systems that do not easily integrate with emerging blockchain technologies, which can slow the adoption of tokenized assets.

At SFF 2024, Lesley Chavkin, Global Head of Public Policy, Paxos, emphasised the importance of coordinated global regulation and the challenges posed by the lack of US leadership. "I think we'd all agree that global coordination and harmonisation is needed. I think it's going to take the work of G7, G20 doing this in a coordinated fashion," noted Chavkin. Paxos launched its Global Dollar Network in Singapore as part of SFF, drawn to the country's strong regulatory framework.

One of the primary concerns is ensuring that existing regulations apply to tokenized assets, particularly around issues like asset segregation, smart contract security, and legal risks related to token ownership.

The International Organization of Securities Commission (IOSCO) Fintech Task Force is conducting outreach and collaborating with industry stakeholders to assess risks, improve understanding, and provide guidelines for regulators. It aims to ensure that tokenization preserves market integrity, investor protection, and financial stability while fostering innovation.

"Financial asset tokenization is one of the important areas of focus for the IOSCO FinTech Task Force (FTF), noted Merion Anggerek, Head (Capital Markets Policy Division), MAS and FTF workgroup lead. "The task force set up a new working group to look into the current state of development in financial asset tokenization and to look at the adoptions of DLT in the capital market space and, more importantly, to identify potential new areas of risk as well as novel issues,"

Hon. Caroline D. Pham, Acting Chairman, U.S., Commodity Futures Trading Commission

> *"At SFF 2024, Hon. Caroline Pham, then Commissioner for the U.S. Commodity Futures Trading Commission and now Acting Chairman, highlighted the importance of a balanced and pragmatic approach to regulation. She emphasised that: "Regulation should be smart, data participants, moving away from a one-size-fits-all approach." She shared her desire to see more clarity in the US digital asset space and proposed initiatives like a US regulatory sandbox for blockchain pilots."*

Jurisdictional Complexities

In the United States (US), asset tokenization falls under various regulatory bodies, primarily the Securities and Exchange Commission (SEC) and Commodity Futures Trading Commission (CFTC). The SEC has emphasised compliance with securities laws for token offerings, leading many projects to seek more favourable jurisdictions due to the stringent regulatory environment (Blockchain Academy, 2024).

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While some legislative acts are pending, such as the Payment Stablecoin Act and FIT21, stablecoin regulation has bipartisan support. Acting Chairman Pham expressed optimism for more structured and transparent policies in the near future.

Charles Moussy, Head of Innovation and Digital Finance, Autorité des Marchés Financiers.

As for the European Union, Charles Moussy, Head of Innovation and Digital Finance, Autorité des Marchés Financiers, shared that "in terms of clarity, MiCA (Markets in Crypto-Assets) will definitely go a step further, because right now in the European Union, you have 27 countries, 27 different regimes. So, for a crypto asset service provider (CASP), it's kind of a nightmare." This is "because you could be established somewhere and couldn't passport your activities. But with MiCA there will be a unique single framework (which applies) to all EU countries. This will definitely bring more clarity for the players, more security for the consumer."

Globally, the regulatory landscape for asset tokenization is complex and varies significantly across jurisdictions. As countries try to navigate the best route to take to regulate these new financial instruments, achieving a balance between fostering innovation and ensuring investor protection will be crucial for the future of asset tokenization.

Tokenized assets are inherently cross-border, and international cooperation is critical to ensure consistent regulatory standards and prevent arbitrage. The ongoing evolution of legal frameworks will play a vital role in determining how effectively these assets can be integrated into mainstream finance.

Classification as Securities

One of the primary concerns for regulators is whether tokenized assets should be classified as securities. This classification triggers compliance with securities laws, which are designed to protect investors through transparency and disclosure requirements. In the US, for instance, the SEC applies the "Howey Test" to determine if a token qualifies as an invest-ment contract, thus subjecting it to securities regulations (Norton Rose Fulbright, 2024). However, in a split ruling, a US federal judge held that sales of Ripple's XRP coin

Figure 5: Global Regulatory Landscape on Tokenization

Jurisdiction	Key Factors to Enable as Competitive lokenization Market				Enabling Environment Rating
	Government Sponsorship	Legal Framework	Regulatory Environment	Market Infrastructure	
Singapore	Positive	In Progress	In Progress	Positive	Positive
USA	Negative	Negative	Negative	In Progress	Negative
UK	In Progress	In Progress	In Progress	In Progress	In Progress
Hong Kong S.A.R	Positive	In Progress	In Progress	Positive	Positive
EU	In Progress	Positive	In Progress	In Progress	In Progress
Switzerland	Positive	Positive	In Progress	Positive	Positive
UAC (Dubai)	In Progress	In Progress	In Progress	In Progress	In Progress

LEGEND Positive In Progress Negative

Source: KPMG in Singapore Research (October 2023).

on crypto exchanges were not unregistered offers and sales of securities, as the SEC had asserted, but Ripple's USD 729 million in XRP sales to institutional investors constituted an unregistered securities offering (Investopedia, 2023).

Legal Recognition and Compliance

For tokenized assets to gain acceptance, they must be legally recognised as equivalent to their physical counterparts. This includes aligning ownership rights and responsibilities with existing legal frameworks. Without this recognition, ownership disputes may arise, complicating enforcement in courts (Openware, 2024).

Han Kwee Jua at DBS added: “So not only the regulators, I think we also need the accounting bodies to come together to help us, because commercialisation is not difficult, but if we can get these basic things cleared, then I think the adoption is going to be quite fast, because the efficiency that all of us see is instant.”

Singapore has emerged as a leading hub for digital assets and developed comprehensive regulatory frameworks that support digital asset innovation while ensuring market integrity. Examples include **Payment Services Act (PS Act) 2019,** which regulates digital payment tokens (DPTs) and outlines licensing requirements for service providers**,** the **Digital Token Service Providers (DTSP)** framework, which licenses service providers operating outside Singapore but with connections to the country, and the **Stablecoin** framework which aims to ensure stablecoin stability and reliability as mediums of exchange.

Insights: Unlocking the transformative role of Asset Tokenization

Chia Der Jiun, Managing Director (MD) of the Monetary Authority of Singapore (MAS) highlighted the real world potential of asset tokenization and transformative role of digital assets in the financial system. He outlined the tokenization, settlement, and exchange of a variety of asset classes for multiple real world use cases, such as multi-currency payment settlement, treasury management, collateral management, and security settlement, with over 40 industry partners and institutions under Project Guardian thus far.

“There are also clear economic benefits for all participants by reducing intermediation, reducing cost, and increasing speed of transactions.” he said. To achieve these potential & commercial scalabilities, he emphasised the importance of addressing the challenges of asset tokenization on three distinct layers.

Token Layer

The first layer is the token layer, where various assets including fixed income, foreign exchange, funds, and securities—can be represented as tokens. For effective exchange, it is essential that the data and attributes of a fixed income token, for example, are clearly defined and recognisable to both parties involved in the transaction. This necessitates establishment of industry frameworks and standards to ensure mutual understanding and agreement on what constitutes a fixed income token.

Settlement Layer

The second layer pertains to the settlement process. When exchanging tokens, it is not feasible for example to directly trade a fixed income token for a fund token. Instead, an intermediary in the form of digital money on-chain is required. This highlights the need for high quality settlement assets, which could include central bank digital currencies, tokenized bank deposits backed by bank balance sheets, or stablecoins. MAS is contributing to this effort by developing a clear stablecoin regulatory framework that outlines the characteristics of well-regulated and sound stablecoins.

Infrastructure Layer

The third layer focuses on the infrastructure or chain layer, which currently operates in a somewhat unregulated environment. Industry participants have indicated a need for enhanced interoperability among networks. As networks are established around current or future private and public chains, it is crucial that they can interoperate effectively to prevent fragmentation of tokens and liquidity. Furthermore, this infrastructure must be designed to comply with existing laws and regulations, making programmability and compliance by design essential. To address these issues, Global Layer One has formed an industry consortium comprising a core group of global banks and market infrastructure providers. They are collaboratively working on solutions to these challenges. The excitement surrounding asset tokenization remains high, reflecting ongoing discussions and developments in this area.

Chia Der Jiun, Managing Director, Monetary Authority of Singapore.

Deep Dive: Asset Tokenization in Financial Services

Financial Market Infrastructure Transformation

The financial industry is undergoing a profound transformation, driven by innovations in blockchain technology, asset tokenization, and decentralised infrastructure.

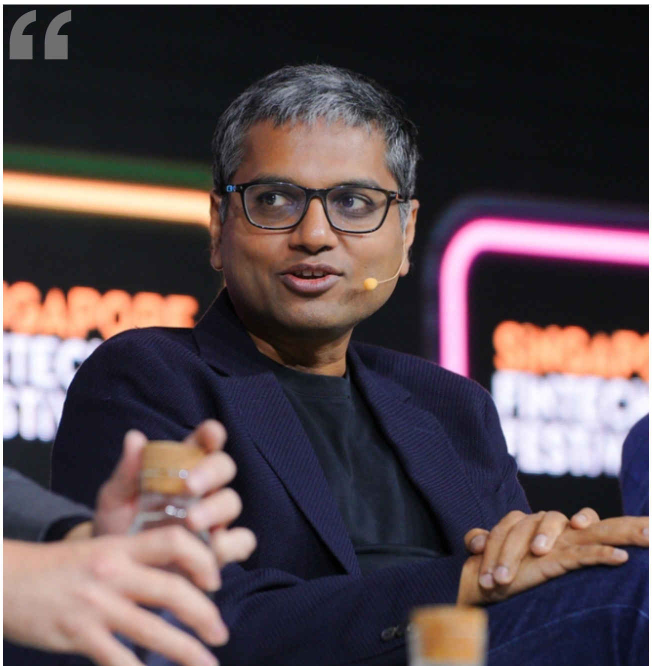
In panel discussions at SFF 2024, there was broad agreement that financial institutions need to modernise and adopt technologies that allow direct interactions without intermediaries. There is growing interest in decentralising financial market infrastructure to improve efficiency.

Sergey Nazarov, co-founder of Chainlink emphasised that "you had the internet appear, and that was the last big generational shift in how the financial system worked. Because everyone got interconnected, and everyone started transacting over the internet." Now, he said, "we have a new set of technologies, blockchain, smart contracts, oracle networks emerging, and they're forcing the need for clarity. They're forcing the need to clarify how a transaction works in this new format. Because the blockchain format of the transaction is valuable. It has all these wonderful properties—speed, transparency, risk management. It's a superior format in many ways for how certain transactions works."

Currently, 40% of financial market participants are actively using DLT or digital assets, reflecting the growing adoption of blockchain-based solutions across the sector (WEF, 2024).

Among opportunities in tokenization, tokenized funds especially are gaining traction, with asset managers like BlackRock and Fidelity launching successful live products. The buy-side's adoption of tokenized assets signals a broader shift, pushing other financial institutions to adapt and integrate blockchain-based solutions.

"We have capital market infrastructure regulation now in place in the EU that allows us actually to disintermediate. To eliminate the necessity for clearing to move to atomic matching and settlement for tokenized assets and doing that in a self-custody, enabling form, directly accessible to participants. I always like to say it's the missing piece of the puzzle that is now actually coming together in order to allow and enable trading and also drive liquidity into tokenized financial instrument." Max Heinzle, Founder & Chief Executive Officer, 21X.



Pradyumna Agrawal, Managing Director, Investment, Temasek.

> *"Workflows have been established over several decades. There are systems of record keeping which have been established over several decades. I think the bigger thing which everyone is grappling with and making changes to is really modernizing business and entire systems and workflows. So, I always say this, and I say this every year, digitization before tokenization."*

Collaborative efforts such as Project Guardian, led by MAS, and major private sector initiatives like the Canton Network, and Axelar's cross-chain solutions are reshaping traditional markets by enhancing liquidity, efficiency, and interoperability. These projects unite public and private stakeholders—from central banks and regulatory bodies to leading financial institutions—to create scalable solutions for tokenized financial assets. This trend underscores the integration of blockchain into mainstream financial services, laying the groundwork for a more integrated, secure, and efficient global financial ecosystem. The following sections detail these innovative projects, highlighting their roles in shaping capital markets and cross-border financial services.

Policymakers such as central banks and regulatory bodies, including the International Monetary Fund, MAS, Deutsche Bundesbank, and Financial Services Agency of Japan, play a vital role in advancing regulatory standards, ensuring compliance, and promoting cross-border collaborations. The private sector, including major financial institutions such as BNY Mellon, J.P. Morgan, Citi, and DBS, contributes to expanding asset tokenization use cases across capital markets (MAS, 2024).

Pathways to Scale

"For tokenization to scale and achieve industry-wide adoption, we need to see tokenized activity span across assets, across key currencies, across networks, and also to interoperate with existing systems," said DMD Leong Sing Chiong of MAS. "We think four jigsaw puzzle pieces need to come together to support industry-wide deployment of tokenized assets: (1) Liquidity, (2) Foundational Infrastructure, (3) standardised Frameworks & Protocols, and (4) Common settlement assets."

The MAS-led Project Guardian is a public-private sector collaboration to enhance the liquidity and efficiency of financial markets through asset tokenization. It seeks to create a sustainable digital asset ecosystem by establishing industry standards, regulatory frameworks, and scalable solutions for tokenized assets. The initiative bridges collaboration between policymakers and financial institutions.

Project Guardian primarily focuses on the tokenization of traditional financial assets across multiple asset classes (MAS, 2024).

- **Fixed Income:** Developing protocols and data standards for tokenized bonds. The Guardian Fixed Income Framework (GFIF) worked with the International Capital Market Association to develop protocols and data specifications building on that organisation's Bond Data Taxonomy. It also considers the types of risk factors and disclosures required in a tokenized bond offering document.

- **Foreign Exchange:** Establishing foreign exchange (FX) data specifications, risk management frameworks, and foreign exchange documentation for tokenized assets in partnership with the International Swaps and Derivatives Association and the Global Foreign Exchange Division of the Global Financial Markets Association.

- **Asset and Wealth Management:** Guardian Funds Framework (GFF) provides a set of recommendations for industry best practices for tokenised funds. Creating standardised models for fund tokenization, enhancing efficiency and transparency. In collaboration with global custodians and asset managers, it focusses on common data models and model risk considerations specific to fund tokenization.

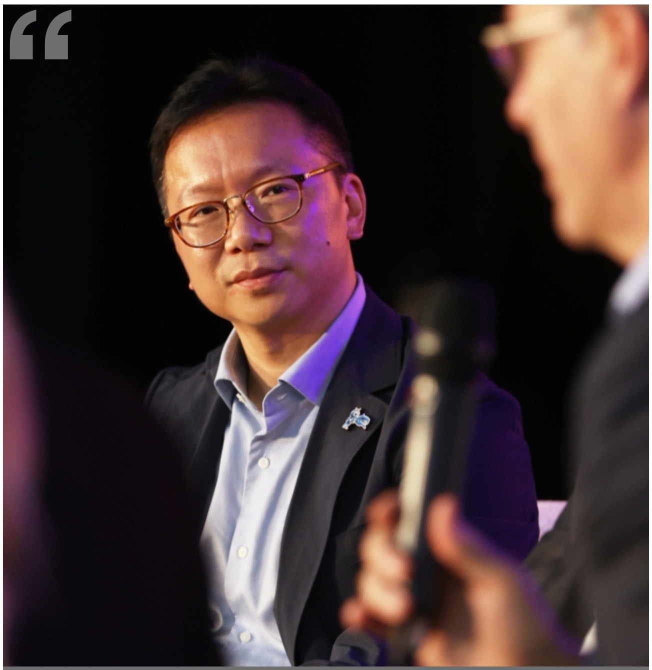
Spotlight: Project Guardian achievements announced at SFF 2024

Pioneering Tokenization

DBS has proven atomic trading, settlement, and custody using tokenized securities. It has also introduced solutions for Treasury Tokens (e.g., for intra-company foreign exchange transactions) and tokenized bonds on the DBS Digital Exchange.

Fernando Luis Vázquez Cao, Chief Executive Officer, SBI Digital Asset Holdings

"I would like to thank the MAS for their foresight. When we started, it was one central bank, the MAS, and three private sector players, including us. And now it's 40 plus private sector players. And I think this MAS-led effort has spurred other regulators and central banks in Europe, Japan, and the US to follow suit."



Kelvin Li, Head of Platform Tech, Ant International.

> *"Project Guardian and some other regulatory projects allowed us to do tokenization within the regulated framework. We started to equip a treasury infrastructure with token. So, nowadays, about 35% of Ant's treasury, global treasury activity, are happening on (these) treasury platforms. We process over 300,000 transactions on the blockchain platform. So, it's not a Proof-of-Concept (POC), it's actually a scalable adoption nowadays. It helped us a lot. Firstly, it helped us to reduce greatly our working capital by around 60%. The pre-funding that we used to need to put in all payout accounts can be greatly reduced. And secondly, on FX, the cost has also been reduced."*

SBI Digital Asset Holdings successfully validated tokenized securities concepts, focusing on retail distribution across borders (e.g., Japan, Singapore, Switzerland). It has successfully operationalised end-to-end value chains in select corridors, highlighting the need for global regulatory alignment.

Schroders has tokenized insurance-linked securities and experimented with decentralised finance models. They emphasised the potential of composable finance frameworks to digitise entire financial value chains.

Guardian Wholesale Network

The network underpins diverse use cases in tokenized cash, foreign exchange, fixed income, and funds.

Live transactions have been conducted on a test net by initial members, including Citi, HSBC, Schroders, Standard Chartered, and UOB.

The network focuses on composability and interoperability, enhancing programmable and digital financial solutions.

Global Layer 1

As part of MAS' Project Guardian, Global Layer One (GL1) is a new initiative aimed at creating an open digital infrastructure for cross-border transactions and global liquidity pools. GL1 initiative plans to develop standards, market practices and governing principles of foundational digital infrastructure for tokenized assets to foster the development of a public permissioned foundational digital infrastructure, upon which commercial networks could be deployed.

"This willingness to build a GL1 ledger, which will be share between financial institutions, which will be very transparent in the way it has been built, very transparent in the way the technical specifications would be set, yet at the same time, very well aligned with the general principles, but also the regulations that call for regulated activities, financial activities and assets in the industry which mean the GL1 network would be compliant by design." Jean-Marc Stenger, Chief Executive Officer, Societe Generale, Forge.

Through Guardian and GL1, MAS has engaged early on with central banks, regulatory bodies, international standards setting bodies, including the Banque de France, European Central Bank, Japan Financial Services Agency, Swiss Financial Market Supervisory Authority, the UK Financial Conduct Authority, Deutsche Bundesbank, and staff of the International Monetary Fund and the World Bank. This policymaker group would help provide inputs on governance arrangements, give guidance on how GL1 infrastructure can be developed in line with global standards, and advise on appropriate regulatory guardrails for tokenized asset transactions.

At the SFF 2024, the next phase of GL1 Initiative was introduced. This transformative, shared ledger platform aims to enhance financial infrastructure and promote the adoption of digital assets through improved interoperability, security, and trust.

Key industry players such as JP Morgan, Citigroup, BNY Mellon, MUFG, and Societe Generale Forge contribute their expertise and resources to the initiative, which seeks to transform an asset lifecycle and how capital markets are conducted.

GL1 is designed to complement existing platforms like Partior (DLT-based international settlement network) and BIS initiatives such as Project Agorá, fostering collaboration across the public and private sectors.

The initiative is open to regulated institutions globally, ensuring wide participation and consistent standards.

(Left to right) Masashi Watanabe, Managing Director, Deputy Head of Digital Strategy Division MUFG Bank; Naveen Mallel, Managing Director, J.P. Morgan; and Alan Lim Director and Head, Financial Infrastructure and Artificial Intelligence Office, MAS

> *"I think the GL1 efforts (are) really open to regulated institutions around the world, regulators, and really people who are committed to providing regulated financial services on infrastructure that meets regulatory expectations. So, I think that's certainly the ambition and goal." Alan Lim Director & Head, Financial Infrastructure and Artificial Intelligence Office, MAS.*

Global Initiatives on Blockchain and Tokenization

BIS' recent working paper articulating the vision of the "Finternet" and the concept of "Unified Ledger" reinforce the case for tokenization and its applications such as cross-border payments and securities settlement. Open and interconnected financial ecosystems, if well managed, could improve access and efficiency of financial services through better integration of financial processes (BIS, 2024).

The Finternet aims to use technology to make the financial system much more user-centric and to eliminate many of the frictions that add cost and complexity to today's financial system. Tokenising financial assets would bring many benefits. In particular, if the assets were on a common ledger, there would be much less need for complex messaging and clearing, which are the source of so much cost and delays in today's financial system. Tokenised assets can settle atomically, helping to further reduce the time needed for financial transactions. And tokenised assets can be programmed. This could open a huge array of financial transactions not possible today. BIS has also launched Project Agorá to study using tokenized deposits integrated with tokenized wholesale central bank money to streamline cross-border payments (BIS, 2024).

The Canton Network is a privacy-enabled interoperable blockchain network designed for institutional investors. The Canton pilot has seen the execution of over 350 simulated transactions on blockchain for tokenized assets, fund registry, digital cash, repo, securities lending and margin management. The goal is to explore potential benefits, including reducing counterparty and settlement risks and optimizing capital. This has allowed firms such as Goldman Sachs, BNY Mellon, DRW and Oliver Wyman and Paxos to seamlessly transact and settle tokenized assets.

The Canton Network has launched its Global Synchronizer, a decentralized interoperability infrastructure, along with its utility token, Canton Coin. This milestone marks significant advancements in synchronized financial markets, enabling seamless tokenization and exchange of regulated financial assets. After a decade of development and a year of testing, the launch represents the first public infrastructure of its kind, addressing the growing demand for efficient, privacy-focused financial solutions. The network is governed in a decentralized manner, supported by the Linux Foundation, and incentivizes third-party participation through Canton Coin, fostering innovation and connectivity in capital markets (Canton, 2024).

Axelar has collaborated with Onyx by J.P. Morgan and Apollo in a successful proof-of-concept showcasing how blockchain technology and smart contracts can manage client portfolios at scale. It demonstrated automated portfolio management for tokenized financial assets (real-world assets, or RWAs) across interconnected blockchains. By leveraging Axelar's cross-chain infrastructure, portfolio managers could compose, trade, and rebalance positions in tokenized funds seamlessly. One key feature was the Rebalancing Module, which allowed automatic portfolio rebalancing, reducing human error and enhancing composability and automation.

This collaboration is seen as a significant step toward standardising blockchain transactions in decentralised finance (DeFi) and centralised finance (TradFi), with the potential to transform real-world asset management (Axelar 2023).

Asset tokenization is a transformative approach to managing ownership rights over various asset classes through blockchain technology. While it offers numerous advantages such as increased liquidity and accessibility, addressing regulatory and technological challenges will be crucial for successful implementation.

Other Digital Asset Highlights at SFF 2024

Bo Li, Deputy Managing Director, International Monetary Fund.

> *"In this ecosystem of payment, (the) central bank should take the lead because payment is really money. So, when we talk about (the) central bank taking the lead, when we talk about payment, we think right now we see a good trend of what we call public -private collaboration. We see that both in the retail CBDC and in the wholesale CBDC. And we think that's both not only necessary, but also desirable."*

Denis Beau, First Deputy Governor, Banque de France.

> *"What is important is to make the central bank available to support the settlement processes of tokenized assets as that is the segment that systemic risks might materialise first."*

Balaji Srinivasan, Co-founder and Board Member, Coin Center.

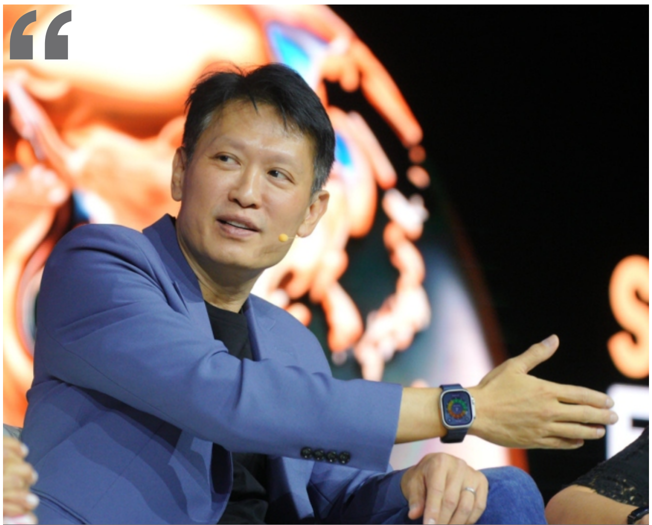
> *"Digital currency is good for transactions that are very large, very small, very fast, very automated, very international, very private, and / or very transparent."*

Dante Disparte, Chief Strategy Officer and Head of Global Policy, Circle

"We've demonstrated unequivocally in the last decade that the crypto economy can in fact bring to scale ledgers that can ledger trillions of dollars of activity safely, instantly, soundly for the entire world."

Chan Yam Ki, Vice President, Circle.

"Digital currency, specifically stablecoins, is a way to do that settlement where it's faster, cheaper, and programmable. The first wave of adoption happened to be in the digital capital markets. And what we're seeing now is actually the movement into payments, as well as in traditional capital markets. Just a couple days ago, UBS announced that it has a tokenized money market fund, and the subscription and settlement currency will be a tokenized cash, will be a form of digital dollar. We already do that with BlackRock's BUIDL fund."



Richard Teng, Chief Executive Officer, Binance.

"If you look at the top 200 institutions, most of them have a crypto agenda— some have started allocation, the family offices have done it, and the endowments have started to do it. On our side, we have seen a 131% increase in institutional onboarding this year. The pace of adoption is very fast, and on our platform, we now have close to 240 million users globally. For the first 100 million users, it took us five years to onboard, the next 100 million took us roughly 26 months, and for the year-to date this year, we have onboarded 60 million new users. So, you can see it is coming through in a big way. Because crypto is a traceable technology, unlike fiat, it's much easier to trace."

Eric Anziani, President & Chief Operating Officer, Crypto.com.

"When we got the Bitcoin ETF approved. I think it was very strong signal as something was changing in the US having larger asset managers like Blackrock Fidelity Franklin Templeton going all-in (on) the space and then following with the Ethereum ETF approval. I think it was a clear direction that was set."

Conclusion

The advent of Digital Assets is reshaping the global financial landscape. Tokenization— the process of digitising physical and financial assets using blockchain or distributed ledger technology—offers profound benefits such as enhanced liquidity, reduced fraud, and lower operational costs through smart contracts.

By 2030, tokenized assets are expected to account for USD 16 trillion, influencing key sectors such as healthcare, finance, and education. Financial institutions are particularly focused on tokenizing traditionally illiquid or high transaction cost assets to unlock new revenue streams and improve transaction efficiency.

Regulatory frameworks are being established to foster a secure and transparent digital asset ecosystem by both national regulators and international bodies such as the IOSCO FinTech Task Force and Financial Stability Board. Moreover, collaborations between central banks and private financial institutions are advancing the real world and increasingly commercialised solutions using tokenized assets across multiple asset classes as demonstrated by initiatives such as Project Guardian. Despite regulatory challenges, asset tokenization is poised to drive significant innovation and growth in global financial markets.

The insights gathered from Singapore FinTech Festival highlights a collective recognition of the economic benefits associated with asset tokenization, such as reduced intermediation costs and improved transaction speeds. By prioritising practical applications over mere technological advancements, the financial industry can pave the way for a more inclusive and efficient market landscape. The future of finance is poised for significant change as asset tokenization becomes increasingly mainstream, making it essential for all participants to adapt and innovate in response to this evolving paradigm.

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