Tokenised Securities in APAC - A State of Play

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1 Introduction

ASIFMA's 2019 paper on "Tokenised Securities a Roadmap for Market Participants"[1] is a backbone roadmap for market participants and regulators in helping to explain Tokenised Securities. It covers the key aspects of the end-to-end Tokenised Securities lifecycle (i.e., structuring, issuance, distribution, primary listing, secondary trading, custody, portfolio management, advisory and market making) and how it compares to that of traditional securities. It also outlines how tokenisation could impact market participants (including incumbent financial institutions and issuers) and presents areas where gaps exist from a technology, regulatory and ecosystem perspective.

The aim of this 2021 overlay is to provide a concise supplementary update to the 2019 paper with some key recent developments and emerging trends that have since happened in the Tokenised Securities space. As stated in the 2019 paper, Tokenised Securities are generally thought of as traditional, regulated securities, but with a digital wrapper. This paper intends to capture what the different market participants think about the current and future state of Asia's Tokenised Securities market and ecosystem, what are the remaining challenges and gaps, and discusses some notable success stories and use cases that have happened recently in the arena.

The data, intelligence, and materials for this paper were collated and gathered by conducting interviews and paper surveys (between 1 March and 29 March 2021) with a wide range of stakeholders including digital asset exchanges, infrastructure providers, technology platforms, issuers, banks and regulators, in order to understand the various participants' thoughts and opinions on their past or present experiences, challenges, concerns and advice for others on the road ahead. This paper is jurisdictional-neutral but provides examples of certain issues and pain points that apply in certain jurisdictions.

The interviews and surveys focused on two main areas comprising: 1) participants' specific platforms and product offerings, their challenges and future plans; and 2) general questions with regards to the current market and the minimum viable ecosystem.

27 stakeholders (listed in the Appendix A) responded, 16 through paper questionnaires and 11 via in-person interviews. This wide selection of players from across the ecosystem included regulators and organisations such as the Hong Kong Securities and Futures Commission (SFC) and Bank for International Settlements (BIS), platforms (7), exchanges (5), technology providers (5), banks (6), and issuers (2). The majority of players focus their platform[2]/ products on the initial stages of primary issuance (19), settlement (17), and self-executing smart contracts (16). Subsequently followed by other respondents focusing on secondary trading (14), custody (13) and 'other' areas (11). Breaking these numbers down further, we found that the technology providers mainly focus on the initial stages of primary issuance, settlement and secondary trading, whereas platform business models are more focused on self-executing smart contracts and primary issuances. While fairly uniform, digital asset exchanges demonstrated a slightly higher focus on settlement and self-executing smart contracts.

9 of the 25 respondents (excluding regulators) are licensed, with the majority being licensed in Singapore. Some firms

[1] ASIFMA, 'Tokenised Securities a Roadmap for Market Participants', 2019, https://www.asifma.org/wp-content/uploads/2019/11/tokenised-securities-a-roadmap-for-market-participants-final.pdf

[2] Platform - a model for value creation by facilitating exchange (business-to-business, business-to-customer, or even customer-to-customer) and/or co-creation that scales via its network.

also mentioned their type of service is not required to be licensed in the jurisdiction(s) where they operate (e.g., some technology providers). Respondents stated Singapore was chosen as their initial launching pad due to the strong support from the Singapore regulators, and also Singapore's advancements in the Tokenised Securities space compared to other jurisdictions. The other popular jurisdictions are Hong Kong, followed by the US and Gibraltar. This paper will primarily cover the APAC region and lay out some of the differences between the jurisdictions. It will cover why some jurisdictions are more advanced than others, which could be owing to having started earlier, their jurisdictions having more transparent regulations, structured regulatory frameworks, or there being more regulatory support to participants in the tokenisation space.

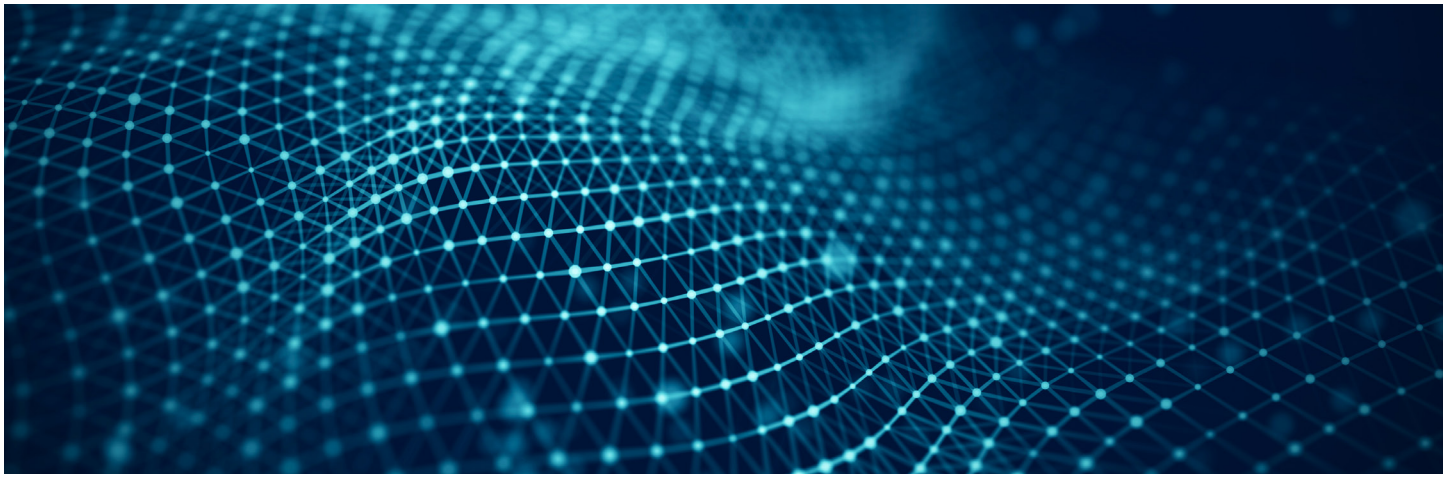
In this paper, Tokenised Securities are referred to as representations on the blockchain of traditional regulated securities such as shares and bonds, and may also comprise or represent other types of securities as well, such as interests in collective investment schemes (funds), real estate, and structured products.[3]

We wish to thank the subject matter experts from the ASIFMA Tokenised Securities Taskforce for their efforts in contributing to this report. Special thanks goes to (listed in alphabetical order) Victor Alexiev (APAC Head for Citi Ventures Programs & Strategic Partnerships for ICG, Citi), Jatin Badiani (Senior Manager, Technology and Innovation Regulatory Change, Standard Chartered), Boon-Hiong Chan (Head of Securities Market and Technology Advocacy, Securities Services, Corporate Bank, Deutsche Bank AG Singapore), John Ho (Head, Legal, Financial Markets, Standard Chartered), Deepak Mehra (APAC Head for Strategic FinTech Investments and Digital Solutions, Citi), and Chirdeep Singh (Entrepreneur in Residence, Citi Ventures APAC, Citi) for their contributions and support to ASIFMA staff with drafting the paper and conducting the stakeholder interviews.

[3] A number of factors are also likely to be relevant to payment and utility-type tokens with features that may classify them as securities in certain markets, but this is not the focus of this paper.

2

Executive summary



There were numerous positive developments in the tokenised securities space over the last 18 months. Market participants have come a long way in understanding the advantages of tokenised securities. There have been successful Proof of Concepts (PoCs) within firms as well as on a multi-party basis. Regulators too have generally been starting to acknowledge the benefits of tokenisation and in several jurisdictions have accommodated sandboxes to support practical experimentation, and have been reviewing their frameworks and issuing new licenses. Due to the trend towards digitisation of financial assets and the opportunities of tokenisation on the global financial markets, we have also seen the entry of traditional financial institutions into the digital assets space which will greatly help the tokenisation space and the progress of the industry.

Despite all these positive developments there are still many challenges that need to be addressed before we will see tokenised securities in "Main Street". Many of the remaining challenges are in the regulatory space, ranging from a lack of inter-jurisdictional harmonisation and taxonomy to historical paper-based requirements and processes, to the exclusion of retail investors. We recommend that regulators continue to work together and with the industry to provide harmonised guidance on the classification and recognition of Tokenised Securities, continue to further explore regulatory sandboxes for full value chain experimentation and continue to remove archaic paper-based requirements that undermine the full adoption of tokenised securities across the entire lifecycle.

From an ecosystem perspective, further education, collaboration and experimentation is needed to address the talent and liquidity gaps and reduce friction in a fragmented ecosystem. This might enable large marquee transactions which could encourage faster adoption.

3

Positive developments and leveraging the advantages of Tokenised Securities

a. Questionnaire findings

Most platform providers and exchanges cited digitalisation/ modernisation, speed of settlement, and reduction in settlement risk as the main problems they want to solve and improve efficiency on. While the technology providers shared the same concerns, they also added liquidity, automation of compliance, and 24/7 trading as areas they are aiming to expand and enhance. For platform providers, immutability (i.e., permanent, indelible and unaltered record of transactions) ranked quite high and was the highest amongst all groups interviewed for that focus area.

b. The advantages of Tokenised Securities

A common understanding amongst respondents is that Tokenised Securities leveraging on new or emerging technologies such as blockchain or distributed ledger technology (DLT) could bring about a major reduction in settlement time, settlement risks, and administrative costs associated with, for example, Know Your Customer (KYC) and reconciliation functions, alongside the implementation of automation of data and compliance management. That is, having compliance rules and exceptions, KYC particulars, or asset servicing requirements over the lifecycle of the product 'built-in' or configurable to the token framework. This would particularly benefit audit transparency in tracking the provenance of data and how the data is processed- resulting in faster, more accurate, and accessible central 'source of truths' with close to full immutability. This could mitigate the central point of failure and allow players to analyse and process sensitive data from multiple parties, provide assurances about how that data is used, without compromising on confidentiality.

The issuers stated an efficient price discovery mechanism (investors' appetites and sensitivities) and access to a broader investment base of smaller investors whilst promising to lower their prohibitive KYC and fund administration costs as the main advantages of issuing Tokenised Securities. These are significant savings which could be passed on and carried by the platform as the platform is the party which conducts the KYC due diligence on the individual investors.

The 'tokenisation' of traditional financial instruments is also expected to enable opportunities for efficiency improvements across the entire trade and post-trade value chain, contributing to more efficient risk management and pricing. Traditional securities settlement is complicated and involves many intermediaries, leading to long clearing and settlement cycles. Substantial manual intervention is currently also needed, which makes the traditional securities settlement cycle prone to errors. The various intermediaries (banks, custodians, clearing houses etc.) work on various systems, increasing complexity and reducing transparency. While tokenisation does not change the underlying risks in the settlement cycle, it may transform and change how they are managed (e.g., timing, custody and clearing cycles), and help eliminate the need for constant reconciliation of multiple ledgers within, and across organisations, and provide a reference source of truth for any analytic and reporting purposes. It will also

have implications for the role that intermediaries play in securities clearing and settlement. A recent example is the Australian Securities Exchange who is completely replacing its 25+ year-old equities post-trade services clearing and settlement system, CHESS[4], by a Digital Asset Modelling Language-powered DLT solution that is tokenising post-trade services for cash equities in the Australian market. Another example is HSBC's digitisation of transaction records of private placement assets, including debt, equity and real-estate being employed by HSBC, for its Digital Vault solution using R3's Corda– allowing global custody clients to access details of private assets in real-time, instead of having to request searches of paper-based records.

Another key advantage of Tokenised Securities is the ability to improve secondary market liquidity through digital fractionalisation/democratisation which enables the expansion into newer customer segments, improves accessibility and options for diversification, and expands access to new market participants through increasing the pool of investors through global outreach. Tokenised Securities allow for a cheaper, less burdensome and more inclusive way of financing for small and medium-sized companies by streamlining capital-raising processes and enhancing competition. By creating new investment structures, firms can bring to market new types of assets and create new marketplaces for previously illiquid assets. This is accomplished by leveraging new technologies such as blockchain or DLT to make technology-driven investment vehicles more accurate, hold real-time accessible data, (for example, providing real-time data on an agricultural underlying asset), and more attractive to investors (for example, InvestaX's launch of the first global digital SPAC, i.e., special purpose acquisition company).

c. Recent advancements around the advantages of Tokenised Securities

Clearing the misconceptions - The majority of respondents agree the market has come a long way in understanding the advantages of Tokenised Securities.

For the already established players in the ecosystem, some are also working on educating internal management, market participants, regulators, and the public, by trying to clarify the misconceptions and ease the stereotypes people may have with regards to Tokenised Securities (e.g., "Tokenised Securities is merely a passing fad and trend that will go away soon").

Experimentation - Financial institutions and issuers have been creating internal pools of expertise via practical experimentation. Over the past 18 months, we have also seen moves from internal PoCs/PoVs to multi-party PoCs (e.g., Deutsche Bank/STACS' collaboration for digital assets PoC[5]) and also PoVs such as Singapore Exchange (SGX)/HSBC/Temasek's digital bond issuances with Olam/Singtel/UOB[6]. This has led to a better understanding of the risks, costs and benefits of the key performance metrics under this new infrastructure model, as well as a better understanding of the interaction between DLT networks and adjacent business process and infrastructure (e.g., accounting and taxation, compliance, etc).

Interoperability - Some other players are focusing on working towards 'stitching' the end-to-end processes together, aiming towards being a 'one-stop shop' for issuers and investors alike, stating that **"covering all the phases in the lifecycle is only of value if they are "stitched" together**

[4] Australian Stock Exchange (ASX), 'About CHESS Replacement', https://www2.asx.com.au/markets/clearing-and-settlement-services/chess-replacement/about-chess-replacement

[5] Deutsche Bank, 'Deutsche Bank and Singapore fintech STACS announce collaboration for digital assets proof-of-concept', January 2021, https://www.db.com/news/detail/20210107-deutsche-bank-and-singapore-fintech-stacs-announce-collaboration-for-digital-assets-proof-of-concept

[6] (1) Ong Sing Yee, The Business Times, HSBC, Marketnode complete digital bond issuance with Singtel', April 2021, https://www.businesstimes.com.sg/banking-finance/hsbc-marketnode-complete-digital-bond-issuance-with-singtel; (2) Michelle Zhu, The Business Times, 'UOB pilots digital bond issuance of S$600m perps at 2.55%', June 2021, https://www.businesstimes.com.sg/banking-finance/uob-pilots-digital-bond-issuance-of-s600m-perps-at-255

and aligned on the same technology, else it is no better than the process being paper-based" (Julian Kwan, CEO, InvestaX)". Interoperability is a major area of focus across a majority of the respondents interviewed both in terms of interoperability between legacy and new systems as well as interoperability between different platforms and chains. Firms recognise that interoperability is integral to success, and must be taken into consideration early on in order to be able to integrate it into the framework at a later stage. **"If we don't solve for interoperability now, all we're doing is re-creating the data silos issue the industry is facing with slightly bigger data silos using newer technology" (Digital Asset).** The importance of interoperability is also highlighted in recent research from R3's Central Banking Digital Currency (CBDC) Working group, comprising of 140 central banks and financial institutions, **"In flight CBDC projects show that interoperability is possible through standardisation and the structured atomic swap capabilities that central banks are now able to leverage. Projects such as Project Jura have demonstrated that Atomic Delivery versus Payment is possible across networks and platforms to mitigate settlement and concentration risks." (Willy Lim, Strategic Consultant, Digital Currency, R3)**

Proactively working with regulators - Regulators too have generally been starting to acknowledge the benefits of tokenisation. Recognising that Tokenised Securities are 'here to stay', many have accelerated their learning journey. This has been aided by the industry players taking a more proactive approach by understanding and addressing the regulators' concerns, clarifying misconceptions, and explaining to them how they would, or plan to be compliant. For example, regulators were more receptive to reintroducing bearer assets to the financial system after their initial concerns about tokenisation were eased by the clarification and explanation that tokenised bearer assets would be fully compliant with the current day KYC/anti-money laundering (AML) standards.

There have been significant benefits for the industry players and the regulators/agencies working more openly and closely together (for example, the sandboxes provided by the SFC and Monetary Authority of Singapore (MAS), and SIX's work with the BIS and Swiss National Bank in developing PoCs for wholesale (CBDCs). These benefits include clearer and transparent policies and regulations, better understanding by regulators (and therefore more focused rules and compliance guidelines), and greater steps towards clearer and delineated classifications and definitions. Another benefit of frequently and proactively providing updates to regulators, is that they are kept informed on issues and developments in the tokenisation space (e.g., liquidity issues), and respondents have added that regulators have at times reached out for their views on the industry and trends as well.

In acknowledging these benefits, risks of tokenisation[7] and of blockchain technology in general, regulators in several jurisdictions are reviewing or have amended their traditional securities laws (and/or other laws) to support the development of the Tokenised Securities market and benefit the participants in the ecosystem.

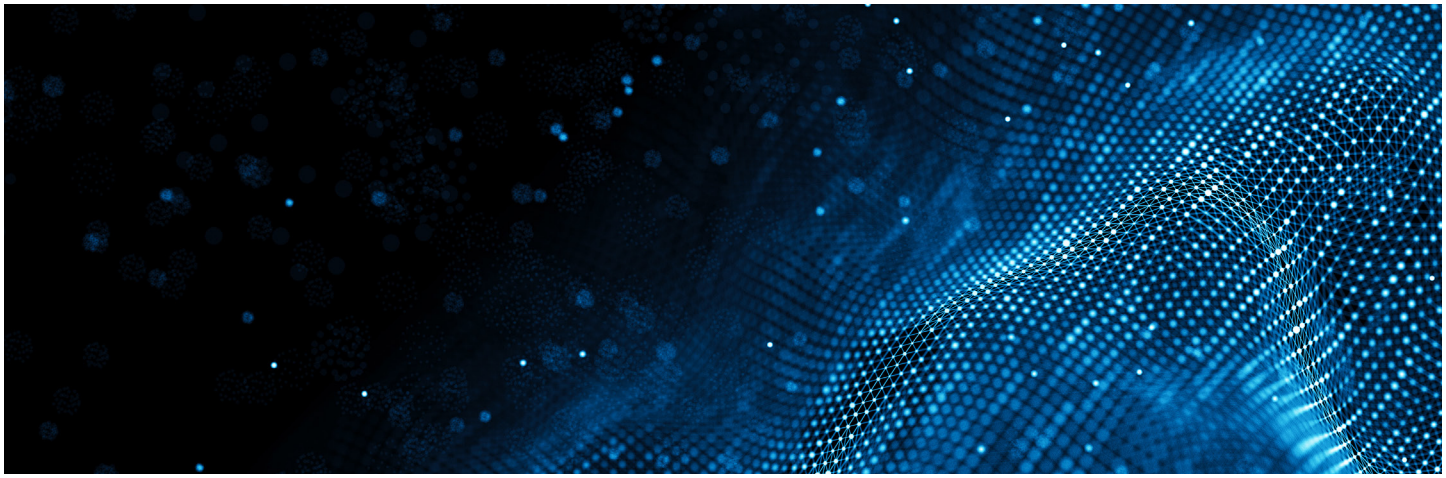
d. How issuers chose their platforms

Issuers advised there are currently very limited choices in technology platform providers as the market is still in its early stages. The main criteria for influencing which platform provider issuers chose were: 1) whether they had an advanced technology platform with a clear vision (know what they were building and how they wanted to build it); 2) had a comprehensive setup and compliance management framework; and lastly, 3) were receptive to the feedback provided, helping to ensure a successful bilateral two-way partnership.

[7] BIS - Morten Linnemann Bech, Jenny Hancock, Tara Rice and Amber Wadsworth, 'On the Future of Securities Settlement', 2020, The risks and benefits of Security tokenisation, https://www.bis.org/publ/qtrpdf/r_qt2003i.pdf

4

Key recent developments



a. Recent regulatory developments

All participants involved in Tokenised Securities need to carefully consider the nature and features of the tokens being offered to determine whether or not the tokens would be categorised as securities, or another type of regulated instrument such as a payment token, or a hybrid token. Applicable regulatory requirements will depend on the legal categorisation of the tokens and the services offered by the provider. Regulatory requirements also vary based on several other criteria, such as whether the offering is made through a private placement or a public offering, whether the investment is restricted to institutional investors or whether they target certain categories of retail investors such as the 'sophisticated investor'. And finally, regulatory frameworks in certain jurisdictions, such as Singapore, can have extra-territorial provisions and cover participants (trading platforms or financial advisory services) outside Singapore if the services are offered to investors in Singapore.

The Financial Action Task Force (FATF) Travel Rule is also a recent development currently being implemented by member countries and Virtual Asset Service Providers (VASPs) in domestic frameworks. It requires exchanging of real-name user identification during transactions, to better align with FATF Standards and global AML and Counter-Financing of Terrorism guidance.

i. Reviewing existing regulations

While there is a general recognition that Tokenised Securities are to be treated as securities, the regulatory regimes applicable to securities will typically apply to Tokenised Securities in addition to any more recent regulations specific to issuing tokens or other crypto-assets. With an increasing focus on digitisation, regulatory thinking has begun to evolve from a "same business, same risk, same rules" to an exploratory approach, with the aim of reviewing existing regulations under two objectives: 1) to provide regulatory certainty in the application of existing regulations to emerging technology; and 2) to identify risks or gaps that are not addressed by existing regulations and the amendments that are required in order to adequately address such regulatory gaps.

To date, while regulators in most jurisdictions have tended to adopt a technology-neutral framework and rely on existing technology risk management frameworks, technology risk is increasingly recognised as more relevant with tokenisation. As such, regulators are turning to balancing "new risks, amended regulations" for supporting the adoption of new technologies. **As Ms Clara KL Chiu, SFC's Head of Fintech unit and Director of Licensing, stated: "In respect of regulating a novel asset class, a practical and well-balanced regulatory approach will promote the healthy and orderly development of markets."**

Authorities have also been reviewing the processes and procedures that are paper-based and thus undermine the digital Tokenised Securities processes as well as legal

frameworks to ensure electronic records have the same legal status as their paper counterparts. Of note is the ongoing work underway in Singapore with the Accounting and Corporate Regulatory Authority and the Singapore Academy of Law for allowing 'digitally native securities'.

ii. Proactive regulations by regulators

In general, the evolutionary jurisdictional approaches to the regulation of Tokenised Securities vary considerably, and this also reigns true for Asia. Jurisdictions such as Japan[8] and Hong Kong[9] have provided regulatory clarifications focusing on Tokenised Securities. Hong Kong has published a new licensing regime for digital asset service providers, while the Dubai International Financial Centre is consulting on a full-on framework for security tokens, China, however, has banned Tokenised Securities since 2017[10].

Respondents lauded the following examples of proactive regulations. The SFC granted its first licence to a virtual asset trading platform in Hong Kong in late 2020[11]. The MAS supporting the development of Tokenised Securities by laying down guidelines for the tokenisation of assets[12]. And – outside of Asia - the numerous Swiss DLT law amendments that went into effect in February 2021, which included the following changes - modifications that accepted and recognised Tokenised Securities as a new asset class, revisions that provided authorisation for trading venues that focused on digital assets, amendments to the regulatory framework for custody providers that clarified the regulatory treatment of custody service providers for digital assets, and the introduction of a new type of digital securities known as 'uncertificated register securities' (registerwertrechte)[13]. The guidance from the UK's Financial Conduct Authority (FCA) on Crypto-assets[14] was also touted as a proactive regulatory development as it provided clarity on the types of crypto-assets that fell within the FCA's regulatory remit, and the resulting obligations on market participants.

Regulators in a few jurisdictions such as Switzerland and Dubai[15], have initiated public–private partnerships by setting up advisory working groups or are seeking inputs on regulatory consultations to identify any amendments required in existing regulatory frameworks or areas where additional regulations should be published. A sandbox approach has also been utilised or proposed by some jurisdictions. For instance, the MAS launched a Sandbox Express Program[16] in 2019 specifically for firms establishing or operating an organised market. The objective of the program was to provide firms with a faster option to test innovative financial products and launch services in the market. Some of the interviewees who were part of this regulatory sandbox had received MAS' support prior to and during their launch. The MAS also published a guide on the application of the relevant laws administered by MAS in relation to offers or issues of digital tokens in Singapore. The European Commission's Digital Finance package includes a proposal for a pilot regime[17] with sandbox characteristics for DLT-based market infrastructures to help identify changes required to the legislative and regulatory framework. While

[8] FSA, Japan, 'FAQ on Financial Instruments and Exchange Act', Section 2, https://www.fsa.go.jp/en/laws_regulations/faq_on_fiea/section02.html

[9] SFC, Hong Kong - (1) March 2019, 'Statement on Security Token Offerings' (2) November 2019, 'Position paper - Regulation of virtual asset trading platforms' (3) November 2018, 'Regulatory standards for licensed corporations managing virtual asset portfolios' (4) November 2018, 'Circular to intermediaries Distribution of virtual asset funds'

[10] (1) Daniel Ren, South China Morning Post, 'Central bank deputy governor: STO business 'essentially an illegal financial activity in China', December 2018, https://www.scmp.com/business/banking-finance/article/2177134/central-bank-deputy-governor-sto-business-essentially; (2) Norton Rose Fulbright, 'China issues announcement to ban fundraising through token offerings', September 2017, https://www.nortonrosefulbright.com/en/knowledge/publications/aa676f71/china-issues-announcement-to-ban-fundraising-through-token-offerings

[11] SFC, 'SFC licenses first virtual asset trading platform', December 2020, https://apps.sfc.hk/edistributionWeb/gateway/EN/news-and-announcements/news/doc?refNo=20PR127

[12] MAS, 'A Guide to Digital Token Offerings', May 2020, https://www.mas.gov.sg/-/media/MAS/Sectors/Guidance/Guide-to-Digital-Token-Offerings-26-May-2020.pdf

[13] (1) Jenny Gesley, Library of Congress, ' Switzerland: New Amending Law Adapts Several Acts to Developments in Distributed Ledger Technology', February 2021, https://www.loc.gov/law/foreign-news/article/switzerland-new-amending-law-adapts-several-acts-to-developments-in-distributed-ledger-technology; (2) Registerwertrechte - Uncertificated Register Securities (Switzerland).

[14] FCA, 'Guidance on Cryptoassets: Feedback and Final Guidance to CP 19/3', July 2019, https://www.fca.org.uk/publication/policy/ps19-22.pdf

[15] DFSA, 'Dubai Financial Services Authority consults on regulation of Security Tokens', March 2021, https://www.dfsa.ae/news/dubai-financial-services-authority-consults-regulation-security-tokens

[16] MAS, Sandbox Express, https://www.mas.gov.sg/development/fintech/sandbox-express

[17] EUR-Lex, 'Proposal for a regulation of the European Parliament and of the Council on a pilot regime for market infrastructures based on distributed ledger technology', COM/2020/594 final, September 2020, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020PC0594

not yet finalised as of the date of this paper, this pilot as proposed will allow applicants to apply for exemptions from certain requirements that may be problematic in the context of DLT systems. In Hong Kong, the SFC has also provided a sandbox although some respondents mentioned it does not go 'far enough'.

b. Recent developments in the ecosystem

There have been a number of noteworthy recent developments in the ecosystem. Examples (non-exhaustive) include OSL Digital Securities Limited (currently the only SFC-licensed digital asset exchange and brokerage in Hong Kong), announced in May 2021 its launch with the execution of its first successful customer trades in Blockchain Capital LLC's blockchain capital tokens. Japan's SBI Group is collaborating with Switzerland's SIX to create a Singapore digital asset exchange to be launched in 2022 (subject to regulatory approval). Also just announced, on 15 June 2021, is a consortium by Boostry, Nomura Securities, SBI Securities, and SMBC Nikko Securities called 'ibet for Fin' - a financial platform network based on blockchain to handle Tokenised Securities, with plans to grow the network as a decentralised platform by enlisting other financial institutions to participate and join[18]. Elsewise, Bitgo, Fireblocks and Metaco are some of the providers leading the space for digital asset custody solutions, thus enabling market makers and service providers to enter the digital asset ecosystem and have an important role to play in the future of Tokenised Securities.

i. The evolution and role of traditional financial institutions

The entry of traditional financial institutions into the digital assets space constitutes an important development that will greatly help the tokenisation space and the progress of the industry. This development is expected to have a positive spill-over effect for all the entities, wherein expanding the customer base they hold will increase the market liquidity. One such example was the recent announcement of the DBS digital exchange with a regulated platform that will cater for the issuance and trading of digital tokens that are backed by financial assets (such as shares in unlisted companies, bonds and private equity funds)[19]. DBS was also the first traditional financial institution in Southeast Asia to issue a security token in the form of a DBS Digital Bond for USD 15 million[20]. Another example is Standard Chartered, who has partnered with BC Group to establish a digital asset brokerage and exchange for institutional and corporate clients in the UK and Europe using OSL's (member of BC Group) digital asset technology. They have also announced the formation of Zodia Custody, an institutional grade digital asset custodian service, with partners, Northern Trust, and invested in Metaco, a provider of security-critical digital asset infrastructure. Similarly, Citi announced its' strategic FinTech investment in BondEvalue, the MAS-regulated Recognized Market Operator of the BondbloX exchange that is facilitating the electronification of bonds, as well as promoting financial inclusion by fractionalising the bonds to a denomination of USD 1,000 vs USD 200,000 using DLT. Switzerland's SIX Digital Exchange (SDX) is also expanding its coverage to address the needs of regulated institutions in APAC – partnering with Japan's SBI Group to create a Singapore digital asset exchange to be launched in 2022 (subject to regulatory approval). The project plans to include the full lifecycle of issuance, listing, trading, on-chain central securities depositary (CSD) and custody and use technologies from both companies. As **BC Group's Hugh Madden says, "it's not one over the other proposition, there will inherently be two camps that coexist. We will have regulated markets being dominated by the large institutional players alongside a decentralised ecosystem serving as a hive for continued innovation. It's symbiotic; with value exchanged between the two - capital and**

[18] Boostry,' Boostry 'ibet for Fin' Press Release', June 2021, https://boostry.co.jp/assets/pdf/PressRelease-20210615-01.pdf (Japanese only)
[19] DBS, 'DBS to launch full-service digital exchange - providing tokenisation, trading and custody ecosystem for digital assets', December 2020, https://www.dbs.com/newsroom/dbs_digital_exchange
[20] Fintech News SG, 'DBS First Bank in the Region to Issue Security Token at S$15 Million ', May 2021, https://fintechnews.sg/51464/blockchain/dbs-first-bank-in-the-region-to-issue-security-token-at-s15-million/

liquidity for talent and technology - that will allow both to grow and prosper."

Over the course of the past two years, financial institutions have steadily gathered pace and accelerated their learning on digital assets and Tokenised Securities. This has been largely due to the increased participation and initiation of PoCs. Pools of expertise and product management are starting to form, and the understanding of backwards compatibility (i.e., allowing interoperability with older, legacy systems) requirements and infrastructure capabilities that are required to handle the new reality of Tokenised Securities, is improving at a progressively exponential rate. Backwards compatibility is a key challenge as most regulators do not yet recognise 'value on the chain' or 'digitally native securities', only asset-backed securities.

c. Recent technological developments

i. Interoperability

In the 2019 paper, the interoperability between blockchain or DLT protocols or platforms, integration of DLT platforms with legacy systems, and the benefits of smart contracts, were among the key dimensions for the technology roadmap. In simple terms, interoperability refers to the ability to exchange information or data across different protocols, platforms or networks. Strong interoperability would enable users to experience the seamless integration of capabilities being offered by such blockchain or DLT protocols or networks. They featured heavily in 2019, still do in 2021, and will very much likely continue to be of prime importance into the next few years as the technology develops. While interoperability was and still is a key concern, it is not one area of important focus whereby resources and experiments seem to be deployed. No PoC or PoV we are aware of has tested interoperability across networks. This may be simply a sign that various PoCs are not testing for a mature ecosystem scenario.

As with any new technology, open standards and consistent taxonomy will help to accelerate the adoption and interoperability. The digital assets ecosystem is no different, in fact it can leverage the existing standards for securitised products and extend them to cover new asset classes using similar frameworks. There are various work streams[21] that are focused on standardisation, though it has to be acknowledged that these work streams are in their early stages, these standards define interoperability, address market requirements, and support advancement of all platform technologies in digital assets.

ii. Advances in infrastructure

Not only have the understanding and approaches to data management in a DLT world evolved, but the advances in infrastructure for creating and managing digital securities has grown from general-purpose blockchains, to the creation of specific purpose-built blockchains that can address gaps in architecture, for example, Polymesh created a specific purpose-built blockchain to address the gaps in Ethereum's architecture that it needed in order to align with blockchain requirements. And R3 Corda's platform was designed in consultation with global investment banks to be an enterprise-focused permissioned distributed ledger and digital asset platform to address the privacy, performance, scalability and enterprise grade digital asset requirements of capital markets participants. As mentioned by **InvestaX's CEO, Julian Kwan, "All major expansions of the capital markets were driven by the implementation of new technologies (electronic trading, exchange traded funds, indexes etc). In the private markets nothing has changed in hundreds of years until now. Blockchain technologies and smart contracts will bring the same explosion of growth into the private markets with the creation of new technology-driven investment vehicles attracting more capital and creating new markets and products [than] we have ever seen before."**

[21] There are standardisation efforts being driven by Interwork Alliance (IWA), https://interwork.org/ and Global Digital Finance (GDF) https://www.gdf.io/

5

Issues, challenges and recommendations

Respondents flagged regulatory and legal uncertainty as the main challenges, followed by a lack of precedents. Respondents also flagged technical challenges, lack of specialised firms/advice and internal hurdles such as management understanding as the biggest challenges encountered in their journeys so far.

a. Regulatory and legal challenges

It was almost universally recognised by respondents that regulators themselves are on a learning journey with regards to the systemic implications of Tokenised Securities. Many of the remaining challenges highlighted were within the regulatory space. These included the lack of regulatory guidance and a well-developed regulatory/legal framework. **"The 'not your keys, not your crypto' mantra is simply not viable in the world of regulated assets - and it is critical therefore that the conversation around tokenisation moves from this simplistic starting point to a compliant and compatible model in line with the operations and protections of modern capital markets." (Digital Asset).**
"Being a new development in the securities space, Tokenised Securities are currently not explicitly contemplated across the entire legislative and regulatory spectrum in most jurisdictions. As a result, platforms and entities involved with Tokenised Securities sometimes have to operate within the existing regulatory construct in an inefficient manner. One necessary condition for the maturation of the ecosystem will be a harmonisation of legislation across all fields in a manner that is supportive of securities tokenisation. While the path there will be a complex one, we are heartened by the efforts [.....] of the MAS in Singapore, and various government agencies in this regard" (Darius Liu, Co-Founder and COO, ADDX – Singapore based).

Inter-jurisdictional standardisation and consistency - Respondents highlighted that even as progress was being made on the regulatory front, a key challenge remained reflecting the heterogenous nature of the region with a lack of consistency from regulators across jurisdictions. Respondents advised this adds a substantial hurdle to the adoption of truly regional or global liquidity.

Paper-based/non-digital requirements working with regulators - There are certain processes for some asset classes where physical copies of documents and wet ink signatures are still required by financial institutions or due to regulatory requirements. The operational challenges were highlighted in ASIFMA's November 2020 whitepaper 'ASIFMA Operational Challenges in the Hong Kong and Singapore Capital Markets due to a Lack of Adoption of Electronic Means (November 2020)'[22]. In the SGX bond issuance process, there is still the need for a paper document to be created alongside the Tokenised Security as part of its onboarding to the CSD; and some corporate action elections for assets still require physical documents to be couriered to registrars to effect elective actions on assets held by investors. Amending the rules in this space to enable full digitisation of assets throughout their lifecycle can increase the benefits available through tokenisation.

It was also noted that most regulators currently do not yet recognise 'value on the chain' or 'digitally native securities', but only asset backed securities (with the physical/ legacy digital security in CSD/Central depository account/ International central securities depository).

Also worth mentioning are the capitalisation tables. For some jurisdictions, their requirements are currently still quite prescriptive in stipulating firms keep their capitalisation tables in a very specific 'old school way', which

[22] ASIFMA, 'Operational Challenges in the Hong Kong and Singapore Capital Markets due to a Lack of Adoption of Electronic Means', November 2020, https://www.asifma.org/wp-content/uploads/2020/11/asifma-report-operational-challenges-due-to-lack-of-e-means-in-hk-sg-final_201130.pdf

as a result does not add much value or purpose as it is simply duplicating what is on paper in a digitally viewable format.

Retail Investors - Many respondents feel strongly about the need to allow retail investors to be able to participate in crypto-assets and digital securities, and there have been calls for regulatory changes to be focused on this front. With the SFC's position paper on Tokenised Securities in 2019, we have seen institutional grade players being encouraged to set up safe, compliant platforms for the trading of Tokenised Securities. As retail investors are yet to be allowed in Hong Kong, this could in effect drive retail investors to other offshore unregulated venues which could potentially harm them. For investors, leverage in the derivative markets is not provided or supported (as to protect consumers), but for 'sophisticated investors' they are valid and necessary tools for a functioning market, and for institutional firms, they are required to protect and hedge their derivatives, and also, for professional investors, so they can express their risk appetites.

FATF travel rule - The FATF travel rule, which requires the exchanging of real-name user identification during transactions, is currently being implemented by member countries and VASPs in domestic frameworks. The FATF, during its 12-month review in June 2021, will assess the global response to the travel rule by which time it expects VASPs to have upgraded their systems to accommodate this new requirement. But as some regulators may be further down the track in this space than others, respondents suggested the need for consistent implementation of the FATF travel rule in all key jurisdictions to avoid regulatory arbitrage.

Settlement-related Issues - The industry will benefit from clearer implementation regulations for tokenisation covering for example which investment products are eligible and clarity on the finality of settlement. A respondent highlighted in their experience with client institutions and regulators, that regulators tended to raise concerns in the key areas such as recognition of settlement finality based on existing regimes, strategy around risk management ensuring compliance is managed, and support of security and potential market risk scenarios such as 'black swan' events. Respondents have been trying to address some of these key concerns by keeping regulators 'in the loop' and included in the process during the project implementation phase.

b. Regulatory recommendations

i. Regulatory priorities and the evolution of tokenised money

As highlighted in the 2019 paper, realisation of the full potential of Tokenised Securities would require a corresponding evolution of tokenised money for the settlement of transactions e.g., via CBDCs. A few respondents highlighted that Tokenised Securities seem to have a lower regulatory priority than CBDCs (perhaps due to the wider impact of and/or the financial inclusion element of CBDCs), to the extent that it is hampering the regulatory attention and support towards the adoption of Tokenised Securities. In any event, CBDCs are seen as a key enabler for unlocking the potential of and driving the adoption of Tokenised Securities.

ii. Taxonomy and classification guidance

We are supportive of international regulatory cooperation towards a globally consistent and harmonised taxonomy, and classification and recognition of tokens (for example, cryptocurrencies vs derivatives with cryptocurrencies as an underlying), as this could aid with regulatory interpretation, application and compliance, particularly in cross-border applications. **"Currently, there is a plethora of terminologies, and the taxonomy means different things to different people" (SIX Digital Exchange - SDX)**. The importance of taxonomy was underscored from a technology and interoperability standpoint as well. Respondents also raised that the description of what 'Tokenised Securities' and 'complex products'[23] were, requires more definition and nuance. This implies both standardisation and socialisation work are necessary to arrive at the use of a common taxonomy.

The Global Financial Markets Association (GFMA) in April 2020 responded[24] to the Basel Committee on the Banking Supervision (BCBS) 2019 discussion draft paper 'Designing a Prudential Treatment for Crypto-Assets'[25]. Within this response, a taxonomy on crypto assets, the approach to classification and understanding crypto-assets, and a framework for determining the prudential treatment of 'high risk' crypto-assets was defined. The BCBS on 10 June 2021 published a follow-up consultation on preliminary proposals for the 'Prudential treatment of [banks'] cryptoasset exposures[26]. This document builds on the contents of the BCBS' 2019 discussion paper and responses received from a broad range of stakeholders, as well as ongoing initiatives undertaken by the international community, the GFMA will also be responding to this consultation.

Experimentation sandboxes / guardrails - We recommend that regulators further explore regulatory sandboxes that allow for full value chain experimentation and broader ecosystem participation given the myriad of regulatory parameters, and also collaboration sandboxes to underwrite cooperation between financial institutions to safely test interoperability and help scale participation, engagement, rate of investment, and accelerate transformation. This would help participants gain a more pragmatic understanding of the risks, challenges, benefits, and help both the financial institutions, industry, and regulators alike be more informed. Respondents felt the best method to provide such sandboxes would be for the regulators to run a test net[27] with a confined and clear framework for participants to build and test on, until they received approval from the regulator they had 'graduated' and could exit the sandbox, (e.g., Propine Technologies Pte. Ltd. entered the MAS Fintech Regulatory Sandbox in November 2019 and has since graduated successfully with a Capital Market Services license to provide custodial services and is now fully operational).

Inter-jurisdictional harmonisation and consistency - We recommend that regulators work together on inter-jurisdictional harmonisation and consistency. The G20, International Organisation of Securities Commissions and the Organisation for Economic Co-operation and Development (OECD)[28] have a unique role to play and a positive recent example is the 'Regulatory Approaches to the Tokenisation of Assets' report published by the OECD that made policymakers aware and identified key regulatory issues in tokenised assets and markets. The pro-active role International Capital Market Association, ASIFMA and International Swaps and Derivatives Association are taking was also noted.

iii. Paper versus blockchain

When trying to streamline processes, regulators will want to make sure the investor is not disadvantaged by the differences between the traditional 'paper' way vs via blockchain or DLT. A recommendation of key factors to take into consideration when streamlining procedures include the ability to correct and change mistakes, to be able to re-issue tokens if something goes wrong, and to ensure legal issues are able to be dealt with in a similar fashion (e.g., estates of deceased persons and sell down or transferring of assets). We recommend that regulators and authorities continue to review their regulations so as to remove solely paper-based requirements (e.g., share registers), recognise blockchain or DLT-based electronic registers, and recognise tokenised shares/digitally native securities.

[23] SFC, 'Statement on Security Token Offerings', 'Under the Guidelines on Online Distribution and Advisory Platforms and paragraph 5.5 of the Code of Conduct 4, Security Tokens would be regarded as "complex products"', March 2019, https://www.sfc.hk/en/News-and-announcements/Policy-statements-and-announcements/Statement-on-Security-Token-Offerings

[24] GFMA, 'Consultation response Basel Committee on Banking Supervision - Designing a Prudential Treatment for Crypto-Assets ', March 2020, https://www.gfma.org/wp-content/uploads/2020/04/gfma-bcbs-prudential-crypto-assets-final-consolidated-version-20200427.pdf

[25] BIS, 'Basel Committee on Banking Supervision: Discussion paper Designing a prudential treatment for Cryptoassets', December 2019, https://www.bis.org/bcbs/publ/d490.pdf

[26] BIS, Prudential treatment of cryptoasset exposures, 'Basel Committee on Banking Supervision Consultative Document Prudential treatment of cryptoasset exposures', June 2021, https://www.bis.org/bcbs/publ/d519.pdf

[27] BTC Lexicon, 'Testnet - an instance of a blockchain powered by the same or a newer version of the underlying software, to be used for testing and experimentation without risk to real funds or the main chain', https://btclexicon.com/testnet/

[28] OECD, 'Regulatory Approaches to the Tokenisation of Assets', January 2021, https://www.oecd.org/finance/regulatory-approaches-to-the-tokenisation-of-assets.htm

c. Ecosystem challenges

Respondents flagged various ecosystem gaps from an issuer, investor, intermediary and stock exchange perspective:

Issuers - Find it challenging to identify which platforms and exchanges they should go to for issuance and to identify where their new investor base is given the many different venues. This can potentially lead to product and liquidity fragmentation.

Investors - Find it challenging to identify the avenues through which to invest in a Tokenised Security. Many exchanges and platforms offer direct participation, but this means that an investor would need to go through multiple onboarding and maintenance processes for each platform, this creates additional operational hurdles and friction.

Intermediaries - As of today there are only a limited number of intermediaries that are ready to facilitate intermediation between the issuers and the digital platforms, and between the investors and the digital platforms.

Stock exchanges - Traditional stock exchanges and recognised trading venues are a natural centre of gravity for liquidity, and CSDs allow for one-time KYC and onboarding. Exchanges could step in the Tokenised Securities Space but would need to avoid cannibalisation and raising the investment costs for their participants (intermediaries), and avoid choosing industry partner(s) who are competitors with the rest, which could keep participation difficult. Respondents mentioned the PAXOS-Depository Trust and Clearing Corporation model as a good reference model that has managed to balance considerations.

Additional remaining ecosystem gaps identified are:

Liquidity - The currently listed tokens are still thinly traded and relatively illiquid.

Talent gaps - Many respondents indicated managements' understanding and the acute talent gaps (especially from a product management, risk management, engineering and smart contract architecture point-of-view) to be key bottlenecks for growth acceleration.

Precedence and large marquee transactions - In APAC precedence and a large marquee transaction were also lacking to perk up the public interest and encourage a faster pace of adoption.

Shortage in professional firms - Also highlighted was the great shortage and need for more professional firms that had knowledge and experience in the area.

Secondary market sandboxes - And lastly, there was also a pronounced need for secondary market sandboxes for transactions to scale and platforms to connect to.

d. Ecosystem recommendations

An issue with the current approach of PoCs and PoVs is that it does not work towards a specific outcome. Mostly, experiments are currently used as a way for institutional players to familiarise themselves with the technology and risks involved. But as experimental metrics tend to be non-commercial, there is no real drive forward, nor is there an industry-wide shared view of possible end states. It would be reasonable to explore a regulator-endorsed, value/risk capped full ecosystem experiment, as this would concurrently help explore interactions, competitive dynamics, and interoperability in one go.

e. Technological challenges

Interoperability - As mentioned earlier, interoperability is one of the major gaps as PoCs in the industry are fragmented and siloed from each other. There is a consensus that there is a strong need for more wholesome industry participation at every stage of the security lifecycle. A few firms are managing these gaps by focusing on applying (blockchain) network agnostic designs and leveraging existing smart contracting protocols, but these are yet to be tested for integration with other organisations' networks (including assets, assets' lifecycles across networks, and their smart contracts). It is also increasingly evident that there are significant trade-offs to consider with regard to such approaches where they may minimise the potential of the underlying ledger and multi-party workflow capabilities of the platforms they seek to harmonise. Operating in a reality of multiple parallel ecosystems as opposed to an integrated value network, means participants are only seeing a fraction of both the challenges and opportunities available. Partial tests of transaction lifecycles and restricted size and scope of experimentations constrains knowledge acquisition. **"If players in the market are only building their own private blockchains, those businesses are making it more efficient for themselves but are missing the real opportunity for global distribution and the connection with Decentralised Finance (DeFi) and cryptocurrencies which is where we will see an explosion of value" (Julian Kwan, CEO, InvestaX).** In a closed wall environment like that, the true global distribution capabilities remain untouched, interoperability is unchanged, and growth will still be very slow.

Fragmentation - Respondents highlighted that there were several digital venues offering access to Tokenised Securities, but many were following the business-to-consumer model. From the end investor point of view, as they were all separate silos, this requires signing up to multiple platforms, including completing the KYC process multiple times.

Legacy systems - Another issue raised is the gap in legacy systems for valuing assets and managing workflows that can inhibit progress, for example, some accounting systems can only calculate up to 4 - 5 decimal places when bitcoin requires from 12 - 18 digits, hence the missing decimal places whilst immaterial, when accumulated can add up to be quite significant overtime.

f. Technological recommendations

If network interoperability is seen as such a key concern, we recommend that more experiments should test its boundaries. Clear business logic and governance architecture are key pre-requisites to a good technical design. The current organic approach without a target state may result in path dependency and fragmented networks.

The industry is used to a walled-garden approach to software engineering, while the fundamental drive behind DeFi is open source. More co-development is necessary to improve quality and guarantee interoperability of protocols and networks.

g. Impacts on traditional market participants

Traditional market participants have expressed that although they think there will be vast changes in the roles, responsibilities and workflows of the traditional market players, the 'raison d'être' played by the traditional market participants would unlikely disappear because investors would still need brokers to allow access to their desired price etc., and custodians would still have asset and investor protection mandates, and there would still be the need for parties to be accountable. In the end, although technology does drive this evolution, ultimately it is the risk-adjusted returns that make the final impact on the decision of whether a party will exit, scale to combine and/or find new roles in the new space.

Ownership rights - One area that respondents highlighted would be impacted was the maintenance and recording of ownership and rights by transfer agency services, which could overtime be substituted by DLT and smart contracts. Another area was the role of the custodian and the CSD, whereby the pain points experienced could be eased with tokenisation. Once these pain points are addressed, the focus may instead drift to where best these assets could be utilised, and subsequently how to adapt support in matching these new digital assets.

Joint-venturing / partnerships - With the introduction of these new tokenised assets and new market opportunities such as non-fungible tokens, traditional market participants would find the need to joint-venture and partner to remain relevant and competitive, hence there may need to be an ensuing change in operating and business models. For example, the UnionBank of the Philippines and SC Ventures (Standard Chartered's innovation and ventures arm), partnered to successfully complete a PoC for a PHP 9 billion issuance of a retail bond on a blockchain-enabled platform for bond tokenisation.

Adapting to new technologies - How traditional market participants might benefit will depend on their adoption rate, risk appetite, general attitude of the traditional participants in the market space, and how willing they are to adapt to the new technologies. If the traditional market players are willing to take advantage of these new technologies, then they will be able to reap the benefits and rewards of increased flexibility and control over settlement (for example, the exact date and time), extended hours of trading or operations, flexible trade opportunities and subsequently greater liquidity availability than is possible currently.

6

Emerging topics, plans and projections for the road ahead

The future plans that the respondents have shared can roughly be divided into 3 broad directions: 1) leveraging the characteristics of blockchain as the basis for new financial services; 2) implementing new competitive operating models that capitalise on blockchain's characteristics; and 3) lowering of the barriers to adoption with readily available infrastructure services for participants.

a. Leveraging the characteristics of blockchain as the basis for new financial services

Tokenisation capabilities from digitising current funds structures to 'wrapping' of today's securities would immediately allow more 'traditional' financial assets to flow into the blockchain space, where new benefits and competitiveness could be unlocked. This is a key future plan mentioned by many respondents.

In parallel, there are also plans to issue digitally native financial products and instruments. Together with tokenisation of traditional financial products, these two approaches could broaden the choice for investors and issuers; and raise the demands for tokenised-ready intermediaries. The mere replacement of paper or changing 'traditional electronic' financial services into a digital form are not drivers for Tokenised Securities. Indeed, harnessing tokenisation's capabilities for new competitiveness is the main driver.

b. Implementing new competitive operating models that capitalise on blockchain's characteristics

As mentioned previously, respondents had highlighted that one of tokenisation/blockchain's abilities was to allow communication of real-time digitised information to multiple parties. This characteristic could be used as a basis to build new competitiveness and efficiencies.
Acting as a 'shared resource' by multiple parties, the concurrent real-time information allows significant benefits to be realised from the use of the common definition of data as well as commonly accepted business logic processing by these parties.

Programmability was another key ability mentioned by respondents, to offer new competitive services. Both these attributes would also mean a gradual paradigm shift in the capital markets, away from the paper-based sequential paradigm that the modern capital markets have inherited from the 1960s 'Wall Street Paper Crisis', into one that allows real time, concurrent, digital and programmable information that would minimise costs from duplicated investments and activities.

"We are moving away from the over-the-counter nature of the industry, hence, reducing excess spreads and empowering investors by delivering bonds at better prices and greater transparency. With this shared truth and asset provenance, we can then allow investors to trade bonds

in smaller denominations and have instant settlement of trades" (Rahul Banerjee, CEO, BondEvalue).

Respondents also highlighted the focus to offer digital assets custody to other interesting, emerging operating models. Firstly, an operating model that is based on digital fractionalisation of financial instruments that can allow greater liquidity and participation from investors, either as a stand-alone or complementary operating model. Or secondly, new distribution models to reach more investors located in wider geographical areas, and in a safe and secured manner.

Programmability and concurrent communication of real-time information boosts these 'intelligent' and precision distribution capabilities. Fractionalisation of Tokenised Securities and funds can add important financial inclusion opportunities as well as enhance turnover velocity and liquidity.

c. Lowering the barriers to adoption with readily available infrastructure services for participants

The current market is in a transition period towards Tokenised Securities and this means that legacy traditional computer systems that market participants operate on, can effectively raise barriers to adoption. Addressing this 'sunrise' type of problem, where both legacy and tokenisation services would co-exist for a period of time, is also part of respondents' plans.

These plans include launching managed services and infrastructure to facilitate speed-to-market and scalability, tokenisation services to meet market participants' plans to service their clients, and open-sourced libraries that participants can draw on to create different types of smart contracts.

Respondents also raised, interoperability between different ledger technologies and on/off ledger financial activities like payments, and cost-effective and risk-managed systems and process integration could help lower barriers to adoption.

CBDC sandboxes - On the technology front of sandboxes, many of the interviewed institutions also stated they were building sandbox capabilities to explore interacting with CBDCs in constrained environments, and of specific interest were wholesale CBDCs. For example, R3's 'Sandbox for Digital Currencies', with more than 20 central and commercial banks globally test driving CBDC workflows and accessing an ecosystem of participants, and also partnering with the Association of South-East Asian Nations (ASEAN) entities such as the ASEAN Financial Innovation Network (a not-for-profit entity jointly formed by the MAS, the International Finance Corporation, and the ASEAN Bankers Association)[29].

Incentivising the adoption to tokenisation - The needs to incentivise and encourage user adoption and increase the network effects were also raised, and respondents provided many ideas and basis that could facilitate the adoption of Tokenised Securities, including the need for backwards compatibility with existing infrastructure which could help bring down the cost of adoption. What also came out during the survey was the leadership roles that industry associations could play to professionalise and promote tokenisation of securities.

Suggestions were muted though, on the starting points of how legal, regulatory and licensing clarity could start; which indicates possible next steps for the industry to explore.

[29] R3, 'AFIN Collaborates with R3 to Drive Central Bank Digital Currency Innovation', June 2021, https://www.r3.com/press-media/afin-collaborates-with-r3-to-drive-central-bank-digital-currency-innovation/

7 Appendices

a. Interviewed firms (in alphabetical order)

The following firm descriptions were provided in their entirety by the interviewee firms.

Disclaimer: This Paper does not provide and should not be treated as legal or professional advice on regulatory compliance, licensing requirements or any other matter. It is up to readers to obtain their own legal, tax and other professional advice. This Paper does not endorse, approve, recommend, or make any representation or warranty (express or implied) about, any particular product, transaction, service, exchange, entity, platform or service provider and other intermediary and we assume no responsibility or liability for any consequence that may arise from your use or reliance of any of them (including the information and views they provide and the products and services they offer).

ADDX previously iSTOX	**ADDX (previously iSTOX)** Darius Liu Co-founder & Chief Operating Officer Oi Yee Choo Chief Commercial Officer	ADDX is on a mission to democratise the private capital markets. Using blockchain and smart contract technology, the global private market exchange fractionalises securities across multiple asset classes such as hedge funds, wholesale bonds and unicorn shares, automating manual processes and reducing minimum investment amounts from USD 1 million to USD 10,000. This expands access to all individual accredited and institutional investors globally. ADDX currently serves investors from 27 countries, spanning Asia Pacific, Europe and the Americas (excluding the US). ADDX raised USD50 million in its Series A round in 2021 from shareholders, including Singapore Exchange, Temasek Holdings subsidiary Heliconia Capital, Japan government-backed investors Japan Investment Corporation and the Development Bank of Japan, Korea's Hanwha Asset Management, Japan's Tokai Tokyo Financial Holdings and Thailand's Kiatnakin Phatra Financial Group. ADDX is regulated by the Monetary Authority of Singapore as a platform for the issuance, custody and secondary trading of digital securities.
BC GROUP OSL THE TRUSTED DIGITAL ASSET PLATFORM	**BC Group / OSL** Hugh Madden CEO	BC Technology Group (stock code: HK 863) is Asia's leading public fintech and digital asset company. It is the parent company of OSL, the region's most comprehensive licensed digital asset platform. OSL is the world's first and only insured and SFC-licensed digital asset platform, providing brokerage, custody, exchange and SaaS services for institutional clients and professional investors. With a comprehensive Prime Brokerage business, the company offers OTC, iRFQ and electronic trading services giving traders access to the world's deepest liquidity pools, as well as secure and insured wallets to ensure the safekeeping of digital assets with timely transaction settlement. BC Group and the OSL platform are enabling institutional adoption of the digital asset class, setting standards for performance, security and compliance.
BIS	**BIS (Bank for International Settlements)** Bénédicte Nolens (BISIH)	The Bank for International Settlements (BIS) is an international financial institution owned by central banks that "fosters international monetary and financial cooperation and serves as a bank for central banks". The BIS carries out its work through its meetings, programmes and through the Basel Process – hosting international groups pursuing global financial stability and facilitating their interaction. It also provides banking services, but only to central banks and other international organizations. It is based in Basel, Switzerland, with representative offices in Hong Kong and Mexico City.

BondbloX BondEvalue	**BondEvalue** Rahul Banerjee Founder George Thomas Director Fixed Income Yen Chung Dan Sleep	BondEvalue is a Singapore based Fintech founded in 2016 with the vision to make bond markets more transparent and accessible to the masses. The company has a web and mobile app that allows bond investors to track bond market information and it also runs a blockchain based fractional bond exchange called the BondbloX Exchange (BBX). BBX operates as a Recognized Market Operator (RMO) in Singapore. A curated list of bonds are listed on the exchange and market participants can trade the digital fractions of the underlying bonds via a CLOB (Central-Limit-Order-Book). The digital asset is called BondbloX and is backed one-to-one with the underlying bond held with third-party custodians. The primary difference between BondbloX and the underlying bond is the minimum denomination of 1,000 versus 200,000. BBX follows a B2B2C model providing access to end investors via financial institutions like banks, brokers, asset managers as well as other fintech companies.
citi	**Citibank** Victor Alexiev APAC Head for Citi Ventures Programs & Strategic Partnerships for ICG Deepak Mehra APAC Head for Strategic FinTech Investments and Digital Solutions	Citi, the leading global bank, has approximately 200 million customer accounts and does business in more than 160 countries and jurisdictions. Citi provides consumers, corporations, governments and institutions with a broad range of financial products and services, including consumer banking and credit, corporate and investment banking, securities brokerage, transaction services, and wealth management.
CONSENSYS	**ConsenSys** Charles d'Haussy Director Clemens Wan Solutions Architect	ConsenSys is the leading Ethereum software company. We enable developers, enterprises, and people worldwide to build next-generation applications, launch modern financial infrastructure, and access the decentralized web. Our product suite, composed of Infura, Quorum, Codefi, MetaMask, Truffle and Diligence, serves millions of users, supports billions of blockchain-based queries for our clients, and has handled billions of dollars in digital assets. Ethereum is the largest programmable blockchain in the world, leading in business adoption, developer community, and DeFi activity. On this trusted, open-source foundation, we are building the digital economy of tomorrow. To explore our products and solutions, visit http://consensys.net/.
DBS digital exchange	**DBS Digital Exchange** Kah Hau Chua SVP, Head, Regulations & Compliance	DBS Digital Exchange is backed by leading Asian financial services group, DBS Bank, which has decades of extensive experience in capital markets and providing secure custodial services. DBS Digital Exchange offers trading services for various digital assets, including security tokens and cryptocurrencies: (A) Companies searching for an option to raise private capital from qualified investors can tap on DBS to securitise real and financial assets into digital tokens, known as "Security Tokens", for listing and trading on DBS Digital Exchange; (B) DBS Digital Exchange offers trading services between four fiat currencies (SGD, USD, HKD, JPY), and four of the more established cryptocurrencies, namely Bitcoin, Ethereum, Bitcoin Cash and XRP.

Deutsche Bank	**Deutsche Bank** Boon-Hiong Chan Director and Head of Securities Market & Technology Advocacy Jiali Liu (Ms) Vice President, Government & Regulatory Advocacy APAC	Deutsche Bank is a globally leading securities services provider of custody, clearing & settlement, agency securities lending and fund administration services to financial intermediaries such as global custodians, broker/dealers and prime brokers as well as buy-side firms and other institutional clients, in more than 30 markets. Technology is an integral part of its strategy to enhance value for markets and clients; and Securities Services is focused on direct connectivity with client's systems via API, "Debbie-Symphony" workflow RPA, predictive and forward-looking services to clients via Artificial Intelligence/Machine Learning, streaming real-time data search and data warehouse analytics. It has also investigated virtual assets, smart contracts, launched a DLT-based beneficiary owner database service, and assessed market structures, digital assets interoperability and new operating models from tokenisation.
Digital Asset	**Digital Asset** Jon Rout Business Development Director, APAC Lomi Hou Business Development, APAC	Digital Asset are the creators of Daml, the open source, cross platform smart contract language powering 5 of the world's top 10 stock exchanges and numerous global financial institutions. With Daml, institutions can tokenize any asset class, from simple commodities to complex derivatives and structured products and everything in between. Daml enables developers to model the full richness and complexity of modern asset ownership as a concise programmatic expression of the bundle of rights and obligations for each of the parties involved. Further, Daml drives full automation for tokenized assets throughout their lifecycle, capturing and automating events and cashflows tied to the asset synchronized across all impacted parties in real time. Beyond tokenization, the world's largest market infrastructures and financial institutions choose Daml to automate complex multiparty workflows, deliver distributed straight through processing across organisations, and to free their businesses from legacy technology silos.
DLA PIPER	**DLA Piper** Scott Thiel Partner	DLA Piper LLP has been active in Greater China for over 30 years. The firm's Greater China group comprises a team of over 180 fee earners located in three integrated offices in Beijing, Hong Kong and Shanghai, making DLA Piper one of the largest international law firms in the region. The firm's lawyers all have a solid understanding of the local laws and regulations of both Hong Kong and the People's Republic of China (PRC), and a thorough appreciation of the local business style and approach. The team also has extensive experience guiding clients expanding and operating in Macau and Taiwan. DLA Piper is a market leader in providing legal services to fintech clients. The fintech team brings together the vast and synergistic skill sets of the firm's finance, intellectual property and technology teams to holistically service clients through both a traditional finance perspective and cutting-edge technology deployment.
Elite Partners Capital	**Elite Partners Capital** Enoch Tan Portfolio Director	Elite Partners Capital Pte. Ltd. ("EPC") is a registered fund manager in Singapore which manages more than EUR 1.2 billion in assets in Europe. It recently listed its Elite Commercial Fund as a REIT (now known as Elite Commercial REIT, "ECR") on the Singapore Stock Exchange, and manages a separate Elite Commercial Fund III. ECR owns more than 100 commercial properties in the UK leased to the UK government. Recently, EPC also set up the Elite Logistics Fund which, to date, has acquired 18 big box logistics assets in Europe, valued at over EUR 400 million. It recently brought in Macquarie Capital as a strategic investor to grow its logistics footprint in Continental Europe and UK.

GMO-Z.com Trust Company, Inc.	**GMO-Z.com Trust Company** Kentaro Nakamura CEO	GMO-Z.com Trust Company connects traditional finance and blockchain for everyone. We are issuing GYEN, world's first regulated Japanese YEN-pegged stablecoin, and ZUSD, the new digital dollar. Established in 2020, GMO-Z.com Trust Company was granted a limited purpose trust charter by the New York State Department of Financial Services.
GSX GROUP	**GSX Group** Andrew Pal CEO, GSX Asia	The Gibraltar Stock Exchange (GSX) Group offers the benefits of listing securities and funds on a regulated and recognised stock exchange, aiming to enhance marketability and tax efficiency for issuers and investors of exchange listed products, on an increasingly digital platform (utilising blockchain technology). The GSX operates two markets, the GSX Main Market and the GSX Global Market: the former as an EU regulated market as defined in the Markets in Financial Instruments Directive (MiFID), whilst the latter operates as an MTF (Multilateral Trading Facility).The Group has also received a Conditional Licence to operate a (digital) exchange, as regulated by the Labuan Financial Services Authority, in a federal territory of Malaysia.
HASHKEY GROUP	**HashKey** Ben El-Baz Head of Ecosystems	HashKey Group is a digital asset management and financial technology leader. We advise and act throughout the investment cycle. HashKey participates in high-potential investment opportunities and delivers solutions across the digital asset ecosystem. Strategic partner Wanxiang Blockchain provides unparalleled access to blockchain research, developers, and technologies. HashKey and Wanxiang Blockchain are member companies of global industrial and financial services conglomerate Wanxiang Group. HashKey has operations in Hong Kong, Singapore, and Japan, and extensive partnerships with fintech ventures, leading academic institutions, and industry associations.
HSBC	**HSBC** Rajeev Tummala Director, Digital & Data, Securities Services	HSBC is one of the largest banking and financial services organi-sations in the world, with well-established global businesses in Europe, the Asia-Pacific region, the Middle East and Africa and the Americas. We serve more than 38 million customers worldwide through our three Global Businesses: Wealth and Personal Banking, Commer-cial Banking, and Global Banking and Markets - of which Securi-ties Services is part of. Our network covers 66 countries and territories in Europe, Asia, the Middle East and Africa, North America and Latin America. Listed on the London, Hong Kong, New York, Paris and Bermuda stock exchanges, shares in HSBC Holdings plc are held by more than 200,000 shareholders in more than 125 countries and terri-tories. There are no external shareholders which have a direct influence over HSBC Holdings plc's strategic direction. HSBC continues to be one of the world's most widely owned shares. For further information on the HSBC Group history, please refer to https://www.hsbc.com/who-we-are/our-history.
InvestaX® Digital Securities	**InvestaX** Julian Kwan CEO	InvestaX provides end to end digital securities issuance, trading and custody all on the ONE platform. Built with open architecture and currently integrated with 6 blockchains. We provide key infrastructure to digitize real assets so you can use them to buy, sell, trade and borrow or lend instantly, across the world, 24 x7.

	**Polymath** Chris Housser Co-Founder & Interim CEO	Polymath makes it easy to create, issue, and manage security tokens on the blockchain. Over 200 tokens have been deployed using our Ethereum-based solution and we are now in the midst of launching Polymesh, an institutional-grade blockchain built specifically for regulated assets. It streamlines antiquated processes and opens the door to new financial instruments by solving the inherent challenges with public infrastructure around identity, compliance, confidentiality, and governance.
	**R3** Willy Lim Strategic Consultant, Digital Currencies Harrison Tan Strategy and operations Ben Singh-Jarrold Product Marketing	R3 is an enterprise software firm that is pioneering digital industry transformation. With our foundation in enterprise blockchain technology, we power solutions that deliver trust across financial services and beyond. R3's enterprise blockchain platform Corda is digitalizing the processes and systems that firms rely on to connect and transact with each other and has more than 350 institutions deploying, servicing and building on it. Our Conclave platform harnesses the promise of confidential computing and Intel® SGX technologies. Conclave empowers businesses to develop applications that analyse and process sensitive data from multiple parties - without compromising on confidentiality. Our customers and partners have access to an ecosystem of leading SIs, cloud providers, technology firms, ISVs, corporates and banks. To maximize value for our customers we provide services and support to shorten time-to-market, as well as guidance on implementation, integration and building blockchain business networks. Learn more at www.r3.com, www.corda.net, and www.conclave.net.
	**SBI Group** Marc Robinson Chief Operating Officer Juan Gomez International Business Development	SBI Digital Asset Holdings (SBI DAH) oversees and operates digital asset-related businesses, under the umbrella of SBI Holdings. SBI DAH has investments into key portfolio companies including BRD, Boerse Stuttgart Digital Exchange, Sepior, Everspin and Sygnum among others. SBI DAH endeavors to bring innovation to the financial industry by building an ecosystem for issuance, custody, management, and liquidity for digital assets. Its team is native in both the financial and technology worlds and can help you deploy state of the art digital solutions to its clients' customers. SBI DAH's global network of partnerships with leading technology and fintech firms gives the company access to a broad range of state-of-the-art technologies.
	**SIX Digital Exchange (SDX)** Alistair Duff Head of APAC	SIX is a major financial market infrastructure (FMI) provider that operates exchanges and centralised securities depositories (CSD) in Switzerland and in Spain. SIX runs the payments system in Switzerland and operates payment infrastructure on behalf of the Swiss National Bank. SIX also manages a financial information business focused on providing data products and services to financial institutions globally. SIX is building new digital market infrastructure in its fully owned subsidiary SIX Digital Exchange (SDX). SDX plans to offer issuance, listing, trading, settlement, servicing, and custody of digital assets with streamlining and automation of asset servicing and post-trade processing. SDX is also a global leader in the development of central bank digital currency (CBDC) via its partnership with the Swiss National Bank and the Bank for International Settlements. SDX has partnered with SBI Digital Asset Holdings from Japan to set up a similar digital market infrastructure offering in Singapore.

	**Securities & Futures Commission (SFC)** Clara KL Chiu Director, Licensing and Head of Fintech Unit, Intermediaries	The Securities and Futures Commission (SFC) is an independent statutory body set up in 1989 to regulate Hong Kong's securities and futures markets. As a financial regulator in an international financial centre, the SFC strives to strengthen and protect the integrity and soundness of Hong Kong's securities and futures markets for the benefit of investors and the industry. We derive our investigative, remedial and disciplinary powers from the Securities and Futures Ordinance (SFO) and subsidiary legislation. Operationally independent of the Government of the Hong Kong Special Administrative Region, we are funded mainly by transaction levies and licensing fees. Our principal responsibilities include maintaining and promoting the fairness, efficiency, competitiveness, transparency and orderliness of the securities and futures industry. We are one of four financial regulators in Hong Kong. The four regulators cooperate with each other to ensure proper conduct in the markets and to forestall financial crime and misconduct.
	**SGX (Singapore Exchange)** Rehan Ahmed Chief Product Officer, Marketnode Peter Shen Head of Digital Services, Fixed Income, Currencies & Commodities, SGX	As Asia's most international fixed income marketplace, SGX is at the forefront of driving efficiencies across the entire bond issuance process. With increasing prominence and size of Asian bond markets, this requires a forward-thinking approach towards supporting infrastructure. Asset digitalisation provides us with the opportunity to do so - Smart Contracts and Distributed Ledger Technology (DLT) can enable financial market infrastructure for an end-to-end issuance, depository and asset-servicing platform for Asian bonds. In 2021, SGX and Temasek formed joint venture Marketnode to achieve this vision, by partnering with platforms including Covalent Capital, a Singapore-based bond issuance platform. Marketnode is Asia Pacific's first exchange-led digital asset venture focused on capital markets workflows through smart contracts, ledger and tokenisation technologies. Besides fixed income, Marketnode will focus on other existing and emerging asset classes that have seen growing market demand, including funds and sustainable finance.
	**SMBC Nikko** Seiko Kamada Planning & Management Department	SMBC Nikko is one of the leading full-line securities company in Japan covering all client segments with a broad range of financial products and services through its international network. SMBC Nikko Securities (Hong Kong) Limited, a member of ASIFMA, is 100% subsidiary of SMBC Nikko Securities Inc., which provides Investment Banking services, Equity and Debt trading, and M&A advisory services in Asia. Other than HK, we have affiliates globally including Singapore, London, NY. segments with a broad range of financial products and services through its international network.
	**Standard Chartered** John Ho Head, Legal, Financial Markets Jatin Badiani Senior Manager, Technology and Innovation Regulatory Change	We are a leading international banking group, with a presence in 59 of the world's most dynamic markets, and serving clients in a further 85. Our purpose is to drive commerce and prosperity through our unique diversity, and our heritage and values are expressed in our brand promise, here for good. Standard Chartered PLC is listed on the London and Hong Kong Stock Exchanges. For more stories and expert opinions please visit: Insights at sc.com. Follow Standard Chartered on Twitter, LinkedIn and Facebook.

TEMASEK	**Temasek** Kevin Lim Director Blockchain@Temasek	Temasek is an investment company with a net portfolio value of SGD 306 billion (USD 214 billion) as at 31 March 2020. Temasek's investment philosophy is anchored around six investment trends, the first three of which mark societal progress (Longer Lifespans, Sustainable Living, Rising Affluence) and the second three are the enablers (Smarter Systems, the Sharing Economy and A More Connected World). Temasek actively seeks sustainable solutions to address present and future challenges, in order to capture investment and other opportunities that help to bring about a better, more sustainable world. Headquartered in Singapore, Temasek has 11 offices around the world. For more information on Temasek, please visit www.temasek.com.sg. For the latest Temasek Review 2020, please visit www.temasekreview.com.sg.
tokeny SOLUTIONS	**Tokeny** Ivor Colson Head of Marketing	Tokeny Solutions allows financial actors operating in private markets to compliantly issue, transfer and manage securities using distributed ledger technology, enabling them to improve asset liquidity. Due to disconnected and siloed services that are currently used to enforce trust, private markets experience poor asset transferability with little to no liquidity. By applying trust, compliance and control on a hyper-efficient infrastructure, Tokeny Solutions enables market participants to unlock significant advancements in the transferability and liquidity of financial instruments. Euronext-backed Tokeny Solutions is the leader in its field and in 2020 were named one of the top 50 companies in the blockchain space by CB Insights.

b. Glossary of acronyms

AML	Anti-Money Laundering
APAC	Asia-Pacific
ASEAN	The Association of Southeast Asia Nations
ASIFMA	Asia Securities Industry & Financial Markets Association
BCBS	Basel Committee on Banking Supervision
BIS	Bank For International Settlements
CBDC	Central Bank Digital Currencies
CEO	Chief Executive Officer
CSD	Central Securities Depository
DEFI	Decentralised Finance
DLT	Distributed Ledger Technology
DVP	Delivery versus Payment
FATF	Financial Action Task Force
FCA	Financial Conduct Authority (UK)
G20	Group of Twenty
GFMA	Global Financial Markets Association
HK	Hong Kong
IOSCO	International Organisation of Securities Commissions
KYC	Know Your Customer
LLC	Limited Liability Company
MAS	Monetary Authority of Singapore
OECD	Organisation for Economic Co-operation and Development
PHP	Philippine Peso
POC	Proof of Concept
POV	Proof of Value
SFC	Securities & Futures Commission (Hong Kong)
SGX	Singapore Exchange
SPAC	Special Purpose Acquisition Company
UK	United Kingdom
USD	United States Dollar
VASP	Virtual Asset Service Provider