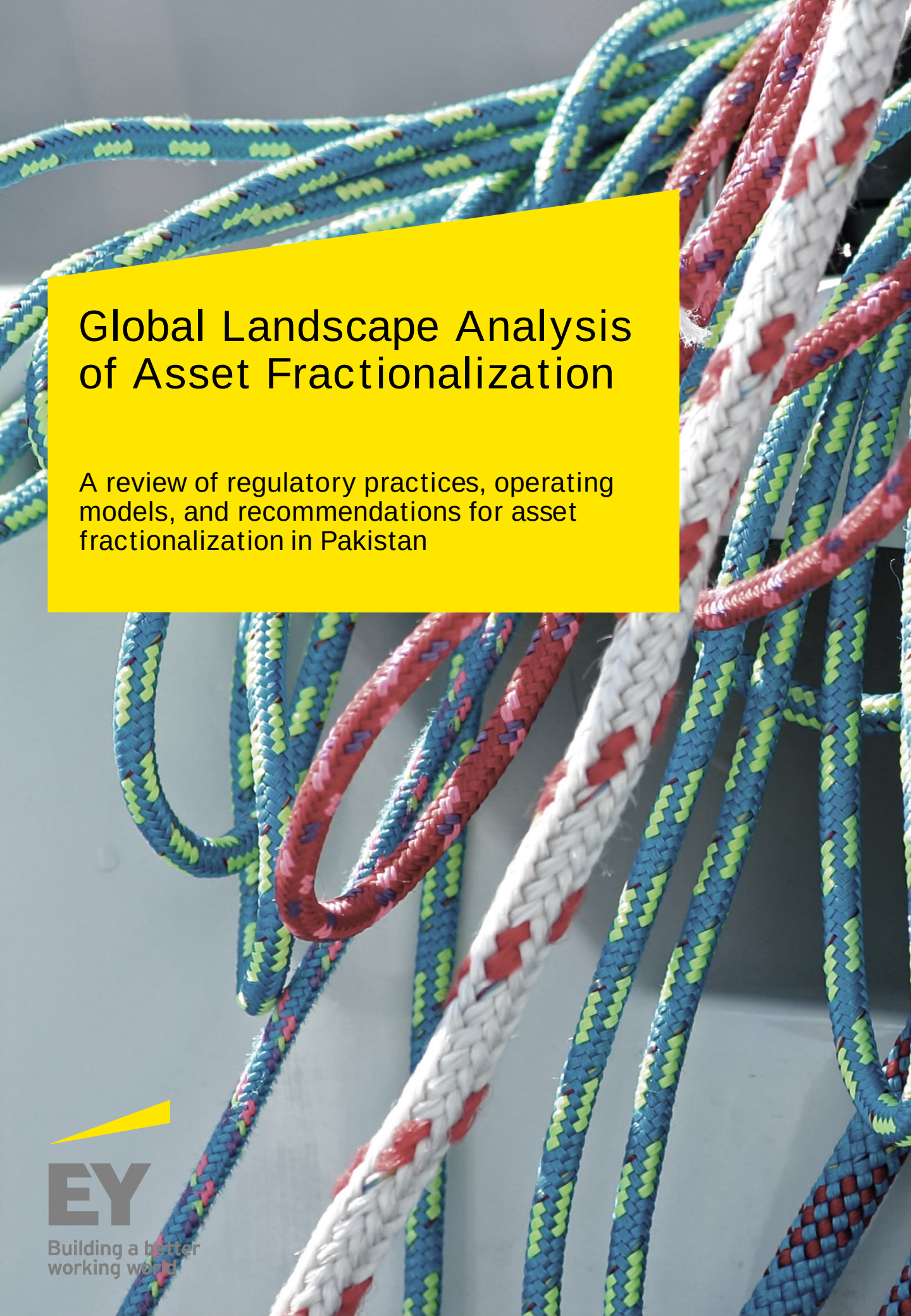

Global Landscape Analysis of Asset Fractionalization

A review of regulatory practices, operating models, and recommendations for asset fractionalization in Pakistan

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I. Preface

The purpose of this Global Landscape Analysis of Asset Fractionalization Report is to present the concepts, technology, operating models and regulatory practices related to asset fractionalization observed globally and in selected benchmark countries such as the US, Malaysia, India, UAE and Turkey, necessary to inform the creation of an enabling regulatory framework for asset fractionalization in Pakistan. This report only focuses on real-asset backed fractionalization or fractions (also called tokenization or tokens). References to virtual, crypto or digital currencies or assets in this report are only to the extent of quoting and comparing with other global frameworks or regulations where different terminologies have been used to cover topics relevant to the subject of this report.

The report starts with an overview of concepts and classes of asset fractionalization along with defining the key steps involved in creating fractions of an asset. Second, it lays out the direction of regulators, key considerations for policy makers and presents an analysis of regulatory frameworks from 5 countries operating within developed and developing markets. A comparative analysis is also provided to make a side-by-side comparison of the guidance provided by regulators to the key players involved in asset fractionalization. Third, the common operating models, enabling technology requirements and guidance on white paper is provided. Last, the report identifies relevant risks and provides recommendations for the regulator in Pakistan regarding the creation of an asset fractionalization market and also identifies some asset classes with good potential for fractionalization.

II. List of Abbreviations

ADGM	Abu Dhabi Global Market
AML	Anti-Money Laundering
AFP / AF Platform	Asset Fractionalization Platform
AFO / AF Operator	Asset Fractionalization Operator
AFI / AF Issuer	Asset Fractionalization Issuer
BSA	Bank Secrecy Act
BRSA	Banking Regulatory and Supervisory Authority
BNM	Bank Negara Malaysia
CFT	Combating the Financing of Terrorism
CDC	Central Depository Company of Pakistan
CBRT	Central Bank of the Republic of Turkey
CMB	Capital Markets Board of Turkey
CBDC	Central Bank Digital Currencies
CTR	Currency Transaction Report
CEA	Commodity Exchange Act
CBUAE	Central Bank of the UAE
CFTC	Commodity Futures Trading Commission
CVC	Convertible Virtual Currency
CMSA	Capital Markets and Services Act
CEO	Chief Executive Officer
DAX	Digital Asset Exchanges
DVAL	Regulation of Virtual Assets
DGCE	Dubai Gold & Commodities Exchange
DEFI	Decentralized Finance
DLT	Distributed Ledger Technology
DFSA	Dubai Financial Services Authority

DIFC	Dubai International Financial Centre
EU	European Union
FINRA	Financial Industry Regulatory Authority
FSRA	Financial Services Regulatory Authority
FCA	Financial Conduct Authority
FATF	Financial Action Task Force
FinCEN	Financial Crimes Enforcement Network
FCIB	Financial Crimes Investigation Board
GDPR	General Data Protection Regulation
ICO	Initial Coin Offerings
IFRS	International Financial Reporting Standards
IEO	Initial Exchange Offering
KYC	Know Your Customer
KYT	Know Your Transaction
LTDA	Legal Tender Digital Assets
LLP	Limited Liability Partnership
MiCA	Markets in Crypto Assets
MSB	Money Service Businesses
NFT	Non Fungible Token
NYDFS	New York State Department of Financial Services
OEC	Observatory for Economic Complexity
PMEX	Pakistan Mercantile Exchange
PoW	Proof of Work
PME	Pakistan Mercantile Exchange Limited
PoS	Proof of Stake
SECP	Securities and Exchange Commission of Pakistan
SBP	State Bank of Pakistan
SCA	Securities and Commodities Authority

SDX	Swiss Digital Exchange
SME	Small and Medium Enterprises
SFC	Securities and Futures Commission
SC	Securities Commission Malaysia
SEC	Securities and Exchange Commission
STO	Security Token Offerings
SLA	Service Level Agreement
SPV	Special Purpose Vehicle
VASP	Virtual Assets Service Providers
VDA	Virtual Digital Assets
VARA	Virtual Assets Regulatory Authority

III. Executive Summary

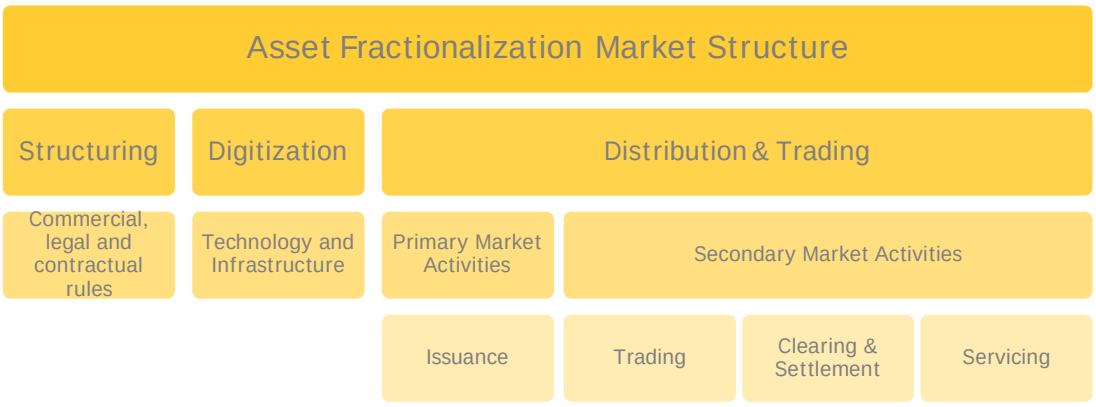
1. Fractionalization of assets, also known as tokenization of assets, is the process of creating digital representations of assets on distributed ledgers, or the issuance of traditional asset classes in the fractionalized form. The process of fractionalization creates a bridge between real-world assets and their trading, storage, and transfer in the digital world. Globally, some standard-setters and regulators have referred to asset-backed tokens or fractions as stable coins, security tokens, or commodity tokens, while others have dealt with them using more generalized umbrella terms such as digital assets, virtual assets, or crypto assets. Hence there remains a general lack of consensus among various regulators in the world on the usage and meaning of terminologies associated with this subject. In this report, however, the terms "*fractionalization"* and "*tokenization"* have been used synonymously to mean the fractionalization of real (physical or tangible) assets.

2. There are various benefits and consequently use cases of asset fractionalization. One of the most important and defining benefits of asset fractionalization is the ability to fractionalize (divide) assets. The existing financial markets do provide an option of fractional ownership through equity or debt issues but those are largely restricted to bankable (financial) assets and suited for large corporates. By contrast, asset fractionalization through DLT can allow for the division of rights to an asset in unusually small fractions, could be applied to non-traditionally-investable real-world assets, and lead to more inclusive financial markets which cater to the consumer and SME segments. Besides, the application of DLT (blockchain technology) and smart contracts in asset fractionalization provides the benefits of transparency, traceability, record registry, and faster settlement.

   Capitalizing on the benefits, some commonly seen use cases of asset fractionalization include the fractionalization of:

   - commodities or precious metals e.g. Tether Gold;
   - real estate property e.g. RealT
   - bills of lading (trade finance) e.g. CargoX

3. Conceptually speaking, the steps involved in asset fractionalization are structuring, digitization, and distribution & trading. Structuring deals with the legal and commercial aspects of a fraction (or of its underlying asset), digitization refers to the technological processes employed in the various stages of a fraction's lifecycle and distribution & trading refer to the specific activities of the primary market, secondary market, and of various market participants for fractionalization. The following diagram further explains this structure.



4. Similar to the traditional financial markets and depending on the level of centralization desired by a regulator, the ecosystem for asset fractionalization will require several intermediaries. A summary of such market participants with their roles is presented below. It is common for service providers to offer one or more of the following services together, so the segregation of roles is rather conceptual.

Market Participant	Type of Activity	Description
Fraction Issuer	Fraction creation, underwriting, and issuance	Responsible for structuring the deal, developing the financial model, undertaking risk management, legal and compliance activities, digitization & creation of the fraction, and, the actual issuance to private and/or public investors.
Physical Custodian	Depository (Custody or Storage)	Holding the safe custody of the underlying asset of an asset-backed token.
Digital Custodian		Providing services to hold the custody of the private keys for a blockchain-based fraction on behalf of the fraction-holder. In the context of fractionalized assets, a private key is similar to a password required to gain access to a fraction.
Custodian or other third-party service providers	Administrative support services	Record maintenance and other administrative activities associated with the issue for example book-keeping, corporate actions, compliance services (AML, CFT, KYC), blockchain analytics, rating services, and security audits. These roles may also be assumed by the fraction platform (exchange).
Fraction Exchange	Marketplace, trading, clearing & settlement[1]	An exchange (in the context of fractionalized assets) is an electronic marketplace where buyers and sellers list fractions, buy/sell (exchange) fractions, and undertake price discovery.
Market Maker	Providing liquidity	Similar to traditional financial markets, these are service providers who provide liquidity to the markets by consistently buying and selling asset fractions at quoted prices while keeping a spread.
Payment services provider	Provides funds transfer and settlement services	These may be banks or other financial institutions which provide funds transfer services to market participants.

5. Many governmental institutions across the world have responded by issuing a range of policies to promote the financial stability, consumer, investor protection, and also market integrity. Regulators in the EU, Switzerland, USA, and UK dealing with fractionalized asset markets have implemented a “technology-neutral” approach to policies and risks, applying existing financial regulations to fractionalized assets. To summarize, the following policy-level approaches are seen when looking at various regulations:

[1] Different models for clearing & settlement exist where other than exchanges, custodians or financial institutions are also seen offering these services to the market.

a. *Technology-neutral approach* – applying the existing regulations of the jurisdiction based on the economic substance of the transactions regardless of the technology used, e.g. US SEC.
b. *Tailormade frameworks* – creating specific tailormade frameworks for the regulation of fractionalized assets e.g. Blockchain Order (France) or Electronic Securities Act (Germany).
c. Selective Amendments–making selective amendments to the existing laws or frameworks to account for specific risks/ scenarios e.g. DLT Act (Switzerland).

d. As per the objective of the report, regulatory frameworks, to the extent relevant and available, were studied for the US, India, Turkey, UAE, and Malaysia.

    i. In the US, the topic of digital assets (and by interpretation fractionalization of assets) is primarily governed by the US SEC at the federal level. The US SEC follows a technology-neutral approach based on the *Howey Test (specific criteria to classify as security)*. If a token (digital asset) satisfies the *Howey Test*, it falls within the ambit of the US SEC and becomes the subject of the Securities Act, 1933. Other regulators at the state and federal levels also exist with guidance on other specific elements of digital asset transactions e.g. AML, KYC.

    ii. In the UAE, there are different regulators in Dubai and Abu Dhabi further divided by their jurisdictions in free zones and the mainland. VARA, the latest regulatory body established to regulate digital assets in mainland Dubai, scopes in both payment and non-payment-based tokens falling within the realm of digital assets while SCA (the federal body for mainland UAE), focuses on regulating security tokens and commodity/asset-backed tokens and also adopts a technology-neutral approach. DFSA (the regulator for digital assets in Dubai free zone) adopts a technology-specific approach and defines a security token as a representation of value stored on a DLT network while FSRA (the regulator for Abu Dhabi free zone) only focuses on security tokens and by interpretation closed-loop payment tokens as it specifically excludes legal tender from its definition and also maintains a technology-neutral approach.

    iii. In Malaysia, the primary regulator for digital assets and therefore by interpretation fractionalized assets is SC (Securities Commission). The Prescription (of Securities) Order, 2019, identifies two forms of digital assets), digital currency (excluding central bank-issued digital currency [CBDC]) and digital tokens. A digital token is defined as a digital representation recorded on a distributed ledger whether cryptographically secured or not – a somewhat technology-specific definition. A further test (similar to that given by the US SEC) is prescribed to qualify both digital currencies (excluding CBDCs) and digital tokens as securities under the existing securities law.

    iv. Both India and Turkey have taken a narrow-scope view of digital assets, dealing with them only in the context of crypto currencies.

        India started by banning crypto currencies and currently does not have a regulatory framework for digital assets. However, certain amendments proposed in their tax laws intend to tax the gains made by individuals or companies trading crypto currencies, so it can be deduced that guidance on the broader use-cases of digital assets e.g. asset fractionalization is absent in India while dealing in crypto currencies is neither legal nor illegal. Turkey also presents a similar situation. It started with banning crypto currencies and then introduced some financial crime-related compliance

requirements for crypto exchanges resulting in their de facto acceptance. If a securities view of digital assets is adopted, this domain will fall within the ambit of the Capital Markets Board of Turkey (CMB). Having said that, presently, the guidance on the broader use-cases of digital assets e.g. asset fractionalization is absent in Turkey while dealing in crypto currencies is neither legal nor illegal.

6. In Pakistan, markets/assets such as real estate, precious metals, warehouse receipts or generally speaking most physical assets present themselves as good candidates for asset fractionalization. Asset fractionalization can help generate transparent, documented, small-ticket *(friendly for small individual investors)* transactions in these markets and similarly in other non-traditionally-investable assets. Over a period of time, asset fractionalization platforms could be enhanced to raise funds for small businesses through unconventional securitization models powered by blockchain technology. To establish a sound eco-system for asset fractionalization in Pakistan, the following high-level recommendations should be considered:

    a. For investor and financial consumer protection and to maintain the stability of financial markets, the requirements and obligations of various market participants in fractionalization should be set on par and comparably with those for issuers, custodians, and exchanges in the traditional financial markets. Hence, in this context, the technological and operational robustness of the digital and physical custody providers would be central to the success and stability of this new market.

    b. A substance-over-form approach should be followed for definitions and terminologies to be used in the regulations. Definitions and terminologies should govern the underlying economic substance of the transaction involving a fractionalized asset rather than its technological or procedural outfit.

    c. To keep up with the evolution in the space of asset fractionalization, the regulator should have a permanent mechanism whereby it can engage with technology creators and contemplate regulatory changes based on innovations happening in the fractionalization space.

    d. The regulations should be sufficiently narrowed down to avoid overlapping or confusion with other laws or regulations in Pakistan governing other asset classes such as conventional financial assets (shares or other securities) and with other sub-classes of digital assets such as cryptocurrencies.

    e. Given the nature of real-asset-backed fractions, a seamless legal link must be established between the on-chain event (transaction on the blockchain) and the off-chain event (transaction outside the blockchain network). Where the regulations do not cover the transfer and settlement of an asset off-blockchain (including providing exceptions/guidance to its existing laws), it may lead to contractual disputes, settlement and custody challenges, and price distortions (arbitrage opportunities).

    f. Specialized guidance or provisions in the taxation framework may be required to ensure that fractionalization transactions are not double-taxed or misinterpreted due to specialized structures required for custody and settlement. This may increase transaction costs and negatively affect market participants.

1. Asset Fractionalization – An Overview

1.1. The Concept of Fractionalization[i]

Fractionalization of real (physical) assets also known as tokenization of assets is the process of creating digital representations of assets on distributed ledgers, or the issuance of traditional asset classes in the form of fractions.

In fractionalization, the economic value and rights derived from pre-existing real assets are linked or embedded by convention to DLT-based fractions (also called tokens), acting as a store of value. The fractions so issued exist on-chain[ii] (as a digital twin of the real-world asset), while the real assets on the back of which the tokens were issued continue to exist in the off-chain[iii] world. The process of fractionalization creates a bridge between real-world assets and their trading, storage, and transfer in a digital world. Globally, asset-backed tokens (also referred to as security tokens or stable coins) are one of the many examples of asset fractionalization.

Asset fractions (as defined above) fall within a wider community of digital assets. However, given the scope and objective of this report, the other forms of digital assets have not been discussed in this report. Regardless, it is important to note that the subject of digital assets (including but not limited to fractionalized assets) continues to evolve as regulators and policymakers around the world make an attempt to draw the ambits of their regulatory frameworks while keeping sight of the emerging use-cases of DLT fast adding to the list of digital assets. There is currently no uniform legal classification of asset fractions at a global level each jurisdiction has its own peculiarities. There are efforts underway to draw up an international taxonomy (e.g., in the EU with the MiCA Regulation proposal). However, in this scenario, it is best to refer to the terminologies associated with asset fractionalization on a generally-accepted (consensus) basis at the time of writing this report.

1.2. Common Use-Cases of Asset Fractionalization

The recent developments in the Blockchain and other Distributed Ledger Technologies (DLTs) have significantly impacted fast-evolving FinTech landscape. As we advance, blockchain will expand its scope of usability in many more sectors, from payments with central bank digital currencies and fiat-backed stablecoins, to post-trade with DLT-based clearing and settlement systems, from unregulated crypto-asset markets such as bitcoin, to the fractionalization of assets, with the latter now among the most prominent emerging uses for this technology. Following the successful completion of many pilot projects all over the world, asset fractionalization has firmly established itself in mainstream finance with use-cases in fractionalized equities, fractionalized bonds, and fractionalized commodities. Just recently, the Swiss Stock Exchange launched SDX (Swiss Digital Exchange) to help build new business models, products and services and enable its clients to store and service their fractionalized (digital) assets in a trusted and secure environment. Hence, the fractionalization process marks a promising solution in converting rights to an asset into a unique digital representation (fraction) while at the same time improving transparency, efficiency and speed in the financial sector thus reducing the costs of financial products and services.

The prevalent use cases of asset fractionalization arise from the various benefits of fractionalization. The application of DLT and smart contracts in asset fractionalization has the potential to deliver a number of benefits, including efficiency gains driven by automation and disintermediation; transparency; improved liquidity potential, and tradability of assets with near-absent liquidity by adding liquidity to current illiquid assets; faster and potentially more efficient clearing and settlement. Further, fractionalization, as the name suggests, allows for fractional ownership of assets which, in turn, could lower barriers to investment and promote more inclusive access by retail investors to previously unaffordable or insufficiently divisive asset classes, allowing global pools of capital to reach

parts of the financial markets previously reserved to large investors. The flow of private financing from capital owners to SMEs could be eased and facilitated, enhancing access to financing for SMEs (OECD, 2020).

A. Operational Efficiency

By streamlining IT systems, sharing the infrastructure between all participants and reducing the need to involve a central third party, transaction costs are significantly reduced. The shared infrastructure also prevents a single point of failure which would be possible if not likely in a centralized system. The digitalization and automation of manual work along with the reduction of a part of the reconciliation/compliance work also enable cutting inefficiencies. Furthermore, the use of smart contracts and atomic swaps allow for instant clearing and settlement of transactions thus reducing the need for intermediaries and costly clearing and settlement systems.

B. Transparency

The use of distributed ledger technology (blockchain technology) automatically brings transparency to all the transactions conducted on a blockchain network. All transactions occurring on a Blockchain infrastructure are accessible to all its participants (i.e. all participants on a public blockchain can view the state of the transactions and all authorized participants can view the state of the transactions on a permissioned or private blockchain). This property is inherited by all fractions representing assets on a blockchain.

C. Single Source of Truth

In complex multiparty ecosystems, it is difficult or costly to maintain a single source of truth especially when linkages between various data points are required for example to establish the chain of ownership or asset-owner linkages. This is often achieved with the creation of specialized registries or data custodian companies. As DLT/Blockchain introduces a single IT layer of trust for allowing business partners or competitors to share their data, multiple actors of an ecosystem can interact with the same digital representation of an asset (asset fraction), driving efficiency all along the value chain or industry and introducing new ways of collaboration. In addition, the DLT/ blockchain technology also brings immutability of transactions meaning once a transaction is brought on chain, it shall remain indelible.

D. Asset Fractionalization

One of the most important and defining benefits of asset fractionalization is the ability to fractionalize (divide) assets. Through fractionalization, investors can hold fractional ownership of assets. The existing financial markets do provide an option of fractional ownership through equity or debt issues but those are largely restricted to bankable (financial) assets and suited for large corporates. By contrast, asset fractionalization through blockchain can allow for the division of rights to an asset in unusually small fractions, could be applied to non-traditionally-investable real-world assets, and lead to more inclusive financial markets which cater to consumer and SME segments.

Employing the virtues and various benefits of asset fractionalization, there are a number of commonly seen use cases around the world. A non-exhaustive list of these use-cases with a brief description is presented below:

- *Fractionalization of commodities or precious metals.* For example, Tether Gold is a digital token (fraction) backed by physical gold. One full XAUt (unit of Tether Gold) token represents one fine troy ounce of gold on a London Good Delivery bar (Tether, 2022).

- *Fractionalization of real-estate property.* For example, RealT is a platform that offers investments in real estate. Ownership of these real estate properties is denominated by digital tokens (fractions) on the Ethereum blockchain. RealTokens are electronic, cryptographic, digital tokens (fractions) issued as Ethereum-based smart contracts on the Ethereum Blockchain (RealT, 2019)
- *Fractionalization of cargo (bill of lading/ trade finance).* For example, CargoX a platform for blockchain document transfer enables the original and confidential transfer of trade documents in a trusted and transparent digital environment (CargoX, 2021).

1.3. How Does Fractionalization Work?

In terms of conceptual business processes, fractionalization of assets follows the following lifecycle:

A. Structuring

The purpose of fractionalization is to bring more security and efficiency to a transaction while keeping the commercial, regulatory and contractual considerations (including rights and obligations) of the parties involved intact. Therefore, in the structuring phase much like a term sheet for a financial asset details such as the terms and conditions of the issue, relevant income streams, the sum of the issue, unit size, custody of the underlying asset, and other similar factors are determined. Similarly, governance and regulatory considerations such as legal ownership *(e.g., the corporate structure for the custody of the underlying asset and the legal cover linking off-chain and on-chain movement of a transaction)*, investor Know Your Customer (KYC) procedures & compliance, accounting, and investment due diligence are also taken into account in this step (SFC (Securities and Futures Commission), 2019).

B. Digitization

Fractionalization of assets requires blockchain technology for the creation of a digital representation of the assets. This process does not differ greatly from other IT projects wherein data models are created to represent assets or goods. In simple terms, fractionalizing an asset consists of creating an informatic code representing the key characteristics or features of the asset. Some functions of this code are exposed to the blockchain network participants allowing them to interact with the fraction. These interactions are in the form of buying, selling, or transferring the fractions or viewing information associated with the fraction.

There are several blockchain networks that differ based on their nature (i.e. public vs private), programmability, use of smart contracts, security, and the cost of usage. Ethereum, is one such network and is one of the oldest and most established blockchain platforms. It was established in 2013 and is a decentralized, open-source blockchain with smart contract functionality. It is widely adopted because of its programmability, smart contract functionality, and growing community of developers. On the Ethereum Blockchain, this informatic code *(representing the unique characteristics of an asset)* is developed in Solidity. Solidity is a programming language that is used for implementing smart contracts on Ethereum.

The term smart contracts mean self-executing programs (lines of code), embodying terms of an agreement between a buyer and a seller, existing on a decentralized blockchain network. The execution of the agreement between the buyer and seller is controlled by this program (smart contract) and is trackable and irreversible. Smart contracts allow for trustless transactions to take place with an instant settlement mechanism.

C. Distribution and Trading

Distribution refers to the primary market where fractions are issued to investors in exchange for capital while trading refers to the secondary market where such fractions are traded for liquidity. Given the evolving nature of markets, the distribution, trading, and/or custody of fractions may take place through one or more digital asset exchanges or marketplaces (centralized or decentralized). In the case of centralized exchanges, regulatory frameworks governing the fractionalization of assets typically cover the essentials of distribution, trading, and custody aspects of fractions by providing standards on (ASIFMA, 2018):

- Licensing
- Fraction issuer business and sponsor due diligence
- Fraction issuer governance and internal controls
- Fraction supply and liquidity considerations
- Due diligence and KYC criteria
- Associated fees

1.4.1. Technical Approach to Fractionalize Assets

Explaining the digitization process discussed above as a part of the overall conceptual lifecycle of fractionalization, it is key to note that from a technical standpoint, the fractionalization process may be broken down into 4 key steps:

A. Selection of a model to represent assets

There are several token (fraction) standards which enable the representation of different kinds of real-world assets by way of fractions on a blockchain. The introduction of these standards eases the DLT / Blockchain adoption and enables interoperability between multiple DLT / Blockchain initiatives. This allows tokens originating from the same token standard (from the same 'family') to use some generic smart contracts or to be stored in widespread wallets/accounts enabling the storage of ownership information. A token (fraction) standard consists of a set of predefined functions and/or attributes which can be intentionally implemented to represent the specificities of each real-world asset but need to be present in all cases.

To consider which token (fraction) standard to choose, the key characteristics of the asset (for instance its fungibility or non-fungibility) should be assessed. Some commonly used token (fraction) standards, today, are presented below:

Example Token Standard	Sample Functionalities
ERC-20	i. transferring fractions from one account to another ii. getting the current fraction balance of an account ii. getting the total supply of the fractions available on a network v. approving whether a quantity of fraction from an account can be spent by a third-party account
ERC-1400	i. Transferring ownership of a security token (fraction) between users, requiring a certificate. ii. Splitting a security token (fraction) into many partitions.

Example Token Standard	Sample Functionalities
	ii. Authorizing an operator to transfer a security token (fraction) on one's behalf. v. Managing documentation associated with a security token (fraction). v. Forcing the transfer or redemption of an asset (by a controller)

It needs to be appreciated that the way an asset is fractionalized does not solely depend on the inherent features of the asset but also on its intended usage and the underlying business process meaning that the same asset may be fractionalized under different standards presenting different use cases.

B. Modeling the asset

Before creating the fraction chosen to represent the asset, one must ask several questions that will impact which information will be embedded on-chain and which will remain stored in off-chain databases. The following points should at least be considered:

Are there any legal or regulatory constraints (e.g. data privacy and protection, sector-specific regulation, etc.)?

- What is the level of trust required in the data?
- What is the business process?
- Which information is essential for the process to happen properly and which has an informative purpose?
- What are the requirements in terms of scalability (volume of data)?

C. Technical and security review of the informatic code

When the code governing the behavior of a fraction has been released on a blockchain, it is not possible to retract or reverse it. Therefore, it is very important to review for all security considerations. Security reviews may be performed through standardized tools or reputed third-party service providers. Such smart contract review tools allow developers to test their code against a standard set of checks and identify weaknesses before actual deployment on a blockchain. For instance, if the smart contract code has any vulnerabilities or deviates from the given token standards, these tools will be able to identify such shortcomings.

D. Deployment of the informatic code

After completion of the above steps, the informatic code (fraction) can be deployed on a blockchain network. Users will be able to interact with these fractions using the exposed function, for instance, to transfer them. They will also store these fractions in their wallet, and possibly on DLT / Blockchain custodians to handle the custody of their fractions.

2. Regulations for Asset Fractionalization

As the market for digital assets continues to develop and find its place in the legal landscape, asset fractionalization is becoming a higher priority for policymakers, regulators, and international standard setters. For the purpose of regulating the asset fractionalization ecosystem and harmonizing market infrastructure, governments and legislators have launched global efforts and adopted diverse political stances.

2.1. General Scope and Direction of Regulators

This section presents a global overview of how international regulators and supervisors of financial services have conceptualized and approached the supervision and regulation of asset fractionalization. A good infrastructure is necessary for controlling and monitoring the asset fractionalization process, which often necessitates oversight and legislation in the following domains:

A. Financial System

This includes a network of financial institutions that facilitates the practice of exchanging funds from one entity to another. The key areas pertaining to the financial system include:

S.No	Key Areas	Description
1	Interconnectivity	The financial system may be exposed to risks from digital assets (including fractionalized assets) insofar as both are interconnected; spill over effects may also be conveyed to the actual economy. Asset fractionalization may have ramifications for financial stability, interfere with the operation of payment and market infrastructures, and have repercussions for monetary policy.
2	Competition	The notion of global asset fractionalization can have political and economic implications and pose a danger to national sovereignty. Concerns exist over the virtual dollarization of underdeveloped countries and the loss of monetary policy instruments in developed nations if digital assets (including fractionalization assets) were widely adopted. This impact can be largely mitigated where localized private or permissioned DLTs are used and the settlement of fractions uses the country's regulated payment systems and therefore the fiat currency (legal tender).
3	Taxation	The tax policy and tax evasion implications of asset fractionalization remain largely studied on a global scale, despite being a vital component of the regulatory system as a whole. The necessity to give tax guidance is highlighted by the fact that jurisdictional disparities create a tension in which regulatory arbitrage may occur.

B. Fraction Issuers

A firm that releases fractions via a trading platform to solicit investment from fraction investors. Among the most important aspects of fraction distribution are:

S.No	Key Areas	Description
1	Eligibility	Issuance is not confined to traditional participants (primarily investment banks); rather, new actors including consultancies, technology SMEs, and corporations themselves would want to participate in the origination. Governments and policymakers throughout the globe are determining the eligibility requirements for fraction issuance by market participants.
2	Contracts	Smart contracts based on DLT/Blockchain would be necessary to track all fraction issuances and fraction holder histories. Currently, guidelines are being drafted to provide guidance on implementing smart contracts by explicitly defining the minimum regulatory information necessary to be contained in each smart contract and its regulatory reporting obligations.
3	Distribution	It may be distributed without the intervention of market makers or brokerage firms acting as intermediaries. However regulations are being developed for distribution of fractions and categories of fractions (such as those backed by real assets) within each jurisdiction to ensure compliance with local laws and regulations.

C. Trading Platform

A platform based on DLT/Blockchain, cryptographically secured at which fractions of an asset are initially issued and subsequently traded. The key areas around the trading platform include:

S.No	Key Areas	Description
1	Eligibility	It will not be restricted to established institutions such as stock exchanges due to the peer-to-peer nature of DLT/Blockchain-based fractions. Extensive criteria must be in place for platform service providers to monitor and operate a 24-hour trading system in order to offer uninterrupted service to traders, and these are currently being created around the world.
2	Clearing & Settlement	It will be based on the key principles of DLT/Blockchain technology. Clearing and settlement will not require central third parties for matching buyer and seller data for each transaction; rather, the technology will handle both

S.No	Key Areas	Description
		of these functions. Guidelines and regulations to ensure management of this vital process are currently under consideration on a global scale.
3	System Requirements	Due to the immutability of Blockchain and irreversibility of the development, some measures must be taken prior to launching a fraction live. Once the code ruling has been published, there is no recourse. Therefore, it is crucial to conduct security audits and ensure that the platform has automated mechanisms to evaluate and stamp each fraction before to coming online. Regulations around these technical system requirements are being developed to ensure proper monitoring and risk management.

D. Asset Fraction Investor

This would include any investor interested in trading asset fractions, who may buy or sell fractions through the trading platform. The following are the important areas affecting investors:

S.No	Key Areas	Description
1	Eligibility	Laws throughout the globe are trying to define the minimal qualifications (financial/technical expertise) for fraction investors and the asset classes in which various sorts of investors would be authorized to trade. There must be regulations in place to protect the investors' interests and keep them informed of their rights.
2	Safekeeping	Asset fractions may be held by a trustworthy third party/custodian or by the owners themselves (institution or individual). Depending on whether the fraction is saved on an internet-connected device or not, a variety of online and offline storage methods are available. Therefore, the laws for ensuring safekeeping of asst fractions are being actively developed and discussed by the regulators.
3	Awareness	The main reason regulators are focused on digital assets is a lack of awareness, information, and understanding of the industry. Currently, digital assets, including fractionalized assets, are poorly regulated in the majority of nations, so investors do not have the same level of security as they would with savings and other accounts held at financial institutions. With traditional financial assets, there is a large degree of centralization and standardization when it comes to the issuers, the markets and the assets. With fractionalization of assets these elements exist with limited effectiveness as the markets are part-regulated or unregulated, asset classes could be infinite given innovative technological applications and

S.No	Key Areas	Description
		likewise the issuers (due to little to no legal barriers to entry). For these reasons, investor protection is much more heavily dependent on investor awareness and education in the case of fractionalization compared to traditional financial assets.
4	Data Protection	Strict laws pertaining to investor data protection, Know Your Client (KYC), and Anti-Money Laundering (AML) will need to be enacted before asset fractionalization begins to ensure that investors are able to share the necessary information with platform service providers and ensure compliance with legal and regulatory standards.
5	Price Volatility	The problems related to digital assets and investor protection are worsened by the price volatility. In terms of market manipulation and exchange risk management systems, for instance, there are variable levels of market maturity and extra risks posed by excessive leverage.

2.2. Policy and Regulatory Considerations

To reduce inherent and residual risks that were identified in the early stages of the asset fractionalization (also called tokenization) process and to promote financial stability, consumer, and investor protection, but also market integrity, many governmental institutions across the world have responded by issuing a range of policies aiming at reducing legal uncertainty and preventing non-compliant behavior of the market participants. Most regulators (e.g., EU, Switzerland, USA, or UK) dealing with fractionalized asset markets have implemented a “technology-neutral” approach to policies and risks, applying existing financial regulations to fractionalized assets. Some have presented new, tailor-made regulatory frameworks for fractionalized assets and DLT-based markets, whereas others have defined new roles for new actors participating in such markets. Finally, some policy makers have amended the existing regulation as to address specific characteristics and risks unique to decentralized networks and systems. Furthermore, it has been established that the level of development of the market for fractionalized assets, its pace of evolution and the corresponding risks play a significant role when deciding a policy approach. However, the overall development of the financial architecture in a chosen jurisdiction, the number of policy makers involved and their mandates and the country’s overall FinTech strategy will have an impact on regulations for fractionalized assets as well (OECD, 2021).

A. “Technology-neutral” regulation

The “technology-neutral” approach indicates that regulators apply same rules to the same types of activities and risks, irrespective of the technological medium through which products, services or activities are provided. Consequently, the implementation of a specific technology does not impact the assessment whether the ensuing financial product/service or activity falls within the regulatory perimeter, and by consequence, whether it is regulated or unregulated.

In addition, to help market participants better understand whether and how their activities fall within the scope of the regulators' remit, policy makers often provide guidance and clarifications around the (pre-existing) regulatory and supervisory frameworks applied to fractionalized assets and markets, thus protecting financial consumers, investors, and other market participants (e.g., the US "SEC FinHub staff framework on digital assets", the UK "FCA's policy statement on crypto assets") (OECD, 2021).

B. Tailor-made regulatory frameworks for fractionalized assets

Notwithstanding general "technology-neutral" approach to financial regulation, some policy makers opt to create tailor-made rules for fractionalized asset markets to better account for and manage new types of risks that may arise from the combination of technologies with finance. In such cases, newly created policies either adapt existing schemes or introduce holistic frameworks or "Blockchain Acts" to better regulate DLT activity in that market (e.g., French "Blockchain Order for issuance of native tokenized assets", or German "Electronic Securities Act" [eWpG-E], or EU-MiCA "Markets in Crypto Assets Regulation". In some instances, regulators introduce new provisions to cover new actors and roles of participants whose main duty usually entails ensuring the existence and enforcement of contractual rights to property represented in fractions on-chain, in the case of "digital twin" fractionalization (e.g., "digital asset providers" in France, or "verifying authorities" in Liechtenstein) (OECD, 2021).

C. Selective amendment of the existing regulation

Some jurisdictions chose to address specific issues related to fractionalized asset markets through the selective adjustment of existing laws instead of introducing new, custom-made regulation applied to such products and services (e.g., Swiss "DLT Act").

Additional policy and regulatory considerations surrounding asset fractionalization are mentioned below:

- Determining Definitional Boundaries

There have been efforts by regulators, business actors, and academics to define the scope and boundaries of asset fractions. One of these attempts is in the direction of network access (open or closed) and record proposals (permissioned or permission-less). In general, their combined views can fall into three categories:

S.N0	Category	Description
1.	Broad	This contains all forms of asset fractions issued and transferred through open, closed, permission-less, and permissioned enterprise DLT systems. Eg. Ethereum (open and permission-less), Alastria (semi-open and permissioned), Ripple (open and permissioned) and Project X (closed and permissioned).
2.	Intermediate	This includes all types of asset fractions issued and transferred through permission-less DLT systems with open access and public transaction history. The asset fractions do not necessarily need to perform an essential function for the underlying network to function properly. Eg. Ethereum (open and permission-less) and Alastria (semi-open and permissioned).

S.N0	Category	Description
3.	Narrow	This refers exclusively to asset fractions issued and transferred via open, permission-less DLT systems that perform an essential function for the underlying distributed ledger or application. Eg. Ethereum (open and permission-less).

Source: (Cambridge, 2020)

According to the "Broad" perspective, each asset fraction produced and transferred via any sort of DLT system is a digital asset. The "Intermediate" approach confines the scope to both open and permission-less DLT systems as well as hybrid systems, whereas the "Narrow" view restricts the scope to open and permission-less infrastructure alone.

- Possibility of confusing Form and Nature

Asset fractions issued on blockchains can reflect conventional agreements stored in a novel form. This DLT (blockchain) infrastructure, which incorporates an integrated mechanism for value transfer, enables new kinds of asset generation, distribution, and transfer. However, even with this new mechanism of transfer, storage or exchange the contractual terms and the economic nature of the underlying asset does not change automatically. Therefore, from the standpoint of a regulator, a difference should only be drawn between:

i. Conventional assets (such as a share of common stock) kept in these new formats and;
ii. New, previously nonexistent asset categories (such as fractions of a physical asset) with different features represented in a new form.

- Ownership of Assets

In a blockchain system, every transaction has to be initiated by private-key based signature. A valid signature gives cryptographic assurance to the DLT system and its participants that the originator of a transaction is authorized to create the related ledger record. However, a valid signature does not always give evidence that the owner of the accompanying private key is the one who generated the signature. Instead, it guarantees that a holder of the private key started the transaction. The concept of custody no longer relates to the direct keeping of assets in the context of digital assets (including fractionalized assets), but rather to the secure storage of cryptographic keys. Despite this functional similarity, it is far from obvious that (exclusive) knowledge of a private key is, for all intents and purposes, comparable to legal ownership.

2.3. Country Case Studies

2.3.1. United States of America (USA)

Introduction

In the US different regulators both at the federal and state levels have been following their own independent regulatory approaches to regulating digital assets. These approaches overlap at some points while contrast at the others. On the subject of digital assets, the

SEC, the FinCEN, the Federal Reserve Board and the CFTC have all issued guidance and regulations attempting to regulate specific aspects of the digital assets market in the US but with overlaps and contradictions. Regulations in the US have used 'digital assets' as an umbrella term to encompass, among other types of digital assets, the real-asset backed fractions. Given the scope and objective of this report, all such references to digital assets in the rest of this sub-section are intended to be read in the narrow context of real-asset backed fractions.

Regulatory Infrastructure

The US has 3 federal level regulators responsible for the supervision of digital assets. These are:

- Securities and Exchange Commission (US SEC): It is responsible for protecting investors, maintaining fair and orderly functioning of the securities markets and facilitating capital formation. According to the Framework for Investment Contract Analysis of Digital Assets issued by the US SEC. A digital asset will be in the regulatory ambit of the SEC if it meets the definition of the term 'Investment Contract' stated in the definition of the term 'Security' or for that matter other types of assets contained in the definition of the term 'Security' as defined in the US Federal Securities Law. The federal securities laws require all offers and sales of securities, including those involving a digital asset, to either be registered under its provisions or to qualify for an exemption from registration.

- Financial Crimes Enforcement Network (FinCEN): It is the primary regulator for digital assets from the financial crime (AML/CFT) perspective. It regulates digital assets (among other assets/markets) for financial crime under the Bank Secrecy Act (BSA).

- Commodity Futures Trading Commission (CFTC): It is responsible for regulating derivatives on digital assets, this includes the regulation of trading and clearing of future contracts and swaps on digital assets.

Scope of the Regulations

Currently, there is no specific legislation or regulation which comprehensively regulates all sub-classes of digital assets under one umbrella. The regulators have defined digital assets, the table below presents these definitions. Even though some of the other regulators such as FinCEN and CFTC uses the term virtual currency to be synonymous with digital assets. For the purpose of this report and to avoid any confusion, these definitions are excluded from the table below.

Term	Regulatory Authority	Definition
Digital Assets	White House (Issued Executive Order)	Digital asset may be, among other things, a security, a commodity, a derivative, or other financial product. Digital assets may be exchanged across digital asset trading platforms, including centralized and decentralized finance platforms, or through peer-to-peer technologies.

Term	Regulatory Authority	Definition
Digital Assets	US SEC	To qualify a digital asset as an investment contract (form of a security), SEC provides the following criteria – called the Howey Test: An investment contract exists when there is the investment of money in a common enterprise with a reasonable expectation of profits to be derived from the efforts of others. The so-called 'Howey Test' applies to any contract, scheme, or transaction, regardless of whether it has any of the characteristics of typical securities.

Other Key Components of the Regulations

This section provides guidance by different regulatory authorities to the market players operating in the digital asset space in US.

Guidance from the White House - Executive Order

To iron out the differences and to achieve a cohesive regulatory approach and a policy towards regulating digital assets, the White House issued an Executive Order in March 2022 (Thompson Reuters, 2022). This Executive Order provides some policy directions to the market and to the regulators on the desired intents and purposes of a potential cohesive regulatory framework. Key points emphasized in this Order are stated below *(only factors that seem relevant to inform the objective of this report are listed below)* (The White House, 2022):

- The Order recognizes that the existing laws can govern digital assets but there is a need to evolve them, align them and to enhance them to seek protection against risks to consumer protection, financial stability, financial crime, financial inclusion, climate change, and national security among others. Overall there remains a very strong emphasis on responsible development of digital assets and coordination between various regulators and government departments.
- Digital asset issuers, exchanges and trading platforms, and intermediaries whose activities may increase risks to financial stability, should, as appropriate, be subject to and in compliance with regulatory and supervisory standards that govern traditional market infrastructures and financial firms, in line with the general principle of "same business, same risks, same rules."
- The United States must ensure appropriate controls and accountability for current and future digital assets systems to promote high standards for transparency, privacy, and security – including through regulatory, governance, and technological measures – that counter illicit activities and preserve or enhance the efficacy of our national security tools.
- The United States has a strong interest in promoting responsible innovation that expands equitable access to financial services, particularly for those Americans underserved by the traditional banking system, including by making investments and domestic and cross-border funds transfers and payments cheaper, faster, and safer,

and by promoting greater and more cost-efficient access to financial products and services.

- The Order provides information on Blockchain. Blockchain refers to distributed ledger technologies where data is shared across a network that creates a digital ledger of verified transactions or information among network participants. The data are typically linked using cryptography to maintain the integrity of the ledger and execute other functions, including transfer of ownership or value.

In addition to the above points, the Order provides some specific time-based goals to various regulators and government departments to study impacts of digital assets on from certain specific points of view e.g. climate change, consumer protection or financial crime etc. and identify needs for changes in the relevant regulations.

Until the effects of the above Order are seen, let us shift focus back to the existing federal regulations in the US and discuss the specifics of them.

Under Federal law, digital asset sales presently are generally regulated by the SEC, FinCEN, or the CFTC. If the sale of digital asset constitutes the sale of a security then the digital asset is regulated by the SEC. Or, if its sale is conduct making the person a money services business then the digital asset is regulated by FinCEN. If Crypto is referenced in a futures, derivatives, swaps, or options contracts it may be considered a commodity and subject to the CFTC's jurisdiction. The CFTC's jurisdiction is further implicated where there are attempts to engage in market manipulation with respect to the digital assets that are considered to be a commodity (JDSUPRA, 2022).

Guidance by US SEC

It should be noted that the details of various regulatory requirements applicable to the issuance or administration of securities in the US or related to the actors or participants involved in those transactions are not discussed in this report for the reason that they do not differentiate between digital assets as securities and other forms of contracts as securities.

Guidance by FinCEN

FinCEN is in the process of rulemaking to regulate the financial crime aspect of digital assets and in this regard has proposed regulations called the "Requirements for Certain Transactions Involving Convertible Virtual Currency or Digital Assets" (as mentioned above, FinCEN using the term virtual currency is considered to be synonymous with digital assets) .

The objective of the regulations is to require banks and money service businesses (''MSBs'') to submit reports, keep records, and verify the identity of customers in relation to transactions involving digital assets with legal tender status (''legal tender digital assets'' or ''LTDA'') held in unhosted wallets , or held in wallets hosted in a jurisdiction identified by FinCEN. FinCEN is proposing to adopt these requirements pursuant to the Bank Secrecy Act (''BSA''). It is worthwhile to reiterate that the above guidance by FinCEN is specifically for monetary instruments. It has been covered in this report only to provide a full view of the regulatory guidance from various regulators but does not directly relate to physical asset fractionalization.

Guidance by CFTC

The definition of commodity under CFTC's governing statute, the Commodity Exchange Act (CEA) is extremely broad. Commodity is defined as goods and articles, and all services, rights, and interests in which contracts for future delivery are presently or in the future dealt in. (Primer, 2020) Hence to say that a particular digital asset is a commodity is unremarkable. (CFTC, 2021)

It is essential to clearly establish the regulatory authority of CFTC before considering its role in governing the digital assets on a federal level. CFTC does not regulate commodities (underlying asset could be tangible or intangible), rather it regulates futures contracts on commodities, and other derivative products such as swaps. Therefore, even if a digital asset (underlying asset) is categorized as a commodity, it is not regulated by CFTC. However, CFTC does regulate derivatives on digital assets, just like it regulates other derivatives. This includes the regulation of trading, clearing etc. of future contracts and swaps on digital assets. In case a derivative is based on security (which is regulated by SEC) or a digital asset which is categorized as security for the matter of this report, then further analysis is required to determine where regulatory authority lies for a derivative product on that digital asset. (CFTC, 2021)

Even though CFTC has not officially issued any regulation on digital assets, it has provided guidance on the subject. some key areas where the CFTC has provided guidance on digital assets and which are considered to be relevant for this report[2] are mentioned below:

- Classification of digital assets depends on its design, stated purpose, and observed use and the stance taken by CFTC is in line with other federal regulators of the US, which is to first categorize the digital asset as security, commodity or any other asset class and regulate it using the existing laws and regulations. Then considerations are made to the existing regulations to adequately cover all the essential aspects of the particular digital assets. The facts and circumstances of an entity's digital asset-related activities is the key factor in determining whether and how that person must register with the CFTC, SEC, or FinCEN. (Primer, 2020)
- Trading platforms that offers derivatives on digital assets in US without registering with CFTC or in violation of CFTC rules are subject to its enforcement authority. Its enforcement authority also includes a broader application for anti-manipulation and anti-fraud authority with respect to digital assets (although CFTC does not regulate them). This is because well-functioning futures contracts and other derivative products rely on the digital assets and the derivative prices are linked to the prices of underlying assets. (CFTC, 2021)

2.3.2. United Arab Emirates (UAE)

Introduction

[2] It is reiterated that the purpose of this report is to cover information about fractionalization of physical assets and therefore the guidance provided by CFTC (targeted at the derivatives of digital assets) should be read accordingly.

The UAE government is taking significant measures to build a robust digital economy and use the benefits of digital transformation. It is prepared to regulate emerging technologies, such as those used in the creation and sale of digital assets (including fractionalized assets), in order to meet the needs of new and current businesses wishing to engage in digital space. Regulations in the UAE have commonly used “crypto assets” and “virtual assets” as an umbrella term. Given the scope and for maintaining consistency in this report, we will use the term “digital assets” and all such references to digital assets in the rest of this sub-section are intended to be read in the narrow context of real-asset backed fractions. Further, token is used synonymously with asset fractions by the UAE regulators.

Regulatory Infrastructure

The UAE has five different regulators responsible for the supervision and regulation of financial institutions and digital assets. These are:

- Central Bank of the UAE (CBUAE): Regulates and supervises all banks, insurers, and insurance brokers on a federal level (excluding financial institutions operating within financial free zones). It regulates the payment side of digital assets and is responsible for establishing and governing payment and settlement systems.
- Securities and Commodities Authority (SCA): Regulates and supervises securities traders and financial markets on a UAE federal level (excluding financial institutions operating within financial free zones). SCA focuses on regulating security tokens and commodity/asset backed tokens (Hub, Resource Hub, 2022).
- Dubai Financial Services Authority (DFSA): The DFSA is the financial regulator and supervisor of all banks, insurers, brokers, securities traders, and financial markets operating in the Dubai International Financial Centre (DIFC), a financial free zone. In the digital assets space, DFSA’s focus is on regulating Investment Tokens (Security Token and Derivative Token) only, it does not regulate any other type of digital assets currently (DFSA, 2021). Derivates token could be based on real physical assets.
- Financial Services Regulatory Authority (FSRA): The FSRA is the financial regulator and supervisor of all banks, insurers, brokers, securities traders, and financial markets operating in the Abu-Dhabi Global Market (ADGM), a financial free zone. FSRA regulates and focuses on Payment Tokens, Security Tokens and Derivative Token. In this case as well, derivates token could be based on real physical assets.
- Dubai Virtual Assets Regulatory Authority (VARA): The ruler of Dubai issued Law No.4 of 2022 on the Regulation of Virtual Assets (DVAL). The DVAL regulation envisions the establishment of VARA, a public entity mandated to regulate digital asset related activities in Dubai (excluding DIFC) and to establish the rules governing the conduct of such activities. VARA has not explicitly mentioned which class of digital assets it will intend to regulate.

The Activities to be regulated by the VARA under the DVAL regulation include substantial overlaps with the activities regulated by the SCA and the CBUAE under existing UAE federal laws. The precise nature and extent of the VARA's association with the SCA and the CBUAE remains to be determined. (Lawyers, 2021)

Scope of the Regulations

Currently, there is no specific legislation or regulation which regulates all sub-classes of digital assets under one umbrella in UAE. The regulators (as listed above) use dual terminologies when referring to digital assets. The table below lists down these terms and

presents their definitions as stated in the relevant regulation.

Terms	Regulatory Authority	Regulation Reference	Definition of the Terminology
Crypto Assets	CBUAE	Stored Value Facilities Regulation (2020)	Cryptographically secured digital representations of value or contractual rights that use a form of distributed ledger technology and can be transferred, stored, or traded electronically.
	SCA	Concerning Crypto Assets Activities Regulation (2020)	A record within an electronic network or distribution database functioning as a medium for exchange, storage of value, unit of account, representation of ownership, economic rights, or right of access or utility of any kind, when capable of being transferred electronically from one holder to another through the operation of computer software or an algorithm governing its use.
	DFSA	Regulation of Security Tokens (2021)	A digital representation of value, rights and obligations that are created, stored, and transferred electronically, using distributed ledger technology (DLT) or similar technology.
Virtual Assets	CBUAE	Retail Payment Services and Card Schemes Regulation (2021)	A Virtual Asset is a digital representation of value that can be digitally traded, or transferred, and can be used for payment or investment purposes. Virtual Assets do not include digital representations of Fiat Currencies, securities and other financial assets that are already covered elsewhere in the FATF Recommendations.
	FSRA	Regulation of Virtual Asset Activities in ADGM (2020)	A digital representation of value that can be digitally traded and functions as (1) a medium of exchange; and/or (2) a unit of account; and/or (3) a store of value but does not have legal tender status in any jurisdiction. A Virtual Asset is (a) neither issued nor guaranteed by any jurisdiction and fulfils the above functions only by agreement within the community of users of the Virtual Asset; and (b) distinguished from Fiat Currency and E-money.
	VARA	Regulating Virtual Assets in the Emirate of Dubai (2022)	A digital representation of value that may be digitally traded, transferred, or used as an exchange or payment tool, or for investment purposes. This includes Virtual Tokens (a digital representation of a set of rights that can be digitally offered and traded through a Virtual Asset Platform), and any digital representation of any other value as determined by VARA.

(Paper, 2021) (ADGM, 2020) (VARA, 2022) (CBUAE R. P., 2021) (SCA, 2020) (CBUAE S. , 2020)

This report focuses on commodity/asset backed tokens and SCA is the regulatory body

which regulates this type of digital assets. SCA regulates Dubai Gold & Commodities Exchange (DGCE), however DGCE has not released any regulations pertaining to commodity tokens. SCA has provided guidance on commodity tokens and this information is shared in more detail in the next section. By extension of the same logic, it is clarified that CBUAE and FSRA (both of which regulate virtual assets) are only covered in the report to demonstrate the regulatory scope and domains adopted by various regulators around the world.

Other Key Components of the Regulations

This section covers key points of the regulation entitled "*Concerning Crypto Assets Activities Regulation"* issued by the SCA. To reiterate, this regulation governs the offering, issuing, listing, and trading of commodity tokens/ asset fractions across UAE on a federal level (excluding both the financial free zones).

A. Asset Fractionalization Issuers (AF Issuer)

Guidance for Asset Fraction Offering

Under Article 6 of the regulation, AF Issuers are obligated to adhere to the following key requirements:

1. Ensure that all asset fraction rights and characteristics mentioned in the offer documents are accurately documented in the computer software, distributed ledger technology, and/or protocol used to support the fraction.

2. Ensure that, if money is gathered for the development of a project or for other purposes prior to the issuance of the appropriate asset fractions, the relevant precautions are taken to avoid their misappropriation until the fractions are distributed.

3. If the duty specified in the offering documents on the development of technology or other items supported by the offering is not satisfied, this must be communicated to those that have accepted the relevant offer, along with an explanation of the relevant problem.

4. Notify promptly in advance those that have accepted the relevant offer of any major changes to the nature of the relevant software that affect their rights in relation to the fractionalized assets.

5. Take reasonable actions to monitor advancements in the nature, form, transferability, and underlying technology of asset fractions, and promptly inform the authority if a fraction ceases to be a regulated fractionalized asset by changing its form or nature. (SCA, 2020)

Process of Offering Asset Fractions – Primary Market

Under Article 8 of the regulation, the offering person/AF issuer should meet the following conditions/criteria for the fractions to be offered on the Asset Fractionalization Platform (AF Platform):

1. Submit the offer documents to the agency if the AF Platform offering is restricted to eligible investors (defined below).

2. Obtain prior consent from the authority if the offering is made available to non-qualified

investors on the AF Platform (defined below).

3. Appoint a Custodian, unless the agency determines that custody arrangements for the relevant fractionalized asset are not necessary based on a request from the offering person that is reasonable.

4. Reveal to investors all costs and commissions associated with the offering of fractionalized assets on the AF Platform.

5. The fractionalized assets may also be listed for trade on multiple AF Platforms authorized by the State Authority. (SCA, 2020)

Minimum Contents of the Offer Documentation – Primary Market

According to Article 6, 9 and 19 of the regulation, the minimum contents of the offer documentation are:

1. There should be a "Key Investor Information" area that includes relevant information on the basic qualities of the asset fractions in question, so that investors may understand the nature and dangers of the asset fractions being sold.

2. The "Key Investor Information" part of the offer documentation should be written in clear, non-technical language and presented in a fashion that is likely to be understood by common investors other than Qualified Investors (as defined below).

3. The offer documentation pertaining to Qualified Investors must include a copy of the prospectus, private placement memorandum, or other equivalent offering document containing the necessary disclosures (described below) having regard to this regulation or the other applicable regulations and decisions of the agency with respect to asset fractions.

4. Provide investors with moderately regular updates on the achievement of any project milestones for the advancement of technology or other matters funded by the offering, as outlined in its offer documentation, and state the periods during which such updates will be provided in the offer documentation.

5. If the fractionalized asset does not include a right for holders to assert a claim against an offering person for a default in the performance of benefits received to holders of fractionalized asset as stated in the offer documentation, this fact must be disclosed to investors in the offer documentation. (SCA, 2020)

Process of Listing Asset Fractions – Secondary Market

Under Article 17 of the regulation, to list asset fractions on the AF Platform in the secondary market, the following conditions shall be met:

1. Explain the categorization of fractionalized assets.

2. The fulfilment of all regulations related to the trading of fractionalized assets and the supply of the necessary assurances for its realization.

3. Submit an application for listing to the authority (minimum contents defined below).

4. Provide evidence of the applicant's relationship and familiarity with the fractionalized

asset, as well as information about the fractionalized asset's principals or issuing developers.

5. The authority may impose trading limitations on the fractionalized asset for a limited time if it finds it necessary. (SCA, 2020)

Minimum Contents of the Listing Documentation – Secondary Market

Under Article 17 of the regulation, the listing application submitted to the authority is to be accompanied by the following information and data:

1. Initial and ongoing entry requirements for listing and trading of asset fractions on its platform.

2. The kind and specifics of the distributed ledger technology or protocol utilized.

3. Any costs or other payment made to the Asset Fractionalization Operator (AF Operator) by the AF Issuer, promoter, or sponsor of the asset fraction, or by any third party, in exchange for listing.

4. Any security weaknesses in the underlying technology of the asset fraction.

5. The capacity to trace fractionalized assets and implement safeguards for preventing money laundering and financing terrorism. (SCA, 2020)

Disclosure Requirements for Fractionalized Assets

Under Article 11 of the regulation, all asset fractions offered should include the following key information and disclaimers in the offer documentation:

1. The asset fractions do not qualify as security tokens/fractions under UAE legislation and are thus not provided any legal safeguards. The given asset fractions are not legal currency in the UAE and lack official backing.

2. Before investing, potential buyers of the offered fraction should perform their own due diligence and consult a professional financial advisor if they do not purely understand the conditions of the offer or advertising paperwork.

3. The characteristics of fractionalized asset may raise the likelihood of fraud or criminality.

4. Transaction for asset fractions may be irreversible; hence, losses caused by fraudulent or unintentional transactions may not be compensated.

5. The volatility and uncertainty of the fraction's price may result in substantial losses within a short time frame. Investors must be ready to lose their whole investment and understand that they may have no option if stated fraction rights or advantages are not delivered. (SCA, 2020)

Regulatory Powers of Authority

According to Article 23, 24, 26 and 27 of the regulation, the regulatory powers of the authority will include the following:

1. The authority may investigate or get access to computer systems, computer data, computer data traffic, or equipment containing the data of an offering person or a party responsible in relation to an offering person.

2. The authority may seek any further explanations, information, documents, or data it considers essential for control and investigative purposes from offering persons, responsible parties in relation to an offering person, and their employees, members, and clients.

3. In the event of detected or reported breaches, the authority may adopt any of the following disciplinary measures:

- Suspend all asset fraction offerings, issuances, and subscriptions.
- Cancel the subscriptions of the investors and compel the relevant authorities to refund the funds paid by the subscribers as well as their income.
- Cease the operation of any technology related to asset fractions and require: (i) the adoption of alternative methods for controlling the relevant fractionalized assets; and (ii) the return of subscription payments to investors in asset fractions.
- Prevent the working of any website within the state by contacting the appropriate government agencies.

4. The Authority may implement any of the following sanctions in the case of violations (whether found or reported):

- Send a notification.
- Impose a financial penalty.
- Suspend the licensed individual from practicing the activity for up to one year. (SCA, 2020)

B. Asset Fractionalization Operator (AF Operator)

AF Platform Licensing Requirements

Under Article 15 and 16 of the regulation, to operate the AF Platform, the applicant/AF Operator needs to fulfil the following key requirements on an ongoing basis:

1. The applicant must be one of the following types of legal entity:

- Exchange licensed by the State Authority
- Company formed in accordance with the Commercial Companies Law
- Individual permitted to run a AF Platform

2. Provide the appropriate technical systems and controls that simplify the process of documenting and reporting trading and transactions occurring on the platform, so that the authority may supervise the platform and get timely and correct information about the trading and transactions.

3. Provide efficient market surveillance procedures that are subject to frequent evaluation and enhancement in order to manage and monitor market trading and transactions and to detect and prevent market abuse.

4. Establish necessary measures to prevent money laundering and the funding of terrorism in order to maintain the market's viability.

5. Restrict trading on the AF Platform to just those who can demonstrate a history of

routinely investing in securities, commodities, or tokens/fractions, or who have the necessary knowledge and expertise to invest in securities, commodities, or tokens/fractions.

6. Provide users of the AF Platform with a risk statement developed in accordance with the disclosure rules (described before) regarding the asset fractions or in guidelines published from time to time by the SCA and acquire their approval to use their personal information.

7. The AF Operator should develop the required rules, regulations, and processes to run the AF Platform (described in detail below).

8. If the user agrees to maintain his assets in portfolios or otherwise in a manner acceptable to the SCA, he must follow the proper procedures for doing so. If the SCA is not satisfied that the AF Platform's processes are adequate, it may force the AF Operator to seek a license to function as a custodian or hire a third party.

9. Provide proper information to clients when they arrange for custody of their asset fractions, so that investors are aware of the needed technical procedures and implications, including the risk of loss resulting that the software on the exchange is incompatible with the investor's portfolio.

10. Disclose the commissions and costs for trading on the AF Platform to customers before they submit orders, in accordance with the instructions given from time to time by the SCA.

11) Provide a user manual for operational risk management that includes the operational risks of the major participants, other exchanges, fundraising platforms, trading platforms, and service platforms.

12. Avoid conflicts of interest between its operations as an AF Operator and any other activity it or its related party engages in. If such conflicts cannot be prevented, the AF Operator is required to notify the SCA.

13. Adopt practices and regulations for access to user information and their activity on the AF Platform, as well as the preservation of the information's confidentiality.

14. Establish guidelines to ensure transparency regarding the trading and pricing of asset fractions internationally in accordance with the relevant fractions, including making reasonable efforts to provide connections to other relevant exchanges and, where applicable, to include investors' warnings about market risks.

15. Adopt procedures to assure the resilience, integrity, and stability of essential systems in accordance with worldwide industry best practices, including disaster recovery or backup plans.

16. Possess financial resources sufficient to cover all risks of users to principal transactions entered from time to time by the AF Operator, conduct ongoing monitoring of financial positions in relation with an independent external audit, and notify the authority as required.

17. AF Platform to keep track of all owners and transactions. (SCA, 2020)

Controls and Procedures to operate the AF Platform

Under Article 16 of the regulation, the recommended controls, and procedures to operate

the AF Platform include the following:

1. Rules that are fair, transparent, and objective for the use of the AF Platform's services.

2. Order types permitted on the AF Platform and the method for deciding and trading on the Exchange, including trading volumes and turnover.

3. Prohibited actions pertaining to Exchange offences.

4. Responsibilities of users of AF Platform services about their accounts and portfolios with the exchange, as well as processes for recovering passwords or accounts.

5. The required processes in the case that modifications to the underlying protocols of asset fractions have an effect on the holdings, transactions, or rights of fraction users.

6. Processes for dealing with new fractionalized asset balances, business actions, and similar situations.

7. Fair, efficient, and effective settlement and custody arrangements for AF Platform deals, as well as custody agreements.

8. Procedures for handling incorrect trades, cancellations, and updates, including instances in which performed transactions cannot be reversed, user defaults, and associated fees.

9. Available dispute settlement means.

10. Procedures for timely disclosure of information to the SCA and the potential for modifications, including suspension or cancellation of asset fraction trade. (SCA, 2020)

Applicable Technological Standards

Under Article 22 of the regulation, AF Platforms should adhere to the following technological standards:

1. On asset fraction management, deliver the SCA, upon request, with real-time information regarding fraction ownership and trading in the case of issuer failure.

2. Adopt the highest international standards applicable to the asset fractions' underlying technology, including cyber security, data protection, software development and oversight, and encryption.

3. Establish systems and software by applying required updates and conducting routine internal and external testing.

4. Provide the SCA with any audits and evaluations done by a third party for the licensed person promptly and upon request.

5. Implement cyber security safeguards and notify the SCA of any material violations of cyber security, data loss, or other events that occur when the licensed entity's technology is compromised in relation to the holding, storage, or management of asset fractions.

6. Hire a technology officer with the necessary knowledge and experience to guarantee compliance with SCA requirements.

7. AF Platform is fully liable for any issues that may develop as a result of outsourcing, including the inability of any third party to fulfil its duties.

8. Outsourcing shall not hinder the SCA's capacity to supervise and audit the AF Platform and get timely information.

9. Outsourcing must be conducted in accordance with a Service Level Agreement that outlines the duties and responsibilities of both parties regarding confidentiality and cyber security requirements. (SCA, 2020)

C. Custodians

Licensing Requirements for Custodians

Under Article 12 of the regulation, SCA would grant a license to conduct custody services for asset fractions, provided that the following key requirements are continually met:

1. The applicant for a license must be a legal entity allowed to run a AF Platform or a token/fraction issuer if the suggested custody services are confined to his own tokens/fractions.

2. Policies and processes are commensurate with the above-mentioned technology requirements.

3. Procedures outlining the production, administration, and controls of cryptographic keys and user portfolios, including generation, verification, online and offline management, transaction and command signing procedures, storage, and backup, must be made available. (SCA, 2020)

Regulators' Guidance for Custodians

Under Article 12 of the regulation, the custodians are expected to cooperate with the authority. The following guidance is provided:

1. The authority may require custodians of asset fractions to provide extra financial resources or guarantees to cover any customer-exposed risk, as it deems essential.

2. The authority may, from time to time, determine the allowed arrangements for the possession of fiat currency by the custodian in its licensing conditions, taking into account the custodian's proposed activities, systems, and controls, as well as the risks posed to customers.

3. If the custodian is not licensed by the Central Bank to take deposits, all client funds must be kept with a bank regulated by the Central Bank or a bank or credit institution licensed in a region acceptable by the authority.

4. If a custodian intends to engage in Financial Activities other than custody services, it must identify these activities in its licensing application, along with specifics on the regulations and controls that will be implemented to ensure the independence of its custody functions. (SCA, 2020)

Duties and Obligations of the Custodian

Under Article 13 of the regulation, custodian of asset fractions should sign an agreement with all holders of fractions in its custody so that the agreement specifies its duties. These duties are mentioned below:

1. Create a distinct account or portfolio for each client, containing information about the asset fractions it has and the transactions performed on its account.

2. Always and permanently separate the client's asset fractions from the custodian's own assets and property.

3. Hold at all times asset fractions equivalent to the aggregate amounts to which the custodian is liable to all customers, in the form of the identical asset fractions to which the custodian is obligated to such clients.

4. Not to transfer, hypothecate, give a security interest or lien on, lend to a third party, or otherwise permit adverse claims to emerge against client's asset fractions.

5. Only transfer asset fractions out of a client's account upon the client's specific instruction, and not on the custodian's own initiative or discretion, unless all conditions under which the custodian may exercise its own initiative or discretion have been disclosed in advance, and the client has consented.

6. Store cryptographic keys, similar electronic data including user rights for fractions or user access log-ins, outside of an online-attack-vulnerable network.

7. Ensure that no one individual in its possession who is authorized to operate such cryptographic keys may fully authorize activities pertaining to asset fractions or transactions of linked fiat currency held for customers.

8. Create and maintain a log of all transactions involving asset fractions and linked fiat currency held in custody by the custodian, as well as any alterations to related cryptographic keys and the individuals authorized to do such acts.

9. Apply regulations that detect and prevent the execution of multiple client-approved instructions for the same transaction.

10. Do not aggregate asset fractions ownership amongst customers in a manner that might affect the custodian's capacity to identify and keep each client's fractions. (SCA, 2020)

D. Asset Fractionalization Investor (AF Investor)

Qualified Investor

Under Article 1 of the regulation, a Qualified Investor is defined as a legal person that has any of the following conditions:

1. The federal government, municipal governments, government institutions and authorities, and corporations wholly owned by any of the above.

2. Foreign governments and their organizations and authorities, as well as enterprises wholly owned by any of these entities.

3. International bodies and organizations.

4. Entities granted a license by the authority or a comparable regulatory body.

5. The legal entity that fulfils at least two of the following conditions as of the date of the most recent financial statements:
- Its total assets are worth 75 million UAE dirhams.
- A yearly net revenue of $150 million UAE dirhams.
- It has a minimum net equity or paid-in capital of 7 million UAE dirhams.

6. A natural person who has been authorized by the authority or a comparable regulatory body to perform any of the responsibilities associated with financial operations or services.

7. The individual who fits the following criteria:
- He possesses a net worth of 4 million UAE dirhams, excluding his primary house.
- His annual salary exceeds 1 million UAE dirhams.
- He affirms that he has enough knowledge and expertise in the investment sector he will practice and its risks, or that he is represented by a licensed entity in a way that does not violate the rules of its license. (SCA, 2020)

Non-qualified Investor

According to Article 14 of the regulation, if an investor fails to meet the criteria of Qualified Investor mentioned above then this investor will not be permitted to invest more than AED 350,000, or its equivalent, in respect of any issuing of the fractionalized assets. (SCA, 2020)

2.3.3. Turkey

Introduction

Amid a financial, currency, and debt crisis, the regulatory situation around digital assets in Turkey is very ambiguous. While it is not "illegal" to own digital assets, authorities have sought user information from digital asset trading platforms, and regulators routinely highlight digital assets as a means of evading capital controls and taxes. In April 2021, the Turkish Central Bank prohibited the usage of digital assets as a method of payment. In May 2021, President Erdoğan issued an executive order adding 82 digital asset exchanges to a list of entities subject to AML/CTF legislation. Despite the harsh language, limitations on usage in payments, and absence of regulatory oversight power, public interest among Turkish residents has risen as they accept and use digital assets more often (Reuters, 2022). Regulators in Turkey have commonly used “crypto assets” as an umbrella term. Given the scope and for maintaining consistency in this report, we will use the term “digital assets” and all such references to digital assets in the rest of this sub-section are intended to be read in the narrow context of real-asset backed fractions.

Regulatory Infrastructure

Turkey has four different regulators responsible for the supervision and regulation of digital assets. These are:

- Central Bank of the Republic of Turkey (CBRT): The CBRT is regulating the payment side of digital assets.. It may impose fines if digital assets are used in payments or if

digital asset exchange platforms work with payment institutions or e-money institutions. (Hub, Resource Hub, 2022)

- Capital Markets Board of Turkey (CMB): It regulates the securities and capital markets in Turkey. It provides governance to brokerage firms, portfolio management companies, mutual funds, pension funds, investment companies, investment advisory firms, stock exchanges, real estate valuation companies, crowd funding platforms, banks operating in capital markets, and rating firms offering services to institutions operating in capital markets. In terms of digital assets, it governs the digital asset market including initial offerings and subsequent token/fractions offerings. (Reuters, 2022)
- Financial Crimes Investigation Board's (FCIB or MASAK): Its primary function is to fight against the offense of money laundering. MASAK is actively overseeing digital asset service providers/exchanges on AML and compliance issues. (Invesbrain, 2022)

In addition to the above-mentioned regulators, Blockchain Turkey Platform is the leading industry association. It aims to build a sustainable blockchain ecosystem in Turkey and to secure Turkey’s leading position on blockchain in the region. In order to expand the use of blockchain technology and establish a bridge between regulators, public institutions and legislators, the Blockchain Turkey Platform organizes training programmes, issues publications and takes part in collaborative efforts such as meeting with regulators and exchanging of ideas with legislators. (Lexology, Lexology , 2019)

Scope of the Regulations

Digital Assets are defined for the first time in the “Regulation on the Disuse of Crypto Assets in Payments” published by the CBRT in April 2021. This regulation defines Digital Assets as "intangible assets that are created virtually using distributed ledger technology or a similar technology and distributed via digital networks, but are not classed as fiat money, deposit money, electronic money, payment instrument, securities, or other capital market instruments". (TCMB, 2021)

This rule restricts and bans the direct or indirect use of digital assets in financial transaction, as well as the provision of services that enable the direct or indirect use of digital assets in financial transaction. In addition, payment service providers are restricted from building business models and offering services connected to such models that permit the direct or indirect use of digital assets in the provision of payment services and the export of digital money. Lastly, it is unlawful for payment institutions and electronic money institutions to act as an intermediary between platforms providing sale, storage, transfer, or export services linked to digital assets, or between platforms performing financial transactions involving digital assets. Notably, the rule does not restrict the purchase and sale of digital assets between private persons or on exchanges. In the regulation, suitable penalties for violations were not specified. (Mondaq, 2022)

Unfortunately, none of Turkey's legislation classify digital assets in a clear manner. Also, it is unknown whether this concept will be adopted as the general meaning of digital assets under Turkish law, or if it will simply apply to the "Regulation on the Disuse of Crypto Assets in Payments." The scope of this description excludes, nevertheless, fiat currency, electronic currency, payment instruments, securities, and capital markets instruments. Commodities are not excluded from the CBRT's definition of digital asset indicating that in the future, digital assets would likely be regarded as commodities. (Moral, 2021)

Other Key Components of the Regulations

The regulators are yet to provide comprehensive guidance to all the key market players operating in the digital asset space i.e. issuers, digital asset service providers, custodians and investors. As mentioned above, for now the CBRT, which looks after the payment side of digital asset has provided guidance by banning their use to pay for goods and services. Since payment side is outside the scope of this report, it will not be discussed further.

On the other hand FCIB or MASAK, who is actively overseeing digital asset service providers/exchanges on AML and compliance issues have published a guide in May 2021 namely, "Main Principles regarding the Prevention of Money Laundering and Financing of Terrorism for Crypto Asset Service Providers". Since, MASAK guide is applicable to all the digital asset service providers including those offering commodity/asset backed tokens (fractions), we will be considering it in this report. The key takeaways from this guide are mentioned below:

A. AF Operator

1. Guidance on Identifying Customers

The points mentioned below are to be observed as general guidelines:

- AF Operators shall verify the identity of consumers undertaking transactions on their AF platform (or people on whose behalf transactions are conducted).
- Identity verification is the most crucial precautionary action in terms of consumer identification. Regardless of the size of a transaction, AF Operators are required to collect and validate user identify information before concluding a contract.
- Before engaging into a contract (forming a commercial connection) or conducting a transaction, proper identification procedures must be fulfilled.
- Apart from continuing commercial connections, AF Operators are required to verify the identification of users in the following circumstances:
    i. In cases when suspicious transaction reporting is required, irrespective of the amount,
    ii. In circumstances where there is reasonable doubt about the sufficiency and correctness of previously collected customer identifying information, regardless of the size;
    iii. When a single transaction or the sum of numerous connected transactions is greater than TRY 75,000. (MASAK, 2021)

2. Obligation to Report Suspicious Transactions

Suspicious transaction reporting is one of the most important elements of combatting money laundering and financing terrorism. Suspicious transaction reporting aims at detecting and preventing money laundering and financing terrorism through cooperation between AF Operators and MASAK. General guidelines on suspicious transactions are mentioned below:

- AF Operator should assess a suspicion based on its perception and intuition, the customer's behavior during the transaction, information previously obtained about the customer, and the compatibility of the transaction and transaction value with the customer's financial profile, among other factors.

- AF Operator are required to report suspicious transactions to MASAK by completing the Suspicious Transaction Reporting Form with as much relevant information and documentation as feasible.
- MASAK is notified of all suspicious transactions, regardless of the value. The responsibility to disclose suspicious transactions remains even if suspicious transactions are reported as part of periodic reporting.
- Reporting suspicious transactions is distinct from reporting a crime. MASAK is an administrative agency, and the suspicious transaction reports it receives are used to determine the legitimacy of AF Operator's suspicion. No action is performed in response to suspicious transaction reports that cannot be connected to money laundering and funding terrorism.
- From the beginning to the end of the reporting process, the sender of the complaint of a suspicious transaction is never revealed. During the stage of suspicion analysis, which is conducted in complete secrecy, if it is determined that the suspicion is based solely on concrete evidence, the file is submitted to the judicial authorities providing the essential proof, information, and papers, without revealing who first reported the suspicious transaction.
- Due to the commercial relationship AF Operators have created with individuals who are involved in or suspected of being involved in money laundering, suspicious transaction reporting also inhibits AF Operators from committing these crimes. (MASAK, 2021)

3. Obligation to Provide Information and Documents

The public institutions, actual and legal persons, and organizations without legal entity status are accountable for providing all types of information, documents, and records in all formats requested by MASAK and its inspectors, along with all information and passwords necessary to access records or make them readable. The aforesaid liable parties cannot avoid supplying information and documents by using provisions of special legislation, without prejudice to the defense provisions. (MASAK, 2021)

4. Obligation to Retain and Submit Documents

AF Operators are required to retain documents pertaining to liabilities and transactions for eight years from the date of issuance, books and records from the date of the last record, and identification documents from the date of the last transaction and submit them to the authorities upon request. (MASAK, 2021)

5. Obligation to Report Periodically

AF Operators are required to notify MASAK of transactions in excess of an amount to be decided by the Ministry in which they participate or mediate. The Ministry will decide the types of transactions, the method and length, AF Operators that are excluded, and other procedures and principles pertaining to the periodic reporting requirement. (MASAK, 2021)

6. Sanctions

MASAK will apply administrative fines for violations of the obligations to identify clients, submit monthly reports, and report suspicious transactions discovered during audits. The cumulative administrative fine cannot exceed a specified amount for each obligation during the same calendar year. In the event that an AF Operator who had previously been charged on the higher limit violates the same requirement the next year, such limitations will be doubled for the subsequent year. The following administrative penalties and maximum

values apply to violations in this area in 2021.

Obligation	Administrative Fine for a Single Violation (TRY)	Administrative Fine Upper Limit (TRY)
Identifying Customers	30,000	4,000,000
Reporting Suspicious Transactions	50,000	4,000,000
Periodic Reporting	30,000	4,000,000

One to three years in jail and a 5,000-day punishment will be levied on AF Operators that breach the following provisions:

- The requirement not to reveal suspicious transaction reports to anyone other than official auditors and judicial authorities,
- The obligation to disclose information and records, and
- The requirement to save and submit documents regarding this crime, certain security measures will be imposed on legal organizations. (MASAK, 2021)

2.3.4. Malaysia

Introduction

In Malaysia, the category of digital assets evolved and expanded rapidly from 2016 to 2018. Strong investor and issuer interest in this new asset class demanded the development of precise laws to regulate such activities, such as the selling of digital assets as an investment or fundraising tool. As such, the regulatory authorities took an immediate notice of the situation and provided clarity on the regulatory approach for the offering and trading of digital assets (ICMR, 2021). Regulations in Malaysia have used 'digital assets' as an umbrella term to encompass, among other types of digital assets, the real-asset backed fractions. Given the scope and objective of this report, all such references to digital assets in the rest of this sub-section are intended to be read in the narrow context of real-asset backed fractions.

Regulatory Infrastructure

Malaysia has only two regulators responsible for the supervision and regulation of financial institutions and digital assets. These two regulators are mentioned below:

- Securities Commission Malaysia (SC): SC has a responsibility for supervising the capital market activities and market institutions including the exchanges, clearing houses and registered market operators. SC has defined digital assets as securities, which makes it the regulator of digital assets in Malaysia. The SC announced that it will regulate issuances of digital assets via initial offerings and the trading of digital assets at digital asset exchanges in Malaysia. It will also regulate the digital asset custodians. Digital asset exchanges are also subject to the SC's guidance on prevention of money laundering and terrorism financing. Previously, guidance on this AML/CFT subject was provided by the central bank. (SC, 2022)
- Bank Negara Malaysia (BNM): This is the central bank of Malaysia and its role is to promote monetary and financial stability. Digital assets are not a payment instrument that is regulated by BNM and does not constitute money that is legally accepted for the exchange of goods and services (not a legal tender) in Malaysia. However, initial offering issuers and digital asset exchange operators which are involved in the issuance

or dealing of digital assets with a payment function will need to comply with relevant BNM laws and regulations relating to payments and currency matters (BNM, 2022).

In July 2020, the SC Shariah Advisory Council (regulates Islamic capital market and products) has resolved that it is permissible to invest and trade in digital assets and tokens/asset fractions on registered digital asset exchanges. This is a groundbreaking resolution that could spur greater development and investment in digital assets as the majority of the population (more than 60%) is Muslim. (Lexology, Lexology, 2021)

Scope of the Regulations

Digital assets are recognized as securities under the Capital Markets and Services (Prescription of Securities) Order 2019, for the purposes of securities laws in Malaysia, if the criteria set out in the Prescription Order 2019 are satisfied. Digital assets come in many forms, but under the Prescription Order 2019, digital assets are categorized into two types which are digital currency and digital token (can also be referred as asset fraction). For the purpose of this report, we will only define digital token. Digital token is defined as "Digital representation which is recorded on a distributed digital ledger, whether cryptographically secured or otherwise".

Further, the criteria for digital token as per the Prescription Order 2019 is mentioned below:

Criteria for Digital Token

A digital token is deemed to be a security for the purposes of securities laws if:

- The person receives the digital token in exchange for a consideration.
- The consideration or contribution from the person, and the income or returns, are pooled.
- The income or returns of the arrangement are generated from the acquisition, holding, management or disposal of any property or assets or business activities.
- The person expects a return in any form from the trading, conversion or redemption of the digital token or the appreciation in the value of the digital token.
- The person does not have day-to-day control over the management of the property, assets, or business of the arrangement; and
- The digital token is not issued or guaranteed by any government body or central banks as may be specified by the SC.

Accordingly, any digital assets which are not recorded on a distributed digital ledger do not fall under the purview of the Prescription Order 2019. It is also worth noting that, as the law currently stands, privately issued digital assets are not recognized as a legal tender or as a form of payment instrument in Malaysia. (Lexology, Lexology, 2021)

Other Key Components of the Regulations

In line with digital tokens being prescribed as securities, SCA issued "Guidelines on Digital Asset" in October 2020, they set out the requirements relating to fundraising activity through digital token/asset fraction offering, operationalization of trading platform and provision of digital asset custodian functions. (Legal, 2022) Further details for each of the market players are mentioned below:

A. AF Issuer

General Criteria

An AF issuer must comply with the following requirements:

- Must be a Malaysian-incorporated company (excluding an exempt private company and public-listed company) or LLP.
- Must have its main business operations carried out in Malaysia; and
- Must only raise funds through AF Platform and not through any other means.

An unlisted subsidiary or a special purpose vehicle (SPV) of a public-listed company may, however, qualify as an issuer. (Commission, 2020)

Minimum Capital Requirements

An AF Issuer (other than a limited liability partnership) must always maintain a minimum paid-up capital of RM500,000 and shareholder funds of RM500,000. If the AF Issuer is a limited liability partnership (LLP), it must maintain a minimum capital of RM500,000 at all times. SC may at any moment impose on issuer additional financial requirements proportionate to the AF Issuer's nature, activities, and risks.

Application to raise funds through AF Platform

An AF Issuer is required to submit its application to raise funds through an AF Platform to an AF Operator for approval, in the form and manner prescribed by the AF Operator (application). The AF Issuer must confirm that the following are included in the application:

- A declaration that all directors and senior management of the AF Issuer are fit and appropriate
- How the AF Platform project offers a novel solution or substantial digital value proposition for Malaysia.
- The white paper, which must include all of the information listed below.

An AF Issuer must not offer asset fractions (also known as digital tokens) to any person unless the offer is also accompanied by a white paper that has been approved by the AF Operator. The content of the white paper includes:

- Brief description of the directors, top management, key personnel, and advisers of the issuer, including name, designation, country, address, and professional credentials and experience.
- The aim or purpose of the offering, together with specifics on the offering project that will be administered and operated by the issuer.
- The fundamental features of the asset fraction.
- A detailed description of the offering project's sustainability and scalability.
- The issuer's business plan.
- The intended amount to be collected through the offering, as well as the subsequent use and application of the funds, as outlined in a timetable for drawdown and use of proceeds (schedule of proceeds).

- Any rights, conditions, or functions related to asset fractions, as well as any special rights assigned to fraction holders.
- Discussion of the establishment of the accounting and valuation procedures for the asset fraction, including all valuation methodologies and reasonable presumptions utilized in the computation.
- Challenges and threats associated with the topic, as well as strategies to mitigate them.
- Information pertaining to the distribution of asset fractions and, if appropriate, the distribution strategy of the issuer.
- A technical explanation of the protocol, platform, or application of the asset fraction, as applicable, and the benefits of the underlying technology.
- The issuer's audited financial statements; and
- A statement of disclaimer as follows: “Investors are reminded that Bank Negara Malaysia does not recognize asset fractions as a legal tender nor as a form of payment instrument that is regulated by the Bank and that the Bank will not provide any avenues of redress for aggrieved fraction holders”.

AF Issuers Obligations and Duties

An AF Issuer must do the following:

- Ensure that it does not submit or supply any documents or information that are fraudulent, deceptive, or omit material facts.
- Submit to the AF Operator a statement of the fitness and propriety of its directors and senior management within three business days of their appointment or reappointment.
- An issuer must maintain all relevant papers and agreements relating to the offering for a period of seven years from the day they were presented to the AF Operator.
- An issuer shall provide the SC with any asset fraction-related information or assistance deemed relevant by the SC.
- The issuer shall give certification to the SC in the form and manner specified by the SC that the drawdowns have been utilized for the objectives outlined in the white paper.
- Following the issuing of asset fractions, the issuer may not alter the use of revenues or the rights of fraction holders without the permission of fraction holders holding 75% of the total number of fractions held by all token holders present and voting.
- An issuer must design a framework that outlines the rules and processes for managing conflicts of interest effectively and efficiently.
- Upon learning or becoming aware of a major change impacting the offering, the offering project, or the issuer, the issuer shall promptly notify the AF Operator for purposes of announcing the change on the AF platform.
- Following the issuing of asset fractions, the issuer must promptly notify the AF Operator of any sale, transfer, or assignment of at least 5 percent of the issuer's shares.

Reporting Requirements

An issuer is required to create and publish on the AF Platform yearly and semi-annual reports including the relevant information for fraction holders to evaluate the issuer's performance. The issuer's reports are required to provide details on the progress of the underlying business or project, such as financial statements:

- The total number of issued and circulating asset fractions.
- The condition of the issuer's usage of fractionalized asset proceeds.
- The current progress of the offering project
- The most recent year's audited financial statements.

Power of SC in relation to an Issuer

The SC may, at any time, issue a direction to the issuer on the following:

- The SC believes the offering project is no longer feasible or worthy of consideration.
- Not to deal with or transfer funds or property to a third party.
- To not seek business from any individual.
- To refrain from undertaking an act or continuing a path of action or activity.
- To do any act pertaining to its company, property, or asset fraction
- Must comply with the provisions of the securities legislation and the “Digital Assets Guidelines”.
- To dismiss any member of the issuer's Board of Directors or any member of senior management
- Any additional matter deemed essential by the Commission.

B. AF Operator

An AF operator must be a Malaysian-incorporated company unless specified otherwise by the SC and must have a minimum paid-up capital of RM5,000,000. (Commission, 2020)

Criteria for Registration

The SC may register an applicant as an AF operator if the SC is satisfied that all the following requirements are fulfilled:

- The applicant, its board of directors, controller, and senior management are suitable.
- The applicant will select at least one accountable individual. Accountable individual must be senior member of AF Operator and key point of contact to engage with SC, have five years of experience doing due diligence, assessing company ideas and fundraising, or any other relevant experience, and be a fit and suitable person.
- The applicant will be able to handle the risks connected with its company and operations, including showing processes and contingency plans if it is unable to conduct its activities.
- The applicant always has adequate financial, personnel, and other resources for its operation.
- The applicant has adequate security measures, keeping in view the scope of its business activities and the associated risks, including maintaining a secure environment.

AF Operator’s Obligations

The key obligations for the AF Operators are mentioned below:

- Conduct due diligence and a critical evaluation of an issuer

- Evaluate the white paper provided by the issuer to the AF Operator.
- Guarantee that investors may obtain the white paper through its AF Platform.
- Ensure that all key information about an issuer is accessible via its AF Platform.
- Ensure that all applicable fees and costs are reasonable and transparent.
- Conduct ongoing education and awareness activities.
- Disclose any details or give any document as requested by the SC.
- Take all necessary measures to ensure clients are treated fairly.
- Detect and manage possible operational environment vulnerabilities and cyber threats.
- In the case of a system fault, failure, or malfunction, take all required and rapid measures to minimize any damages.
- Establish and manage policies and procedures (as defined below)
- Carry out any additional duties or obligations outlined by the SC

Recommended Policies and Procedures for AF Operators

The following policies and procedures must be in place:

- Give clear reporting lines, authorization, and function segregation.
- Establish anti-corruption and whistleblower protections consistent with the nature, size, and complexity of its operations.
- Identifying, monitoring, managing, and mitigating cyber hazards in its operational environment.
- Detect, monitor, minimize, and manage events and possible circumstances that might lead to conflicts of interest; and
- Ensure compliance with all applicable statutes, rules, and standards.

Risk Management Obligations for AF Operators

An AF Operator must identify and manage any risks associated with its business and operations, including any possible sources of operational risk, both internal and external, and mitigate their impact using appropriate systems, policies, procedures, and controls. An AF Operator must, among others:

- Ensure that its systems are intended to ensure a high level of security and operational dependability and have sufficient capacity.
- Develop a solid risk management framework with the proper systems, rules, and processes to identify, monitor, mitigate, and manage all material risks.
- Having roles and duties for handling material risks that are well defined.
- Have operational reliability targets that are well stated and policies that are geared to accomplish those objectives.
- Ensuring that it has sufficient capacity relative to stress volumes to meet its service-level goals; and
- Possess a comprehensive physical and data security policy that tackles all potential risks and threats.
- Ensure that issuers cannot be hosted simultaneously on several AF Platforms, equity crowdfunding platforms, or peer-to-peer platforms.

Limit on Funds to be raised by the Issuer

The following limits are applied on raising funds:

- An AF Operator shall guarantee that the maximum amount of funds authorized to be raised by an issuer in any continuous 12-month period (subject to a limit of RM100 million) does not exceed 20 times the Issuer's shareholders' money or, in the case of an LLP, the issuer's capital.
- The issuer must show to the AF Operator that the gross funds from the offering will be adequate to fund the offering project outlined in the white paper.
- The asset fractions issued by an issuer must be wholly subscribed, and the issuer may not retain any funds in excess of the fundraising goal. If it is not completely subscribed, the AF Operator must reimburse any funds collected from fraction holders within six business days after the offer period's conclusion.

Withdrawal of Registration by SC

The SC may withdraw the registration of an AF Operator if:

- The SC determines that the AF Operator provided inaccurate or misleading information to the SC at any time, or if there is a major omission of information.
- The AF Operator fails to comply with the provisions of the securities laws, the “Digital Asset Guidelines”, or any other applicable laws or guidelines, or with any instruction made by the SC to the AF Operator.
- The AF Operator quits or fails to conduct the business or activity for which it was registered for a period of six (6) consecutive months.
- The AF Operator breaches any “Digital Asset Guidelines” requirement, condition, or limitation.
- Fails to pay any SC prescribed charge.

Power of the SC in relation to AF Operator

The SC may issue a direction to the AF Operator on the following:

- The SC believes the offering initiative is no longer feasible or sustainable.
- Not to deal with or transfer the fraction holder's money or property to a third party.
- To refrain from soliciting business from anybody.
- To refrain from undertaking an act or continuing a path of action or activity.
- To perform any act relating to its operations, affairs, property, or asset fraction deemed required by the SC.
- To implement any provision of the securities laws.
- To dismiss any member of the AF Operator's Board of Directors or senior management.
- The issuer has violated a requirement under securities legislation or other SC-issued recommendations.
- The issuer has not complied with any of the terms or restrictions set by the AF Operator.

- The application, along with the white paper, contains any incorrect or misleading statements or information, or a significant omission.
- There are concerns over the issuer's corporate governance record or the integrity of its directors and senior management; or
- The SC has reason to think that granting the application would be against the public interest.

C. Custodians

A digital asset (including fractionalized asset) custodian must have a minimum paid-up capital of RM500,000 and shareholders' funds of RM500,000 maintained at all times. (Commission, 2020)

Criteria for Registration

The SC may register an applicant as a custodian for fractionalized assets, if the SC is satisfied that all the following requirements are fulfilled:

- The applicant, its directors, controller, and senior management possess the required competencies.
- The applicant will select at least one (1) responsible individual. Responsible person must be senior member of custodian and key point of contact to engage with SC, have five years of experience doing due diligence, assessing company ideas and fundraising, or any other relevant experience, and be a fit and decent person.
- The applicant would be able to manage risks connected with its company and operations, including showing processes and contingency plans if it is unable to do business.
- The applicant has adequate financial, personnel, and other resources for its continuous operation; and
- The applicant has adequate security measures, considering the scope of its business activities and the associated risks, including maintaining a secure environment.

Custodian's Obligations

A custodian for fractionalized assets must do the following:

- Act in the customers' best interest and take all reasonable precautions to avoid circumstances that are likely to entail a conflict of interest with the clients.
- Protect the rights and interests of its clients, including ensuring that clients always have access to their asset fractions and preventing unlawful access to asset fractions.
- Ensure that all applicable fees and levies are reasonable and transparent.
- Disclose any details or give any document as requested by the SC.
- Comply with all reporting obligations and promptly provide correct information as requested by the SC.
- Identify and manage risks connected with its company and operations, as well as have an efficient business continuity strategy in place.
- Develop and maintain documented policies and procedures (defined below).
- Ensure that its processes and policies in respect to custody of asset fractions are consistently aligned with industry trends.

- Take all necessary measures to ensure clients are treated fairly.
- Detect and manage possible operational environment vulnerabilities and cyber threats.
- In the case of a system fault, failure, or malfunction, take all required and rapid steps to limit any damages.
- Carry out any additional obligations or duties as stated by the SC.
- Retain records for no less than seven years

Recommended Policies and Procedures

The following written policies and procedures need to be in place:

- Give clear reporting lines, authorization, and function separation.
- Prevent unauthorized access or fraudulent transactions.
- Establish anti-corruption and whistleblower protections appropriate with the nature, size, and complexity of its operations.
- Permit complete transparency to the customer of all transactions and asset fractions.
- Ensure compliance with all applicable statutes, rules, and standards.
- Handle client information, which includes collection, storage, use, disclosure, and destruction.

Withdrawal of Registration

The SC may withdraw the registration of a custodian under the following conditions:

- The SC determines that the custodian has submitted inaccurate or misleading information to the SC or that there is a major omission of information.
- The custodian fails to satisfy the standards outlined under securities laws, any other applicable laws or guidelines, or any instruction issued by the SC.
- The custodian fails or stops conducting the business or operations for which it was registered for a period of six months consecutively.
- The custodian of the fractionalized assets fails to pay any charge imposed by the SC.

Power of the SC to issue directions

A direction of SC may include the following:

- Not to deal with or transfer the asset fraction's funds to a third party.
- To refrain from soliciting business from anybody.
- To stop from undertaking an act or continuing a path of action or activity.
- To perform any act relating to its business, affairs, property, or asset fractions deemed required by the SC.
- To dismiss any director from the board of the custodian or any member of senior management
- On any other subject deemed essential by the SC.

D. Token Investors

A person may invest in fractionalized assets subject to the following limits:

- For sophisticated investors (defined below): no restriction on investment amount.
- For angel investors (defined below): a maximum of RM500,000 within a 12-month period; and
- For retail investors: a maximum of RM2,000 per issuer with a total investment limit not exceeding RM20,000 within a 12-month period. (ICMR, 2021)

Sophisticated investors include:

- Individuals with investments exceeding RM 1 million in capital market products, either on their own or through joint accounts with their spouse.
- CEO or directors of licensed or registered persons under the CMSA; and
- Corporations that manage funds of their related companies with assets of more than RM10 million. (Allenandgledhill, 2021)

Angel Investor refers to an individual:

- who is a tax resident in Malaysia; and
- whose total net personal assets exceed RM3 million or its equivalent in foreign currencies; or
- whose gross total annual income is not less than RM180,000 or its equivalent in foreign currencies in the preceding 12 months; or
- who, jointly with his or her spouse, has a gross total annual income exceeding RM250,000 or its equivalent in foreign currencies in the preceding 12 months; (Commission, 2020)

2.3.5. Observations from Unregulated Markets

Introduction

As digital assets are relatively new, the Central Banks of the world's existing unregulated markets have mostly issued warnings about their inherent risks. Digital Assets are not regarded as money or as comparable to fiat currency in unregulated markets, and neither their government nor their central bank backs them.

The Extent of Regulation for Digital Assets

Unregulated countries who are unclear about how to govern this growing technology typically update their legislation in accordance with the Financial Action Task Force's (FATF) guidelines. This is because for most regulators, prevention of AML and CFT risk is of utmost importance for the sake of protecting the financial and capital markets. Malaysia's approach to digital assets, for example, has been mostly consistent with FATF recommendations. (ICMR, 2021)

In 2018, FATF amended its recommendations to cover financial activities related to "virtual assets" and "virtual asset service providers"-related financial activities. Even though FATF uses the word “virtual assets”, it is implied that the term virtual assets is used synonymously with digital assets (these digital assets also include fractionalized assets). The FATF recommendations serve as a general guideline for authorities who may not fully accept digital assets as a new asset class, but who recognize the risks posed by digital

assets as a result of their speed and anonymity as a source of financing for illicit activities. The FATF recommendations address the following seven important areas:

- Anti-Money Laundering/Counter Financing of Terrorism Policies and Coordination
- Laundering of funds and confiscation
- Terrorist financing and financing of prolife
- Preventive measures
- Transparency and beneficial ownership of legal persons and arrangements
- Responsibilities and powers of responsible authorities and other institutional measures
- International cooperation

In June of 2019, the FATF recommendations were revised to include an interpretative comment on the application of the recommendations to digital asset activities and service providers. According to the revision, digital assets should be categorized as "property," "funds," "funds or other assets," or "corresponding value." With the following proposals, it was suggested that countries should adopt a risk-based approach to digital assets and their service providers:

- Digital asset service providers must be licensed or registered in the country where the digital assets are created at a minimum. If the digital asset service provider is an individual, they must be licensed or registered in the jurisdiction where their business is located.
- A country is not required to implement a separate licensing registration system on natural or legal entities that are already licensed or registered as financial institutions within its borders.
- Countries should ensure that digital asset service providers are subject to proper legislation, supervision, or monitoring for AML/CFT, and are successfully implementing the applicable FATF recommendations, in order to minimize the money laundering and terrorism funding risks posed by digital assets.
- Countries should ensure that a variety of effective, appropriate, and dissuasive criminal, civil, and administrative remedies are available to deal with digital asset service providers that do not comply with AML/CFT standards.

Case-Study: India

In India a comprehensive framework to regulate digital assets (including fractionalized assets) is still absent. The regulators are currently working on developing standards and regulations for governing the digital assets. The regulators have used the umbrella term of “virtual digital assets” when referring to the digital assets. In terms of regulatory aspect, the digital asset space is at a fairly nascent stage. This is proven by the fact that only recently the definition for virtual digital assets was proposed.

The virtual digital assets has been defined as, "Any information or code or number or token (not being Indian currency or any foreign currency), generated through cryptographic means or otherwise, providing a digital representation of value which is exchanged with or without consideration, with the promise or representation of having inherent value, or functions as a store of value or a unit of account and includes its use in any financial transaction or investment. But not limited to investment schemes and can be transferred,

stored, or traded electronically. Non fungible tokens and any other token of similar nature are also included in the definition".

Furthermore, virtual digital assets are proposed to be recognized as property as far as the tax code is concerned, essentially making transfers and gifting of virtual digital assets a tax event. No further details on the different classes of digital assets or guidance to the different market players in the digital asset space are provided by the regulatory authorities yet.

2.4. Comparative Analysis of the Regulatory Frameworks and Approaches

A detailed comparative analysis is performed for all the countries studied in the section 2.3 above.

S.No	Key Factors	UAE	Turkey	Malaysia	India	USA
A.	Regulatory Framework for Asset Fractionalization					
1.	Key Regulators and its Domain	Securities and Commodities Authority: It regulates security tokens and commodity / asset backed tokens (also called asset fractions).	Capital Markets Board of Turkey: it governs the digital asset market including initial offerings and subsequent token/fractions offerings.	Securities Commission Malaysia: It regulates issuance and trading of digital assets (including fractionalized assets) at the exchanges. It also regulates the custodians.	Currently, no regulator is providing guidance on digital assets (including fractionalized assets).	Securities and Exchange Commission: Digital assets (including fractionalized assets) will be in the regulatory ambit of the SEC if it meets the definition of the term 'Investment Contract'.
2.	Definition of Digital Asset	Securities and Commodities Authority defined it as, "A record within an electronic network or distribution database	Central bank defined it for the first time as, "intangible assets that are created virtually using distributed ledger technology or a similar technology and distributed via digital networks, but are not	Securities Commission Malaysia has defined it as, "Digital representation which is recorded on a distributed digital	The finance bill has defined it as, "Any information or code or number or token (not being Indian currency or any foreign currency),	To qualify asset fractionalization as an investment contract (form of a security), Securities and Exchange Commission provides the following

S.No	Key Factors	UAE	Turkey	Malaysia	India	USA
		functioning as a medium for exchange, storage of value, unit of account, representation of ownership, economic rights, or right of access or utility of any kind, when capable of being transferred electronically from one holder to another through the operation of computer software or an algorithm governing its use."	classed as fiat money, deposit money, electronic money, payment instrument, securities, or other capital market instruments."	ledger, whether cryptographically secured or otherwise."	generated through cryptographic means or otherwise, providing a digital representation of value which is exchanged with or without consideration, With the promise or representation of having inherent value, or functions as a store of value or a unit of account and includes its use in any financial transaction or investment, but not limited to investment schemes and can be transferred, stored, or traded electronically. NFT and any other token of similar nature are also included in the definition."	criteria – called the Howey Test, "An investment contract exists when there is the investment of money in a common enterprise with a reasonable expectation of profits to be derived from the efforts of others. The so-called 'Howey Test' applies to any contract, scheme, or transaction, regardless of whether it has any of the characteristics of typical securities."
3.	Digital Assets	Yes, no guidelines or regulations seem to	No, Turkey has banned the direct or indirect	No, digital assets are not a payment	Yes, no guidelines or regulations seem to	Yes, no guidelines or regulations seem to

S.No	Key Factors	UAE	Turkey	Malaysia	India	USA
	(including asset fractions) used for payment of goods and services	prohibit the use of digital assets for payment of goods and services.	use of digital assets in making payments and providing services.	instrument that is regulated by BNM and does not constitute money that is legally accepted for the exchange of goods and services (not a legal tender) in Malaysia.	prohibit the use of digital assets for payment of goods and services.	prohibit the use of digital assets for payment of goods and services.
4.	Scoped Class of Digital Assets	All major class of digital asset appears to be scoped in based on the definition (mentioned above).	Based on the definition of digital asset (mentioned above), Commodities (including fractions of a physical asset) is the scoped in class of digital assets in Turkey.	All major class of digital assets appears to be scoped in based on the definition (mentioned above).	All major class of digital assets appears to be scoped in based on the definition (mentioned above).	All major class of digital assets appears to be scoped in based on the definition (mentioned above).
5.	De-scoped Class of Digital Assets	None	Fiat money, deposit money, electronic money, payment instrument, securities and other capital market instruments.	Any digital assets which are not recorded on a distributed digital ledger do not fall under the purview of the Prescription Order 2019.	None	None
B.	Guidance for Asset Fractionalization Issuers (AF Issuers)					
1.	Minimum Capital Requiremen	No guidance on this subject is provided in the relevant	No guidance on this subject is provided in the relevant	Yes, an issuer (other than an LLP) must have a minimum paid-	No guidance on this subject is provided in the relevant	These maybe provided in the law where the SEC makes

S.No	Key Factors	UAE	Turkey	Malaysia	India	USA
	ts	regulations.	regulations.	up capital of RM500,000 and shareholders' funds of RM500,000 maintained at all times. Where an issuer is an LLP, the issuer must have a minimum capital of RM500,000 maintained at all times. SC may at any time impose additional financial requirements on an issuer that commensurate with the nature, operations and risks posed by the issuer.	regulations.	reference to.
2.	Licensing Requirements	No guidance on this subject is provided in the relevant regulations.	No guidance on this subject is provided in the relevant regulations.	An issuer must comply with the following requirements: - Must be a Malaysian-incorporated company (excluding an exempt private company and public-	No guidance on this subject is provided in the relevant regulations.	These maybe provided in the law where the SEC makes reference to.

S.No	Key Factors	UAE	Turkey	Malaysia	India	USA
				listed company) or LLP; - Must have its main business operations carried out in Malaysia; and - Must only raise funds through AF Platform and not through any other means. An unlisted subsidiary or a special purpose vehicle (SPV) of a public-listed company may, however, qualify as an issuer.		
3.	Process for issuing tokens	Yes, the process is: - Submit the offer documentation to authority if the offering is limited to the qualified investors. - Obtain an approval from authority if the	No guidance on this subject is provided in the relevant regulations.	No, it only mentions that issuer must submit its application to raise fund through an exchange for an approval. It then provides further details on the content of application including a	No guidance on this subject is provided in the relevant regulations.	These maybe provided in the law where the SEC makes reference to.

S.No	Key Factors	UAE	Turkey	Malaysia	India	USA
		offering is also made available to the non-qualified investors. - Appoint a custodian for safekeeping of data. - Once the offering is made then clearly disclose to investors all fees and commissions related to offering of on the AF Platform. - Inform the authority, if the digital asset should be offered and listed for trading on more than one AF Platform.		requirement to have white paper.		
4.	Minimum contents of white paper	Yes, few of these are: - "Key Investor Information" section that should include appropriate information about	No guidance on this subject is provided in the relevant regulations.	Yes, few of these are: - Brief description of the issuer's corporate details - The objective or purpose of the initial	No guidance on this subject is provided in the relevant regulations.	These maybe provided in the law where the SEC makes reference to.

S.No	Key Factors	UAE	Turkey	Malaysia	India	USA
		the essential characteristics of the asset fraction - “Key Investor Information” in the offer documentation should be written in a concise manner and in non-technical language - Offer documentation related to the Qualified Investors should include a copy of the prospectus - Provide investors with information on the progress to achieving any project milestones. - Offer documentation to disclose to investors if the digital asset does not provide for a right for holders to a claim against an		offering - The key characteristics of the asset fraction - The business plan of the issuer - The targeted amount to be raised through the initial offering - Any rights, conditions or functions attached to asset fractions - Discussion on the determination of the accounting and the valuation treatments for the asset fraction - Associated challenges and risks as well as mitigating measures		

S.No	Key Factors	UAE	Turkey	Malaysia	India	USA
		offering person in respect of a default.				
5.	Duties and obligations	Yes, these are: - Ensure that all rights and features of the asset fractions are properly recorded in the operations of the distribution ledger technology - Ensure necessary measures are adopted to prevent any misuse of the collected funds until the fractions are issued - Notify the investor If the obligation stipulated in the offering documentation related to the development of technology or other matters funded by the offering is not	No guidance on this subject is provided in the relevant regulations.	Yes, these are: - Ensure that it does not submit any false or misleading information - Submit a fit and proper declaration of its senior management to AF Operator within 3 days from the appointment. - must retain all relevant document for a period of seven 7 years. - An issuer must provide a confirmation to the SC that the drawdowns have been utilized for the purposes stated in the white paper	No guidance on this subject is provided in the relevant regulations.	These maybe provided in the law where the SEC makes reference to.

S.No	Key Factors	UAE	Turkey	Malaysia	India	USA
		met - Promptly notify persons who have accepted the relevant offer in advance of material changes in the nature of the relevant software relevant to their rights in respect of the fractionalized Assets - Monitor the asset fractions and promptly notify the authority in the event that a fraction changes its form or nature.		- An issuer must not make any changes to the utilization of proceeds post the issuance of the asset fractions - Immediately inform AF operator of any change in asset fractions.		
C.	Guidance for Asset Fractionalization Operators (AF Operators)					
1.	Minimum Capital Requirements	No guidance on this subject is provided in the relevant regulations.	No guidance on this subject is provided in the relevant regulations.	Yes, platform operator must be a Malaysian-incorporated company unless specified otherwise by the SC and must have	No guidance on this subject is provided in the relevant regulations.	These maybe provided in the law where the SEC makes reference to.

S.No	Key Factors	UAE	Turkey	Malaysia	India	USA
				a minimum paid-up capital of RM5,000,000.		
2.	Licensing Requirements	Yes, applicant to be a legal person in one of the following forms: - AF Platform licensed by the authority in the State. - A company incorporated according to the Commercial Companies Law. - A person authorized to operate a AF Platform.	No guidance on this subject is provided in the relevant regulations.	Yes, these are: - The applicant, its directors, controller and senior management are fit and proper - The applicant will appoint at least one responsible person. - The applicant will be able to manage risks associated with its business and operation - The applicant has sufficient financial, human and other resources for its operation at all times - The applicant has appropriate security arrangements	No guidance on this subject is provided in the relevant regulations.	These maybe provided in the law where the SEC makes reference to.

S.No	Key Factors	UAE	Turkey	Malaysia	India	USA
3.	Controls and Procedures	Yes, these are: - Not to permit trade on the AF Platform, except for persons who are able to demonstrate a record of regularly investing in securities or having appropriate and adequate knowledge - Provide users of the AF Platform with a risk statement prepared in line with the disclosure requirements - Disclose the commissions and fees for trading on the AF Platform clearly to users - AF Platform to maintain the record of all owners and transactions	Yes, AML/CFT related controls are mentioned below: - AF Operators must confirm the identities of customers making a transaction on their platform. - When a suspicious transaction is encountered, AF Operator must report it to MASAK by filling out the Suspicious Transaction Reporting Form	Yes, these are: - Provide clear line of reporting, authorization and proper segregation of function - Implement anti-corruption and whistleblowing measures - Identify, monitor, manage and mitigate cyber risks in its operating environment - Mitigate and manage situations and potential situations which may give rise to conflicts of interest - Ensure compliance with all relevant laws, regulations and guidelines	No guidance on this subject is provided in the relevant regulations.	These maybe provided in the law where the SEC makes reference to.
4.	Duties and	Yes, these are:	Yes, these are:	Yes, few of them are:	No guidance on this	These maybe

S.No	Key Factors	UAE	Turkey	Malaysia	India	USA
	Obligations	- Provide the necessary technological systems and controls that facilitate the process of recording and reporting trading and transactions taking place on the platform - Provide effective market surveillance programs, which are subject to regular review and development, to control and monitor trading and transactions in the market - Provide adequate disclosures to users when they arrange for custody of their fractions so that investors are aware of the required technology processes and	- AF Operators are responsible for providing all kinds of information, documents, and records in all mediums requested by MASAK and its inspectors - AF Operators are obliged to keep documents regarding obligations and transactions for eight years from the date of issuance,	- Carry out due diligence and critical assessment on an issuer - Assess the issuer's white paper furnished to the AF Operator. - ensure that the white paper is accessible to investors through its AF Platform - Ensure that all fees and charges payable are fair, reasonable and transparent - Identify and manage potential vulnerabilities and cyber threats in its operating environment	subject is provided in the relevant regulations.	provided in the law where the SEC makes reference to.

S.No	Key Factors	UAE	Turkey	Malaysia	India	USA
		implications				
5.	Specific Technology Standards	Yes, these are: - In respect of token management, provide the SCA, upon request with the real-time information related to ownership and trading in the asset fraction in the event of a failure of the issuer - Develop systems and software by carrying out regular internal and external testing and implementing required updates - Adopt cyber security measures and notify the SCA in respect of any material breaches of the cyber security or data loss	No guidance on this subject is provided in the relevant regulations.	No guidance on this subject is provided in the relevant regulations.	No guidance on this subject is provided in the relevant regulations.	These maybe provided in the law where the SEC makes reference to.

S.No	Key Factors	UAE	Turkey	Malaysia	India	USA
		- Appoint a technology officer with sufficient skills and experience to ensure compliance with the SCA standards. - AF Platform shall bear the full responsibility for any matters that may arise from the outsourcing, including the failure of any third party to meet any obligations				
D.	Guidance for Custodians					
1.	Minimum Capital Requirements	No guidance on this subject is provided in the relevant regulations.	No guidance on this subject is provided in the relevant regulations.	Yes, custodian must have a minimum paid-up capital of RM500,000 and shareholders' funds of RM500,000 maintained at all times.	No guidance on this subject is provided in the relevant regulations.	These maybe provided in the law where the SEC makes reference to.
2.	Licensing	Yes, these are:	No guidance on this	Yes, these are:	No guidance on this	These maybe

S.No	Key Factors	UAE	Turkey	Malaysia	India	USA
	Requirements	- The applicant for a license must be a legal person authorized to operate a AF Platform or is a token issuer, if its scope of proposed custody services is limited to the asset fractions issued by him - Policies and procedures are consistent with the technological requirements - Procedures describing the creation, management and controls of cryptographic keys and user portfolios, including generation, verification, online and offline management,	subject is provided in the relevant regulations.	- The applicant, its directors, controller and senior management are fit and proper - The applicant will appoint at least one responsible person. - The applicant will be able to manage risks associated with its business and operation - The applicant has sufficient financial, human and other resources for its operation at all times - The applicant has appropriate security arrangements	subject is provided in the relevant regulations.	provided in the law where the SEC makes reference to.

S.No	Key Factors	UAE	Turkey	Malaysia	India	USA
		transaction and instruction signing processes, storage and backup shall be provided				
3.	Duties and obligations	Yes, these are: - Create a separate account or portfolio for each client - Keep asset fractions belonging to client from Custodians own assets - Hold at all times amounts of fractionalized assets equal to the aggregate amounts to which the Custodian is obligated to all clients - Not transfer, hypothecate, grant a security interest in or a lien over, loan to	No guidance on this subject is provided in the relevant regulations.	Yes, few of these are: - Act in the best interest of the clients - Safeguard the rights and interests of its clients - Ensure that all fees and charges payable are fair, reasonable and transparent - Comply with all the reporting requirements of SC - Ensure that its processes and practices are continuously aligned to industry practices - Take all reasonable steps to ensure fair treatment of clients	No guidance on this subject is provided in the relevant regulations.	These maybe provided in the law where the SEC makes reference to.

S.No	Key Factors	UAE	Turkey	Malaysia	India	USA
		a third party, or otherwise allow adverse claims to arise in, asset fractions belonging to client - Only transfer asset fractions out of a client's account upon the client's express instruction, and not on its own initiative or discretion				
4.	Controls and Procedures	Yes, the controls and procedures are defined as a part of duties and obligations as mentioned above.	No guidance on this subject is provided in the relevant regulations.	Yes, these are: - Provide clear line of reporting, authorization and proper segregation of function - Prevent unauthorized access or fraudulent transaction - Implement anti-corruption and whistleblowing	No guidance on this subject is provided in the relevant regulations.	These maybe provided in the law where the SEC makes reference to.

S.No	Key Factors	UAE	Turkey	Malaysia	India	USA
				measures		
5.	Can AF Operator act as Custodian?	Yes, applicant for a license to act as custodian can be a person authorized to operate an AF Platform.	No guidance on this subject is provided in the relevant regulations.	Yes, AF operator can choose to provide its own custody services to the token/fraction holders.	No guidance on this subject is provided in the relevant regulations.	These maybe provided in the law where the SEC makes reference to.
6.	Conflict of Interest Requirement	Yes, avoid conflicts of interests between its functions as a Custodian and any other activities it, or its related party, conducts. To the extent such conflicts cannot be avoided, the Custodian shall notify the authority of the conflict and its relevant systems and controls in place to mitigate the issue, and shall ensure that disclosure of the conflict is provided to all relevant clients.	No guidance on this subject is provided in the relevant regulations.	Yes, guidance on management of conflict of interest is provided. Custodian must give priority to the clients' interest over its own interests and have written policies and procedures that manages situations which may give rise to conflicts of interest and requires disclosure of any conflict of interest.	No guidance on this subject is provided in the relevant regulations.	These maybe provided in the law where the SEC makes reference to.
7.	Protocols	Yes, these are:	No guidance on this	Yes, these are:	No guidance on this	These maybe

S.No	Key Factors	UAE	Turkey	Malaysia	India	USA
	for safekeeping of Private Key	- Store cryptographic keys outside of a network subject to online attack - Maintain a log of all changes in respect of keys - No single person having access to key is able to completely authorize actions, and set policies and procedures in the event keys become compromised	subject is provided in the relevant regulations.	- Custodian must have in place effective policies and procedures to safeguards key generation and management. - Adopting industry standards and practices in terms of key generation and management, ensuring that the employees that are involved in the key generation process are identified and prevented from having unauthorized access to clients' fractionalized assets. - Having in place procedures to enable the clients to access their fractionalized assets in the event the client loses his	subject is provided in the relevant regulations.	provided in the law where the SEC makes reference to.

S.No	Key Factors	UAE	Turkey	Malaysia	India	USA
				access credentials or where the keys have been compromised.		
8.	Outsourcing Arrangements	Yes, in the event custodian function is outsourced, custodian shall bear the fully responsibility for procedures of storage the keys. In the event that the tasks related to storage the keys is outsourced, outsourcing entity shall fall within a jurisdiction area accepted by the authority and notifying the authority of that.	No guidance on this subject is provided in the relevant regulations.	Yes, a custodian must select an appropriate and efficient service provider for its outsourcing arrangement, and monitor the outsourcing arrangement on a continuous basis to ensure that it does not lead to business disruption and negative consequences to the clients.	No guidance on this subject is provided in the relevant regulations.	These maybe provided in the law where the SEC makes reference to.
E.	Guidance for Investors					
1.	Investors Criteria	Yes, a criteria is defined: - Individuals: Net equity is more than 4M UAE Dirhams and annual income is	No guidance on this subject is provided in the relevant regulations.	Yes, a person may invest in an AF Platform subject to the following limits: - For retail investors: a maximum of	No guidance on this subject is provided in the relevant regulations.	These maybe provided in the law where the SEC makes reference to.

S.No	Key Factors	UAE	Turkey	Malaysia	India	USA
		more than 1M UAE Dirhams and has knowledge in field of investment. - Entities: Total value of its assets is 75 million UAE dirhams, Net annual revenue of 150 million UAE dirhams, and It has a net equity or paid-up capital with a minimum of 7 million UAE dirhams. At least 2 of those 3 criteria's to be met. if an investor fails to meet the criteria of Qualified Investor mentioned above then this investor will not be permitted to invest more than AED 350,000, in respect of any issuing of the fractionalized assets		RM2,000 per issuer with a total investment limit not exceeding RM20,000 within a 12-month period - For angel investors: a maximum of RM500,000 within a 12-month period; - For sophisticated investors: no restriction on investment amount;		
2.	Investor	Yes, few of them are:	No guidance on this	Yes, few of them are:	No guidance on this	These maybe

S.No	Key Factors	UAE	Turkey	Malaysia	India	USA
	Protection	- AF Operators to adopt the best international standards regarding the technology applied in the fractions generally, including the cyber security, data protection, software development and oversight and encryption. - Develop systems and software by carrying out regular internal and external testing and implementing required updates. - Promptly and upon request, provide the SCA with all audits and reviews conducted by a third party for the licensed person.	subject is provided in the relevant regulations.	- Issuers must not submit or provide any document or information that is false or misleading, or from which there is material omission - AF Operators to carry out continuous awareness and education programmes - AF Operators to identify and manage potential vulnerabilities and cyber threats in its operating environment - Custodians to act in the best interest of the clients	subject is provided in the relevant regulations.	provided in the law where the SEC makes reference to.
3.	Reporting	Yes, these are	AF Operators are	Yes, issuer must	No guidance on this	

S.No	Key Factors	UAE	Turkey	Malaysia	India	USA
	and Disclosure Requirements	disclaimers and disclosure to be made in offer document: - The token/fractions are not considered security token under the laws applicable in UAE and are not afforded any protections under such laws - Prospective purchasers of the offered token/fractions should conduct their own due diligence before investing and consult a certified financial adviser - The nature of token/asset fraction may lead to an increased risk of fraud or cybercrimes - Transactions related fractions may be irreversible, and,	obliged to notify MASAK of transactions, which they are a party to or mediate, exceeding an amount to be determined by the Ministry. The types of transactions, the procedure and duration, AF Operators who are exempt, and other procedures and principles regarding the obligation of periodic reporting are to be determined by the Ministry.	prepare an issuers report and publish it on AF Platform. Issuers report to include: - Contain information on the performance of the underlying business or project - The total amount of asset fractions issued and in circulation - The status of the utilization of the asset fraction's proceeds by the issuer - The status of the offering project - Audited financial statements for the latest financial year	subject is provided in the relevant regulations.	These maybe provided in the law where the SEC makes reference to.

S.No	Key Factors	UAE	Turkey	Malaysia	India	USA
		accordingly, losses resulting from fraudulent or accidental transactions may not be recoverable - The volatility and unpredictability of the price of the fraction may result in significant loss over a short period.				

3. Operating Models of Asset Fractionalization

As discussed in Chapter 1 of the report, the conceptual business processes involved in the process of asset fractionalization are structuring, digitization, and distribution & trading wherein structuring deals with the legal and commercial aspects of a fraction (or of its underlying asset), digitization refers to the technological processes employed in the various stages of a fraction's lifecycle and distribution & trading refer to the specific activities of primary and secondary markets and market participants for fractionalization. In this chapter, the conceptual stages of digitization and distribution & trading, as shown in the following diagram, are discussed in detail to show the overall operating model of asset fractionalization.

3.1. Offering and Subscription Models

Primary Market Activities

An asset can be fractionalized by any entity or individual having access to a blockchain network. Such access may be granted by a corporation or a group of enterprises in a private or permissioned blockchain setup and may be granted by a community of users in the case of a public blockchain. When all fractions (representing a real-world asset) are created in one batch those are called 'pre-mined' whereas fractions created on a staggered basis through a specific pre-defined process on a blockchain network are called 'continuously mined'.

Once the fractions have been created, the distribution (or issuance) of these fractions can take the following forms, and accordingly, these can be called primary market activities.

Model	Description
Pre-token (fraction) Sale	This is a private offering of pre-mined fractions to a select group of qualifying investors often at a discounted price. At this stage, the fractions are not available or live on an operational blockchain and may only be issued in the local database of the issuer. Fractions issued in a pre-token (fraction) sale are non-transferrable. Once issued through an

Model	Description
	initial offering, the investors may claim their fractions on the blockchain network.
Initial Offering / Fraction Sale	This is an offering of pre-mined fractions to a broader group of investors generally the public. However, it is possible that fractions issued through an initial offering are issued to a limited group of qualifying investors (comparable to the idea of book-building in traditional financial markets). The fractions issued in an initial offering are transferrable.
Airdrop	Airdrop is the process through which new fractions are issued to existing fraction-holders based on satisfaction of certain conditions.

(Blandin, et al., 2019)

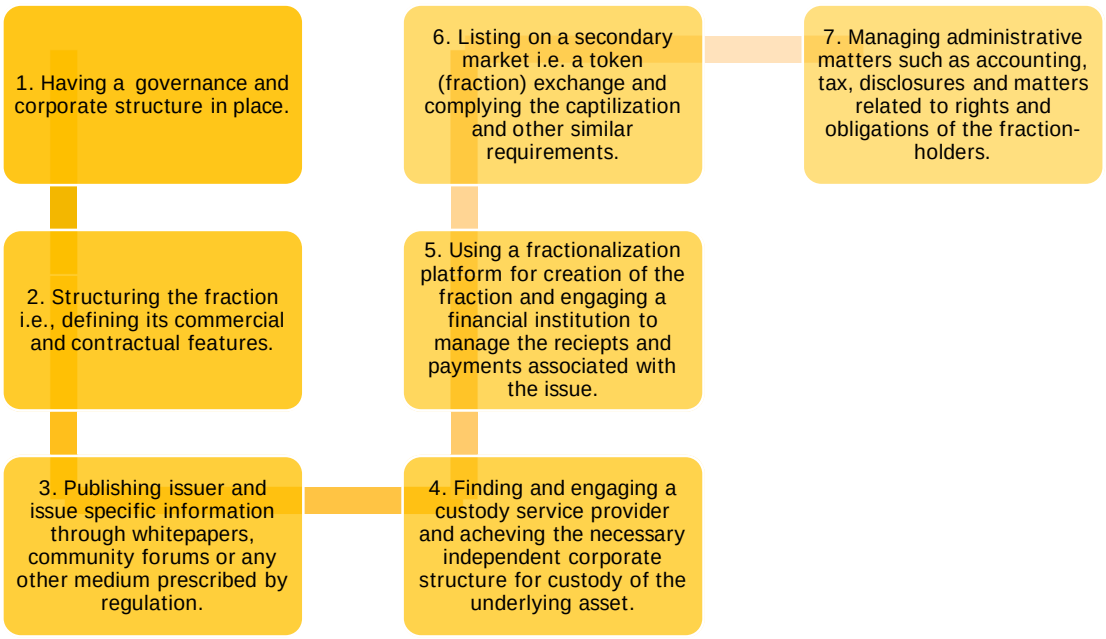
As mentioned above, in a pre-token (fraction) sale or an initial offering, it is possible to issue fractions before they are live on a blockchain network. This would mean that the fractions so issued would continue to represent only the contribution of the investors until they are issued on the network. Such fractions could be redeemed for actual blockchain network-based fractions.

When discussing the primary market for fractionalization, it is important to understand the initial offering process (also called STO or Security Token Offering). STOs are methods of raising funds through the issuance of tokens (fractions) on a blockchain network. In many jurisdictions STOs (unlike initial coin offerings or ICOs) are legally recognized and regulated. They involve compliance with regulatory standards comparable to those applicable to a securities issue/ IPO and that fractions issued in an STO represent an underlying real or financial asset existing in the off-chain world.

Security Token Offerings or simply put initial offerings of asset-backed fractions have the following common characteristics:

- The fraction represents an entitlement to ownership of the underlying asset.
- Elaborate diligence, disclosure, and compliance requirements for all parties involved in the issue and subscriptions are prescribed by applicable law of the jurisdiction of the issue.
- The issuer may be required by law to place the custody of the underlying asset in favor of an independent intermediary.

There are jurisdictional and regulatory differences in the process of STO. A simplified process flow disregarding these differences is presented below for a conceptual understanding.



Fraction issuers in the primary market generally require the services of certain intermediaries. A list of such intermediaries classified by their specific role in a primary market transaction is presented below. It is common for service providers to be offering one or more of these services together, so the segregation of roles shown below is rather conceptual.

Type of Activity	Description	Example Service Providers
Fraction creation, underwriting and issuance	Service providers responsible for structuring the deal, developing the financial model, undertaking risk management, legal and compliance activities on behalf of the issuer, digitization & creation of the fraction and, the actual issuance to private and/or public investors.	Tokeny, Polymath, Harbor, ICOBox, BitMEX and Grayscale Investment etc.
Depository (Custody or Storage)	Holding the safe custody of the underlying asset of an asset-backed token.	Tokeny, Polymath and Harbor etc.
	Providing services to hold the custody of the private keys for a blockchain based fraction on behalf of the fraction-holder. In the context of fractionalized assets, a private key is similar to a password required to gain access to a fraction.	Coinbase Custody, Swiss Crypto Vault, Paladin etc.
Administrative support services	Record maintenance and other administrative activities associated with the issue for example book-keeping,	ICOBench, ZeppelinOS, MME, ConsensusSys and Chainalysis etc.

Type of Activity	Description	Example Service Providers
	corporate actions, compliance services (AML, CFT, KYC), blockchain analytics, rating services and security audits.	

(Blandin, et al., 2019)

Secondary Market Activities

A secondary market for fractionalized assets is a marketplace where already issued fractions are traded (bought and sold) between investors. Activities in the secondary market are centered around 'trading' of fractions and may be described as following.

- Trading: This is the process of listing fractions on an exchange, price discovery and order matching.
- Clearing & Settlement: This refers to the processes where an exchange records trades in the respective accounts of the buyer and the seller, moves fractions from the seller's beneficial ownership to that of the buyer's and accordingly moves funds/or applicable settlement currency of the blockchain network from the buyer to the seller. In executing these processes, the exchange manages credit risk and performance risk. It should be noted that in a fully decentralized DLT system (e.g., a public permission less blockchain network) without a trusted party, the clearing & settlement function can be fully automated through use of smart contracts.
- Servicing: Servicing refers to administrative support services described and discussed in the sub-section on primary markets above.

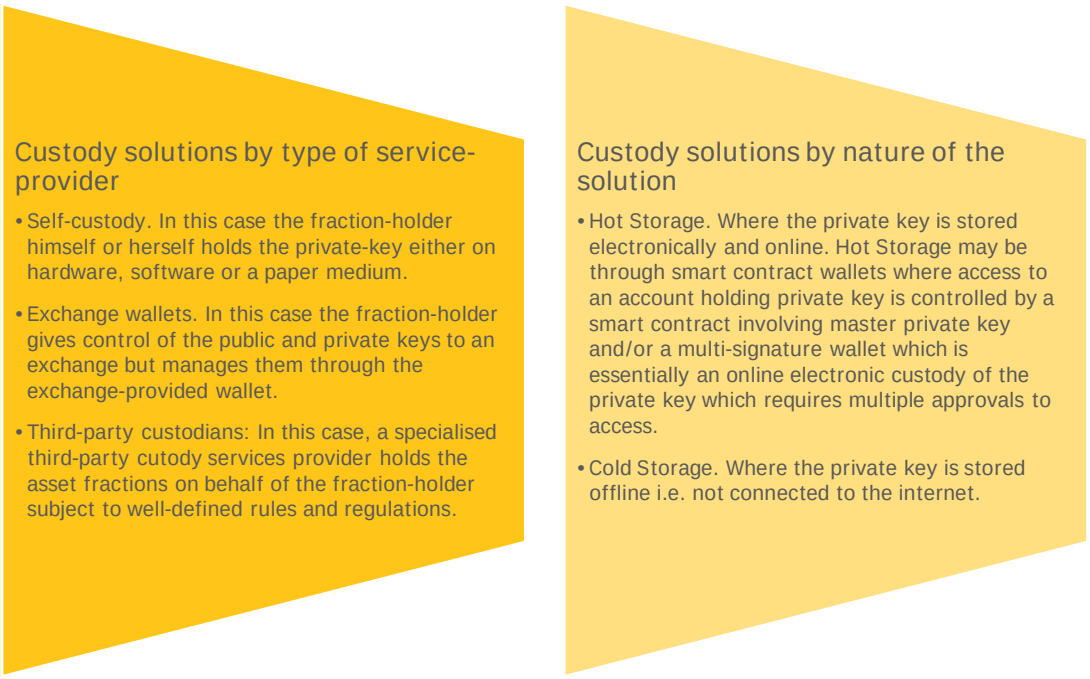
The following table provides a categorization of various service-providers for fractionalized assets trading activities by their role and the nature of services offered. There a number of service providers who provide more than one of these services and so the categorization is conceptual.

Type of Activity	Description	Example Service Providers
Exchange	An exchange (in the context of fractionalized assets) is an electronic marketplace where buyers and sellers list fractions, buy/sell (exchange) fractions and undertake price discovery.	Archax, Swiss Digital Exchange, Binance and Coinbase
Brokerage	Brokers execute trades on the exchange on behalf of buyers and sellers who they have on-boarded and service on a commission basis.	Coinbase, Binance
OTC services	These are essentially brokers which allow their clients to place off-market trades i.e. trades outside the formal market or its trading hours.	Cumberland
Market making	Similar to traditional financial markets, these are service providers who provide liquidity to the markets by consistently buying and selling asset fractions	Galaxy Digital

Type of Activity	Description	Example Service Providers
	at quoted prices while keeping a spread.	

(Allen, Rauchs, Blandin, & Bear, 2020)

Custody and storage services as they relate to blockchain based fractions are fundamental to the operation of the primary and secondary markets hence these are also the focus of various regulatory frameworks. Custodians are institutions that provide customers with an array of financial services including the likes of trade settlement, exchange, clearing, and corporate action execution. However, one of their most notable roles is in the safekeeping of investors' assets. Custodians are like 'vaults', holding investors' assets in both electronic and physical form, charging investors a fee in exchange for maintaining them securely. For digital assets (example tokens or fractions), digital asset custodians provide safe-keeping and storage services for private-keys. A private key is essentially a randomly generated binary number that is used to encrypt and decrypt information and is only made available to the originator of the encrypted content (in this case the token-holder) (Fireblocks, 2022). The following diagram presents different types of custody solutions organized by service-provider and by the type of solution.



(Fireblocks, 2022)

3.2. Technology

Asset-backed fractions or for that matter all other forms of (blockchain-based) fractions mentioned in Chapter 1 of this report are built on and use Distributed Ledger Technology (DLT). Distributed ledger technology (DLT) is an umbrella term used to define multi-party systems that operate in an environment with no central operator or authority, despite parties who may be unreliable or malicious (also called adversarial environmentiv) (Rauchs, et al., 2018). The Bank of England provides a more architecturally rich definition of DLT systems. It defines DLT systems as a distributed database where each node has a synchronized copy of the data but departs from the traditional distributed database architectures in three important ways

- Decentralization
- Reliability in a trust-less environment and,
- Cryptographic encryption

Blockchain technology is a specific subset of the broader DLT universe that uses a particular data structure consisting of a chain of hash-linked blocks of data. It is a distributed database shared among various nodes of a computer network. It is possible to achieve the idea of a distributed shared database with traditional technology but the key differences between blockchain technology and traditional technology in the context of building a distributed system would lie in the concepts of *control* and *data structures*.

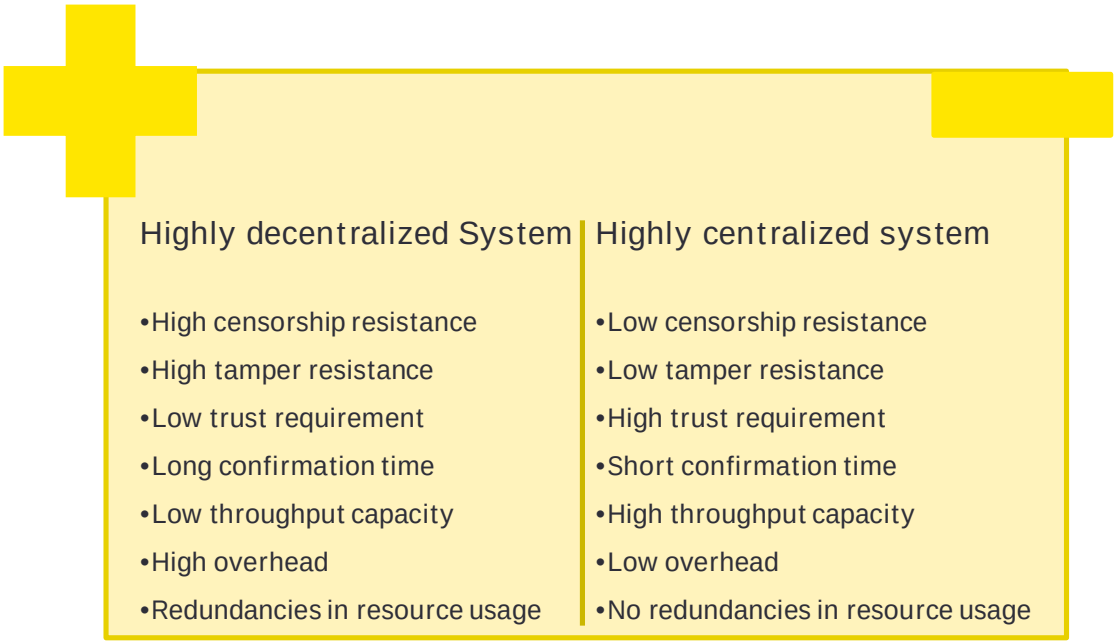
Where traditional technology is used to achieve the objective of having a shared distributed database, the control of the network and/or the protocol will more or less, rest with a centralized entity or individual while in a blockchain it is not just the input, processing and output that can be distributed to various nodes on a network but also the ultimate control of the network and the protocol (e.g., public permission less blockchains). The second key differentiation point between a traditional distributed database system and a blockchain is the data structures. Traditional databases collect information as data tables while a blockchain collects information together in groups, known as blocks that hold sets of information. Blocks have certain storage capacities and, when filled, are closed, and linked to the previously filled block, forming a chain of data known as the blockchain. All new information that follows that freshly added block is compiled into a newly formed block that will then also be added to the chain once filled (Investopedia, 2022). This chain effect creates an irreversible timeline and linkage between validated blocks of data ensuring the authenticity of data on a blockchain (for instance, if data in any block is manipulated or changed, it will affect the data in all other blocks of data on a blockchain and will be immediately identified).

Hence, drawing from the above discussion, a good DLT system using blockchain technology should demonstrate the following minimum characteristics:

- Recordkeeping: The system should be capable of allowing multiple parties on the network to create, maintain or update records, collectively.
- Consensus mechanism: The system should have a consensus mechanism by which records are validated by multiple parties and added to the blockchain (main ledger) based on a consensus rule. In a permission less public blockchain, these parties will be independent with no prior designated or trust relationship among themselves while for a permissioned blockchain, these parties may be authorized or designated parties.
- Independent validation: The system should allow all its participants the functionality to independently verify a new record submitted to the blockchain.
- Tamper evidence and resistance: The system should be capable of allowing unauthorized changes to the data to be detected and make it extremely infeasible for a

network participant(s) to unilaterally change data on the network by violating the consensus rule.

The levels at which the above characteristics are achieved by a particular DLT system (e.g. blockchain) will depend on its specific use case and objectives. A specific-use case or objective may require a DLT system to achieve one feature or characteristic at the expense of the other. For instance, the presence of trust in the system (e.g. identified, regulated entities in a closed DLT system) may allow for a more flexible design approach and increased speed through reduced redundancy than a DLT system built to minimize the trust required between participants (e.g. Bitcoin) but the former will introduce intermediation costs, censorship risks and the system failure risks typically seen in traditional single party controlled shared databases. The following diagram provides a summarized view of such key trade-offs between various properties of a DLT system. Conceptually speaking, the trade-off between these properties should be seen as a continuum rather than a binary outcome.



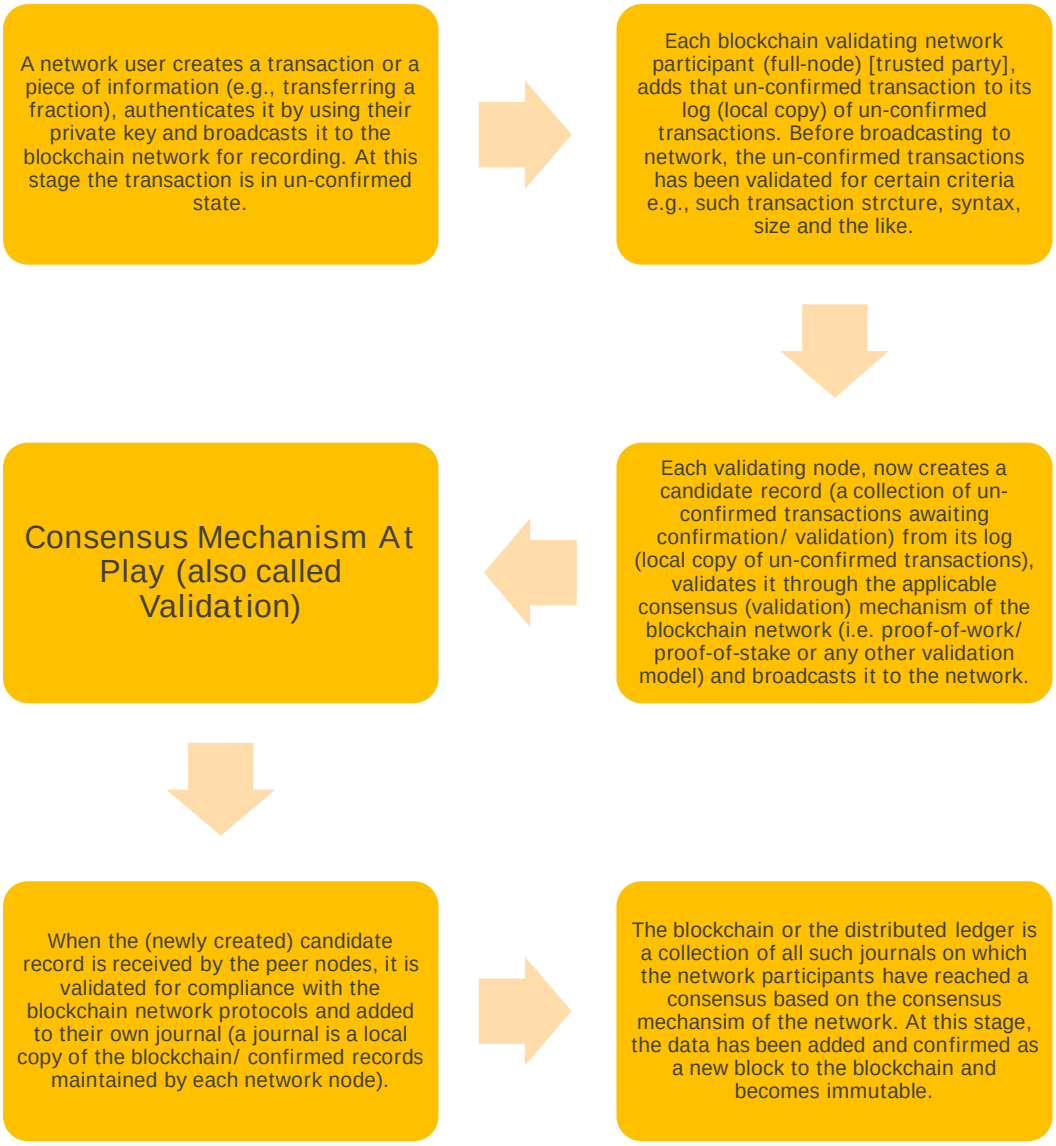
(Rauchs, et al., 2018)

By reference to the various defining characteristics of a DLT system (and by implementation a blockchain network) and the interaction of these characteristics on the spectrum of centralization vs decentralization, the different types of blockchain network are discussed in the table below.

Public blockchain networks	• A public blockchain is one that anyone can join and participate in, such as Bitcoin. • Drawbacks might include substantial computational power required, little or no privacy for transactions, and weak security. • These are important considerations for enterprise use cases of blockchain
Private blockchain networks	• A private blockchain network, similar to a public blockchain network, is a decentralized peer-to-peer network. However, one organization governs the network, controlling who is allowed to participate, execute a consensus protocol and maintain the shared ledger. • Depending on the use case, this can significantly boost trust and confidence between participants. A private blockchain can be run behind a corporate firewall and even be hosted on premises
Permissioned blockchain networks	• Businesses who set up a private blockchain will generally set up a permissioned blockchain network. It is important to note that public blockchain networks can also be permissioned. • Permissioning places restrictions on who is allowed to participate in the network and in what transactions. Participants need to obtain an invitation or permission to join.
Consortium blockchain networks	• Multiple organizations can share the responsibilities of maintaining a blockchain. These pre-selected organizations determine who may submit transactions or access the data. • A consortium blockchain is ideal for business when all participants need to be permissioned and have a shared responsibility for the blockchain.

(IBM, 2022)

The following diagram further explains how information or transactions are submitted, processed, and recorded on a public or a permissioned public blockchain. Private blockchains involving a few validators or trusted parties (centralized) may adopt the following process with local changes.



(Rauchs, et al., 2018)

On-chain transactions or events may require linkage with off-chain data, information or events. This linkage may either be necessary for the settlement processes to take place where for example an on-chain exchange of tokens is to effect an off-chain exchange of asset(s) in the case of an asset-backed token or it may be necessary where an off-chain event or information is to trigger the execution of a smart contract on a blockchain network. This linkage is achieved by the use of Oracles. Oracles is a term used to define a category of applications which serve as a bridge between the on-chain and off-chain world. For example, Ethereum smart contracts can use oracles (like an API) to call or query off-chain information necessary to set the smart contract execution in motion. Chainlink is a very well-known blockchain oracles network service provider which provides middleware solutions to connect off-chain tradition systems with a blockchain network.

Consensus (Validation) Mechanism

In traditional systems of transactions or electronic exchange of information, there are generally trusted centralized parties or systems which ensure the finality of information or the final accepted state of the recorded data which is accepted by all the users as one true source of information. Blockchain typically being a decentralized system without a trusted centralized party, requires a mechanism or a system of rules whereby all the participants of the network (nodes) come to an agreement (consensus) about the final and accepted state of the blockchain. Therefore, a consensus mechanism (also known as consensus protocols or consensus algorithms) is the mechanism that allows distributed systems (e.g. blockchain) to work together and stay secure. The two popular types of consensus mechanisms are proof-of-work (PoS) and proof-of-stake. Others include proof-of-capacity, proof-of-activity, proof-of-history, proof-of-elapsed-time, and proof-of-burn.

3.3. White Papers

In the world of digital assets, cryptocurrencies dominate the rankings when it comes to trading volumes and market capitalization. Bitcoin tops the list with a market capitalization of USD 564.6 billion followed by Ethereum which stands at USD 245 billion and Tether which stands at USD 75 billion (coinmarketcap.com, 2022). Regardless of the dominating market capitalization and trading volumes of cryptocurrencies, we will focus on real asset-backed tokens in this section given the scope and purpose of this report.

The following table presents some well-known asset tokens (fractions) ranked by market capitalization. The key defining features of some of these tokens are also presented in the paragraphs that follow.

Symbol	Description	Category	Market Capitalization	Ranking in the category
PAXG	PAX Gold	Tokenized Gold	USD 595 million	1
XAUT	Tether Gold	Tokenized Gold	USD 445.3 million	2
PRO	Propy Real Estate	Tokenized Real Estate	USD 85 million	1

Symbol	Description	Category	Market Capitalization	Ranking in the category
VEMP	vEmpire DDAO	Tokenized Real Estate	USD 6 million	2

(coinmarketcap.com, 2022) [15 May 2022]

Pax Gold

Pax Gold or PAXG is a tokenized (fractionalized) version of Gold that represents real physical gold. The details of its current market capitalization are given in the above table. This token is issued by Paxos Technology Solutions LLC which is a regulated financial institution based in New York, US. The following describes key features of this token as per the details published in its white paper (Paxos Technology Solutions LLC, 2019).

Sno.	Analysis Factor	Description
1	Value Proposition	To create an investment grade physical gold product that is divisible, easy, and cost effective to own and trade.
2	PAXG Token	Each PAXG token represents one fine troy ounce of physical gold from a specific serialized gold bar (Accredited by London Bullion Market). Tokens can be traced to serialized bars of actual physical gold.
3	Redeemability	If customers own enough PAXG to represent an entire gold bar (430 oz), they can redeem their tokens for a bar of gold.
4	Technology	PAXG is built on Ethereum-based ERC-20 token (smart contract standard). It has portability across the Ethereum blockchain's network of wallets, exchanges, lenders and other platforms.
5	Custodian of physical asset	PAXOS Trust Company. A company regulated by New York State Department of Financial Services. For physical storage and sourcing of Gold, PAXOS Trust Company receives the services of third-party service provider such as Brink's and StoneX
6	Pricing	Pegged with market price of Gold.
7	Regulator of the issuer	New York State Department of Financial Services (NYDFS)
8	Transaction Fee	For on-chain transactions the fee is 0.02% of the traded value in addition to cost of using the blockchain network (gas).
9	Settlement	Physical redeemability as well as cash settlement in US dollars or in virtual currency (Ethereum)

Sno.	Analysis Factor	Description
10	Financial Audit	Public accounting firm: Withum. Services include, financial audits and monthly attestations confirming 1 by 1 pegging of tokens with physical gold.
11	Smart Contract Audit (technology audit)	PAX Gold smart contract code has been audited by Nomic Labs, Chain Security and Trail of Bits. These are specialized blockchain IT security auditing service providers.
12	Monitoring Tools	Comply Advantage and Chainalysis for monitoring of frauds and any other malicious activity.

RealT

RealT (token) is issued by RealToken LLC which is a series limited liability company registered in Delaware, US. A series LLC is a special form of limited liability company in which the liability of each of the issues of the company (called series) is limited to the issue size of that given series and does not affect the other issues of the company hence providing a ring-fencing mechanism. Each series is practically a separate entity and serves as a bridge between the real estate property and the representative token-holder for that real estate property.

Sno.	Analysis Factor	Description
1	Value Proposition	To create an investment structure for fractional ownership of tokenized properties resulting in cash flows from rental income and value appreciation.
2	RealT Token	A RealT token for any given series of RealToken LLC represents an equity ownership interest that independent series of the RealToken LLC and, thus, in the real estate property owned by the Series. Each series represents a unique/separate real estate property. Each token has a unique identification number which is also stated in the certificate of formation of RealToken LLC. For example, the first property in the RealT system is “RET-9943-MARLOWE-STREET-MI” and has a Token supply of 1000. All RealTokens are fully fungible within their own set of tokens but have no relation to any other RealTokens outside of each series contract.
3	Redeemability	Issued only to qualified investors.
4	Technology	RealT are built on ERC-20 standard of the Ethereum blockchain.
5	Custodian of physical asset	Title deed of the real property owned by a series of RealT LLC identifies a particular series of RealT LLC as its owner and by virtue of this the title is recorded in the property registry. RealT LLC has an agreement with all its issued series whereby it acts as a servicing and management company against a fee. (Custody of private

Sno.	Analysis Factor	Description
		key to be managed by investors by providing their digital wallet addresses)
6	Pricing	USD 63.75 per token for Series 1 issue. Maximum offer size equivalent to 1000 tokens. Income through appreciation in the property value and rentals. Min. lot size: 10 tokens.
7	Regulator of the issuer	Financial Industry Regulatory Authority (FINRA). Important to note, that these tokens are not subject to US Securities Act, 1933 and issued only by way of private placement under an exemption to the Act.
8	Transaction Fee	USD 3.19 per token (5% selling commission for the placement agent).
9	Settlement	Settled in DAI (USD pegged stable coin/ cryptocurrency) pro-rata the number of tokens held. DAI could be exchanged for USD. Token transfers allowed subject to conditions.
10	Financial Audit	Yes as per the applicable laws of the jurisdiction.
11	Smart Contract Audit (technology audit)	Cybersecurity audit and smart contract audit not applicable. These are provided as risk factors in the offering documentation.
12	Monitoring Tools	Unknown.
13	Valuation of underlying asset	Third-party valuation of property by an approved property valuator applicable.

4. Recommendations for Asset Fractionalization in Pakistan

4.1. Key Markets in Pakistan and their Structure

Based on an understanding of various concepts associated with fractionalization of assets, the underlying technology, its benefits, and some use cases discussed in the previous three chapters of this report, it is established that fractionalization has the following effects:

- It enables the creation of more liquidity in commonly illiquid markets. Fractionalization also helps broaden the investor base making large-ticket asset classes more accessible to small or retail investors.
- It enables the realization of more efficiency through the reduction of intermediaries and associated transaction costs.
- It offers better and quicker settlement mechanisms due to the use of smart contracts and comes with the usual benefits of traceability and immutability associated with the use of DLT technologies e.g. blockchain;
- It enables the creation of primary markets particularly suited to small businesses when it comes to raising capital.

Applying the above criteria as tests, the following markets in Pakistan seem to present themselves as good candidates for offering the underlying assets for fractionalization in Pakistan. It is worthwhile to note here that the existing financial markets in Pakistan have, intentionally, not been covered below, given that there already exist sufficient primary and secondary market structures in these markets and that the scope of this report is limited to physical (non-financial) assets.

4.2. Potential Asset Classes for Tokenization

Real Estate

The real estate market in Pakistan comprised of commercial properties, residential properties, and open plots of land is one of the major and most lucrative asset classes in Pakistan which has attracted billions of dollars of investments from individuals in Pakistan and overseas Pakistanis. This market has remained a bull market for over two decades and is perceived as a high-return stable market by the masses who find equity and money markets in Pakistan difficult to enter because of their due diligence requirements, level of disclosures, and level of formality. Investments in the real estate sector in Pakistan have and continue to increase for the following reasons:

- Favorable fiscal policies offer incentives such as tax amnesties and tax breaks for real estate investments.
- Availability of subsidized bank credit in the form of interest-free or subsidized loans for the purchase, renovation, or development of residential properties and commercial properties.
- The unregulated nature of the sector keeps it off the radar when it comes to tax authorities and other regulators.

- Extreme volatility in the equity market forces investors to look for other high-return more stable avenues of investment in the economy.
- The demand-supply gap particularly in the housing market stands at (generally accepted) about 9 million housing units.
- Inflation and rapid devaluation of the PKR force investors to save either in foreign currencies or real assets.

While all these factors have contributed to an expanding high-return real estate market in Pakistan, they have also rendered this market unaffordable, inaccessible, and hence un-investable for a wider base of retail investors comprising households in the middle- and lower-income brackets. The reasons are exorbitant property prices. Other more universal challenges affecting the liquidity and transaction growth in this market include high transaction costs, stamp duties, burdensome and slow procedural requirements of the registries, and poor enforcement of the contract, title, and possession in the case of disputes. Apart from outright 'buy and hold' investment models, the most common investment model in the real estate sector especially in urban centers such as Karachi, Lahore, and Islamabad remain investing in under-construction units through periodic payments over a given term and securing the title of the property on its completion. These investment schemes often give rise to performance risk and credit risk due to the unregulated nature of the sector. To address these issues and mainly to open this market to the retail sector, a regulatory regime for Real Estate Investment Trusts (REITs) [3] has been introduced some years ago and has also undergone improvement but the popularity and widespread acceptance of REITs as investment models of choice for the real estate sector remains to be seen.

In the light of these challenges and with the objective of opening up the real estate market to a wider base of small investors fractionalization of real estate assets could be the solution provided the fiscal, transactional and contractual issues noted above are also fixed. Fractionalization will:

- Reduce investment lot-sizes making real-estate investments affordable for small retail investors.
- The use of DLT will provide more transparency and traceability to view and the chain of ownership (a major problem with paper-based registries). The transfer of title through DLT will make transactions more tamper-proof.
- The existence of an exchange or a platform would rationalize prices and improve price discovery.
- Recognition of a real-estate asset backed fraction as an asset class would open it up for collateralized lending from financial institutions or by extension of the idea through any means of decentralized finance.
- Transaction and settlement times which currently stand between months would come down remarkably due to the use of smart contracts, this will improve volume growth and further democratize the market.
- The challenges associated with physical management, storage, lien marking (removing) and the like will be addressed to a good extent.

[3] One key defining and differentiating characteristic of REITs is that they provide investors with the right to profit or other income stream from the asset(s) but not direct ownership of the asset(s), for example, in the case of winding up or on possession of all the units of the REIT.

Metals (Gold)

The precious metals market in Pakistan dominated by the purchase and sale of gold bullion is another major unregulated market in Pakistan with low trading volumes and high-value transactions. Credible data on the size of this market is not available but various news sources have quoted that the bullion market in Pakistan (2022) is roughly PKR 2.2 trillion. Further, according to OEC (The Observatory for Economic Complexity), Pakistan exported USD 122 million in gold (ranking 93rd in the world) and imported USD 45 million in gold (ranking 68th in the world). By these standards, the local consumption/investment in gold in Pakistan can be estimated to be equally large if not larger.

Gold is one of the most preferred asset classes in Pakistan for savings and investments by individuals. The reasons for this are cultural, social, and economic. Among the economic reasons, inflation and devaluation of the PKR are at the fore. Presently, the following models of investment in gold are available:

a) Purchasing from local bullion markets and physical storage. This remains the most popular method but is inherently risky for reasons of security/theft and lack of standardization (trusted sources of purchase). Besides, this market is very illiquid (due to low transaction volume) and has a relatively higher threshold of minimum required investment.

b) Investing in cash-settled futures (gold) offered by Pakistan Mercantile Exchange (PMEX).

c) Investing in gold (mutual) funds with exposure in cash-settled futures of PMEX.

Both (b) and (c), despite having some characteristics of fractionalization have not able to gain wide-spread popularity among retail investors for reasons of procedural complexity and limited awareness among investors.

In addition to the above, gold is also a very popular bank-acceptable collateral for some commercial banks and many microfinance banks in Pakistan which have major portfolios in gold-backed loans.

Given the above, challenges and opportunities, the fractionalization of gold and its subsequent exchange trading may open-up the following opportunities:

a) Provide a feasible and affordable asset class to the masses for investments and savings.

b) Help document and formalize the undocumented gold trading sector to the benefit of the wider economy.

c) Potentially lead to a more democratized (non-bank led) money market of gold-backed loans with effectively lower interest rates and transaction fees.

On the flipside, there is risk that the creation of a highly liquid secondary market for gold bullion results in excessive funds being channeled into gold investments which negatively affect Pakistan's external account and result in parking of funds in a rather un-productive segment of the economy. A practical safeguard against this risk could be to offer the tokenized gold market to foreign investors (e.g. overseas Pakistanis) as a liquid low-risk asset class that offers a hedge against inflation.

Warehouse Receipts

Supply chain finance especially in the agriculture sector in Pakistan is seen as a major enabler for the economy. Availability of easy and affordable supply chain finance for agricultural products is known to result in better price recovery and timely availability of funds to farmers particularly small-holder farmers and hence can result in uplifting the rural economy in Pakistan. The State Bank of Pakistan issued the regulatory regime for warehouse receipt financing in 2014 which was later upgraded for issuance of e-warehouse receipts. To provide the necessary infrastructure for storage, standardization, and accreditation, the SECP also issued regulations for collateral management companies. As a secondary market, future contracts for e-warehouse receipts are also listed on PMEX.

Despite having the necessary infrastructure in place, both the primary and secondary markets for warehouse receipt financing are yet to become broad-based high-volume active markets. The demand side challenges remain limited number of warehouses, limited availability of buyers for warehoused commodities, lack of product certification and standardization processes. On the supply side, challenges are mostly procedural and related to priority of the commercial banks to finance the agriculture sector. Fractionalization of warehouse receipts (using the blockchain technology) can improve the procedural aspects of digitization in the following ways:

- Fractionalization can enable the borrowers to obtain finance from multiple lenders (banks or others) giving more choices to the borrowers. This can improve competitiveness of the money market.
- Time and resources spent in the verification of a warehouse receipt (whether physical or digital) can be significantly reduced as the inherent use of DLT (blockchain technology) prevents double-spend, so the process of marking and releasing pledge on whole or part of the pledged commodity can be significantly simplified and improved. Further, on a blockchain platform all concerned parties (example banks in the system) will be able to see the history and status of the token (fraction) representing a commodity hence effectively working as a registry.
- The use of smart contracts can help add unique characteristics of the commodity to the token example farm location, grade or any other quality standard which can help lenders improve valuations and consequently reduce margins/ increase loan-to-value ratios.
- Fractions representing warehoused commodities can essentially be issued or traded as a separate asset class on an exchange. This will broaden the supply side from banks to non-banks and even individual investors.

4.3. Key Risks and Implications

As with any new technology, the innovative nature of distributed ledger technologies and its integral features bears risks associated with asset fractionalization. This may require the regulator to analyze and address any such risks as part of their ongoing supervisory and regulatory mandate. The following table provides a summarized overview of the most important challenges associated with the fractionalization of assets.

Onboarding	Infrastructure	Fraction Creation	Fraction Transfer	Fraction Servicing
i. Client due diligence, approval and onboarding ii. New asset due diligence, approval, and onboarding	Selection or creation of the underlying blockchain network	Creation of digital representation of a financial or physical asset	Completion of a buy or sell order of an asset fraction and associated transfer	Payments reconciliation, reporting services, client billing and corporate action management
Asset Fraction Custody Life Cycle – Key Risks and Challenges				
i. Inadequate asset fraction due diligence in terms of governance, unique risk profile or suitability ii. Inadequate client onboarding in terms of KYC requirements data privacy & protection or required disclosures.	Infrastructure problems (e.g., interoperability, incorrect consensus algorithm (validation mechanism) or scalability issues) may lead to loss of data, unauthorized activity on the network or financial and reputational loss.	Standardization and functionality issues may create legal & compliance risks. Incorrect fraction distribution may result in financial and reputational risks.	i. Due diligence processes may complicate access to fractionalized asset. ii. Legal and reputational risks due to failure to prevent market manipulation, or poor performance of KYC and sanctions screening	Governance issues due to the difficulty in identifying a sole owner or node accountable for the full network (ultimate validator in the network).

The following table further elaborates on the risks and challenges involved in various stages of asset fractionalization. The regulatory framework and any other supplemental regulatory guidance must address these risks either by assigning responsibility of controlling/managing these risks to the specific market participants (and consequently leaving the choice of controls with the market participants) or by developing clear rule-based prescriptive standards to be complied-with by specific market participants. This will be a policy decision and it has to be consistent with the overall approach adopted by the regulator when it comes to the creation and regulation of new markets in the country.

Components	Process	Risks
Onboarding	Product due diligence	▪ Fractionalized asset is not sufficiently assessed for suitability and/or does not undergo appropriate product governance.
	Client acceptance & onboarding	▪ Client onboarding does not consider unique fractionalized asset risk profile and supplemental KYC requirements. ▪ Data privacy & protection issues. Further, data storage, usage and sharing will require watertight consent management processes as well as effective data rights management systems to be put in place.
	Client agreements	▪ Client agreements do not include required disclosures (e.g., liability, SLAs)
Infrastructure	Set up	▪ Multiple DLTs (blockchain networks) often lack interoperability resulting in increased cost of supporting multiple DLT infrastructures, operational risk, security risks. ▪ Poor protocol selection may result in insecure implementation leading to loss of data. ▪ Incorrect consensus algorithm selection (validation mechanism) and implementation may result in unauthorized activity on the blockchain network. ▪ Settlement finality may be a hurdle for some blockchains networks if the validator or ultimate trusted party is not clearly identified. ▪ Other operational risks (e.g., network stability, exposure to cyber-risk, risk of hacking and business risks related to the migration to a DLT-enabled environment, etc.) ▪ Transition from legacy infrastructure to DLT-based networks requires significant investment, so existing players might find it difficult to graduate to the requirements of the new blockchain based ecosystem.
	Join	▪ Insecure node setup may lead to loss of service or corruption of data ▪ Participating in an existing public DLT network may result in dependency on a community and a lack of accountability.
	Maintain	▪ Node(s) lose service temporarily, leading to loss of visibility into on-chain activity ▪ Nodes are compromised leading to loss of data and loss of service resulting in financial and reputational losses.
Fraction Creation	Select	▪ The token (fraction) standard used may not enable all functionality required by the regulation leading

Components	Process	Risks
		to product being out-of-compliance resulting in financial and reputational losses. ▪ Token (fraction) standard may have vulnerabilities leading to financial loss ▪ Overly complex or poorly engineered token (fraction) standards can result in higher cost, less security and flexibility ▪ Less adopted token (fraction) standards may not be compatible with commonly used wallet structures resulting in poor participation and lower demand in the market.
	Develop	▪ Asset fractions can be created with incorrect data value inputs resulting in reputational, legal, and financial losses. ▪ Not obtaining all necessary approval documentation from issuer may result in legal and regulatory non-compliance for issuing fractions for unapproved securities ▪ Fractionalization of physical assets depends on the existence of a trusted and credible central authority (e.g., a custodian) who will guarantee the connection of the off-chain world with the blockchain (e.g., existence and custody of unique assets backing the tokens).
	Issue	▪ Number of fractions in circulation/issuance may not match underlying securities. ▪ Unauthorized access to fraction creation can lead to incorrect and/or inaccurate fractions being created resulting in legal, reputational, and financial risks. ▪ Allocation of newly created fractions may be incorrectly distributed resulting in reputational, legal damage.
Fraction Transfer		
	Transaction settlement	▪ Inadequate system resources to execute transaction requests ▪ Delays in confirmation due to insufficient network usage fee. ▪ Inability to associate a transaction receipt with a given client both off-chain and on-chain.
	Transaction due diligence	▪ Delays in client access to fractions due to due diligence processes
	Transaction monitoring	▪ Inadequate resources or analytics tools to monitor wallet activity.

Components	Process	Risks
Fraction Servicing	Reporting	▪ Failure to identify and adhere to laws, rules and regulations
	Pricing & valuation	▪ Inability to value asset fractions at time of transfer ▪ Pricing is not provided in a timely or accurate manner ▪ Unclear pricing (valuation) method, may lead to price manipulations on an exchange, collusion or wash-sales.
	Smart contracts	▪ Incorrectly written smart contracts may be unchangeable upon deployment resulting in permanent errors being written to the blockchain causing financial, legal, and reputational damage ▪ The legal status of smart contracts may become a challenge if there is no legal provision or cover available in the country for their finality and acceptance. ▪ Unclear assessment regarding smart contract status can complicate enforceability and financial protection of network participants. ▪ The auditability of the code of smart contracts, especially those with an unclear legal status in the country, requires additional resources from market participants who will wish to confirm the basis on which such smart contracts are executed.
	Corporate actions	▪ Airdropped asset fractions (example, issuance of bonus fractions) deposited in client wallets may not meet internal or regulatory requirements ▪ Incorrect handling of governance tokens (i.e., with voting privileges) ▪ Governance issues relevant to the level of decentralization of the network may cause difficulty in identifying a sole owner or node accountable for the full network. ▪ On the one hand, in terms of liquidity, fractionalization could have positive effect on near-illiquid assets (e.g., participation in the capital of private SMEs). However due to potential risks of bifurcation of liquidity between on-chain and off-chain markets for the same asset, the liquidity may potentially dry up in the off-chain markets, thus giving rise to risks of arbitrage.[4]

[4] Example: If there are real estate projects A and B (same adjacent locations and other characteristics) one being fractionalized and the other not – the number of buyers (liquidity) in fractionalized and non-fractionalized markets could affect the price purely due to reasons of liquidity or a lack thereof – meaning that price differences between two otherwise homogeneous assets would exist only because of the liquidity condition of a given market and not because of the intrinsic demand-supply forces or earning capacity of the underlying assets.

Components	Process	Risks
	Reconciliation	▪ Discrepancies between market participant accounts/records, investor (client) accounts/records and the blockchain may exist due to time delays in the systematic acceptance of transactions between various systems/parties involved or due to initiated but unfulfilled transactions requiring reversals. These events would require a systematic reconciliation mechanism to be in place.

4.4. Making it happen – Recommendations

1. Terminologies: A substance-over-form approach should be followed when it comes to the use of definitions and terminologies used in the regulations. Definitions and terminologies should govern the underlying economic substance of the transaction involving a tokenized asset rather than its technological or procedural outfit. It is important that a conceptual framework listing down the regulatory approach and the basis for specific regulatory decisions and choices is established and consistently applied so that when new use-cases, applications and asset classes are added to the regulations, they do not create inconsistencies or divergences. The regulator should clarify the objectives of regulation by identifying the risks they want to reduce or prevent. Then and only then can regulated parties begin to develop compliant, safe, transparent, and transparent solutions. In cases when these solutions are unavailable, adequate disclosure and reporting regimes can give consumers and other interested parties with necessary information.
2. Market awareness and learning: The subject of digital assets in general and that of fractionalization in particular is fast evolving. To keep pace and to ensure that the regulations do not become unresponsive or restrictive to the existing and new players in the fractionalization space in Pakistan, it is important for the regulator to have a permanent mechanism whereby it can engage with technology creators and contemplate regulatory changes based on innovations happening in the fractionalization space. Following a sandbox approach to extend theoretical learning into a pilot should be an important consideration. Secondly, it is important that all relevant market participants are actively educated in the subject of blockchain and tokenization to achieve the results desired by the regulations.
3. Exclusivity: The regulations should be sufficiently narrowed down so as to avoid over-lapping or confusion with other laws or regulations in Pakistan governing other asset classes such as financial assets (shares or other securities) and with other sub-classes of digital assets such as cryptocurrencies. This differentiation can be achieved through differentiating factors such as the usage/adoption of the term DLT technology (blockchains) in the regulations, clear exclusions in the scope of the regulations and effectively following a ‘tailor-made approach’ to the regulations as opposed to the ‘technology-neutral’ approach. Following the ‘tailor-made’ approach to the regulations will necessitate that the roles, responsibilities, eligibilities and obligations of new players e.g. token issuers as well as any existing players with enhanced roles e.g. depositories, asset registries or valuators be defined or adopted very clearly in the new regulations instead of relying on the provisions of any pre-existing regulations (where applicable). Further, it may be beneficial to offer a generic taxonomy of financial and non-financial assets in the regulations and their regulators for specific domains. This will help provide clarity to the market in terms of regulatory ambits.

4. Relevance: The regulations should be comprehensive and over-arching in the sense that these should regulate all logical phases of a fraction's life-cycle i.e. from issuance to settlement but the regulations should also recognize that the same fractionalization process applied to different types of underlying assets may require and give rise to different asset-type specific requirements that would need to be regulated based on relevance. For example, the valuation and custody requirements for a token representing real estate and a token representing a bar of gold will be very different. To achieve this, there should be an additional layer in the regulations which provides guidance specific to the economic nature and specifics of the underlying asset.
5. Transfer of title and inter-operability: In the case of asset-backed fractions representing the whole or a fraction of a real-world asset, it is important that a seamless legal link is established between the on-chain event (transaction) and the off-chain event (transaction). In a very simplified explanation, this means that when a token (representing an asset) moves from the seller to the buyer on a blockchain, the corresponding movement/transfer of rights and obligations associated with that asset (as recorded in the legal registry or depositary of that asset) should be timely (ideally real-time and simultaneous). In addition, this transfer should be definite and immutable similar to the finality of the transaction over a blockchain.

   Let us take the example of real estate in Pakistan and see some practical implications. The example of real estate is taken because it is an asset class which is unregulated, does not have a secondary market, has high-value transactions, is illiquid and its registry and transfer mechanisms are governed by decentralized set of laws in Pakistan. There are broadly two ways in which fractionalization can be envisaged in real estate.

   - Indirect ownership model: The indirect ownership model is comparable to the concept of asset securitization in financial markets. In this model, the issuer will transfer the real estate property (to) or create a mortgage in favor of the custodian (ideally specialized independent third-party corporate). This transfer will be recorded in the official land registry. Ownership rights of the fraction holders evidenced by the digital token(s) [fraction on the blockchain] will be recorded and registered by the custodian but each token transaction will not require entry and registration in the official land registry. By law, the custodian may be required to effect the transfer of ownership in the favor of the fraction-holder in the records of land registry wherein a fraction-holder is in possession of the minimum required number of fractions necessary to secure the outright ownership and possession of the property. Although this model, puts an additional custody layer in the middle, this will offer better functionality in terms of managing the volume and speed of transactions. This will also help easily maintain information and records about transactions, KYC and other information mandated by the regulator.
   - Direct ownership model: The direct ownership model is comparable to a joint ownership of the property registered in the records of land registry. In this scenario, the land registry will be the sole off-chain registry of the asset and to prevent settlement risk the on-chain transaction will remain incomplete (or in escrow) until an off-chain transfer or entry of ownership has been made in the land registry. To be successful this model will require significant technological, operational and legal enhancements to the land registries and their originating laws in Pakistan as it introduces an entirely new procedure of transferring title. For this reason, this may be difficult and impractical to implement.

   Further the concept of good faith acquisition needs to be preserved in the case of transfer of title through fractions on a blockchain. This essentially means that the title of transferee acquiring the property or an asset in good faith remains good regardless of defects in the title of the transferor.
6. Custody: In the case of fractions representing real world assets, the subject of custody is two-fold. Custody refers to custody of the underlying asset or associated with maintaining a registry of the ownership and other rights associated with it. It also refers

to the digital custody of the private-key and other credentials of the transaction initiator on a blockchain. The regulations should specifically provide detailed eligibility, licensing and auditing criteria for custody service providers especially digital custodians *(a role which may be assumed by the exchange or the DLT platform operator with necessary safeguards)* since transactions on a blockchain are authenticated through a private key and are immutable so it will be catastrophic not to have robust controls in the storage and safe custody of the private key.

7. Investor protection: To ensure investor and financial consumer protection and to maintain stability of financial markets, the requirements and obligations of various market participants in fractionalization should be set on par and comparably with those for issuers, custodians and exchanges in the traditional financial markets e.g. the stock exchange. This is a policy-level recommendation and so while standardization of broader measures with traditional financial market regulations is desired, deviations in limits and other operational parameters will be necessary for reasons of proportionality and the differences in the technological infrastructure.

8. Accounting: As mentioned in section 1, asset fractions are derived from pre-existing real assets and are linked or embedded by convention to DLT-based tokens. Current accounting framework in Pakistan follows the International Financial Reporting Standards (IFRS) and therefore the accounting regulator in Pakistan will have to issue specific guidance/ interpretation for application of specific accounting standards to asset-backed fractions. Fractions have diverse terms and conditions. From the investor's (fraction-holder's) perspective, the purpose for holding fractions differs among the entities, and even among business models within the same entities, that hold them. Hence, the accounting treatment will depend on the particular facts and circumstances and the relevant analysis could be complex. From the issuer's perspective, the accounting treatment could be similar to that of issuance of instrument against cash (with or without some intervening steps).

   As an example *(fraction-holder's view)*, a fraction can be classified as cash, financial instrument (e.g. security), derivative and/or an intangible asset depending on the business model of the acquirer and the contractual terms representing a fraction. Each of these classifications has very different reporting, accounting and disclosure requirements and therefore guidance from the accounting regulator will be required to set the accounting conventions in the market[5].

9. Taxation and other transaction costs: The taxation framework in Pakistan lacks specialized provisions that address transactions and corporate structures involving asset securitization and therefore fractionalization (being similar to securitization) will remain unaddressed as well. In the absence of special provisions, issuers and custody or trust companies (intermediaries) could be taxed on transfer of assets when looked at from the lens of transfer of ownership of non-financial assets – resulting in double taxation and hence increased transaction costs. To explain this with an example, the issuer may be taxed when the underlying asset for fractionalization is transferred to the custodian and the custodian may be taxed on transfer of the asset (or a fraction of it) to the investor and again when fractions are traded among various investors. The word 'taxation' used in this paragraph refers to income taxes in the form capital gain, tax on interest and/or dividend. Further, if each fractionalization transaction is viewed with a fragmented view of the number of participants involved it may also trigger a number indirect taxes such as provincial or federal sales taxes. Other transaction taxes such as stamp duties etc. may also apply especially in the case of real estate properties. Another extremely important differentiation that the taxation framework will have to make is to differentiate between the taxation of an asset acquired or exchanged traditionally and the same asset acquired or exchanged by way of fractions exchanged on a blockchain through an exchange. If the two are not differentiated there remains a

[5] This explanation is not an accounting advice. It is a general understanding of the overall structure of transactions which may take place in a fractionalization model.

risk that a transaction is double taxed i.e. first when the exchange happens on-chain and second when the settlement/ delivery or possession happens off-chain. The rates for the two will also have to be rationalized as inconsistencies may create arbitrage opportunities. Misplaced tax incentives for example, capital gains tax rates declining with increasing holding periods may also affect transaction volumes.

The points discussed in the above paragraph may result in high transaction costs or disincentivize high trading volumes to the detriment of new investors, issuers and exchanges.

To counter these from happening, it is important that a specialized taxation framework is introduced for asset fractionalization which closely follows the accounting framework (for example, similar to the case for taxation of banks in Pakistan) and its treatment of various income streams arising from trading of fractions. Further, the example of taxation of mutual funds may also be followed (due to similarities with the fractionalization model) wherein the income tax is exempt upon paying 90% of profits in dividends and essentially treating the mutual fund as a pass-through entity. A trusted source of valuation (example quotes on an exchange) should be notified to avoid any ambiguity in the calculation of taxes and lastly, the incidence of tax should coincide with the timing of cash flows in fractionalization transaction.

10. Settlement: Settlement refers to the movement of funds from the buyer to seller and the movement of asset(s) from the seller to the buyer. This also includes transaction and counterparty due diligence. With the use of blockchain technology for asset fractionalization, new risks emerge that require particular attention, such as delays in confirmation of transaction due to insufficient “gas fees” (also interpreted as fee for using the blockchain network), failure to perform sanctions screening or Know Your Transaction (KYT), whilst it is important to determine “key risks” that could impact the settlement process, one area of focus for the regulator is to factor in the settlement mechanism. In countries with regulated frameworks and existence of digital currencies (decentralized or central bank issued), the following settlement models are common:

    - A payment token for the settlement of on-chain transactions;
    - Central Bank Digital Currency;
    - Stablecoin;
    - Cryptocurrencies (e.g. the use of Ethereum public blockchain will require participants to settle in Eth)

    In the case of Pakistan, where the use of digital currencies or any other form of payment token is prohibited, the choice of the settlement mechanism or more precisely the on-chain settlement currency will depend on the blockchain architecture being used. One option could be the direct integration between the fraction issuer, custodian and the country’s payment system (e.g. RAAST). The lesser the number of intermediaries involved, the lesser the transactions costs and faster the settlement. Technologically speaking and depending on the architecture of the blockchain, it is possible to have a fully automated settlement mechanism (by use of smart contracts) provided that the inputs required by the on-chain smart contracts from the payment system of the country could be developed seamlessness.

11. As Noted in section 4.3, there are unique risks associated with deployment of smart contracts. Whilst there is a recognition that smart contracts could provide benefits of transparency, traceability, record registry or faster settlement, it is important to perform thorough review prior to deployment of smart contracts. These includes checks associated with Security, Functionality/ Compatibility, Quality, Efficiency and as well as Simulation scenarios i.e. what if analysis. In addition, it is imperative to determine the “legality of a smart contract” against the traditional ways of working for example; what is the legal status of settlement of PKR based vouchers on blockchain in exchange of fractionalized asset? Is it binding in principle just as it is conducted in traditional financial

structure? Providing clarity over such matters are important to enhance adoption within the wider ecosystem.

The existing Pakistani legal framework does not specifically deal with smart contracts and therefore neither allows nor prohibits the use of smart contracts. Based on a combined reading of the Contract Act, 1872 ("Contract Act") (which governs written and oral contracts and requires the key elements of offer, acceptance and consideration), the Electronic Transactions Ordinance, 2002 ("ETO") (which provides legal recognition to electronic communications, contracts and signatures, except for contracts relating to sale of immovable property) read with the Qanun-e-Shahadat Order, 1984 ("QSO"), a strong argument can be made that smart contracts will be legally recognized and enforced by Pakistani Courts. However, in the absence of any judicial pronouncement of the Courts in Pakistan that has dealt with this issue, a definitive view cannot be given. Therefore, for certainty purposes, it would be ideal to amend the ETO to clarify that a smart contract will be treated as an electronic contract and will therefore be binding and enforceable. However, until such time that the ETO is amended, it may be considered whether the use of the term smart contracts in the (to be) proposed Asset Fractionalization Regulations can, from a practical perspective, confer some regulatory endorsement of the use of smart contracts for the benefit of the industry.

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Notes

[i] Based on the feedback received from the SECP on 17th May 2022, EY recognizes the need to use the word "Asset Fractionalization" rather than "Tokenization" given the market perception of dealing with cryptocurrencies, however, for ease of writing the report and comparing it with the Global market (as requested in the Terms of Reference), the word "Tokenization" has been used for consistency purposes and also driven by the "Global Language" where references are often made to Tokenization in comparison to Fractionalization.

[ii] The term on-chain refers to transactions that occur on a blockchain and are reflected on a distributed public ledger.

[iii] The term off-chain refers to transactions or events that occur and exist outside a particular blockchain network. These may include real-world events or transactions as well as digital events or transactions.

[iv] An adversarial environment is characterized by the presence of malicious actors within a system or network, who undermine the system by using it in ways it was not intended for. The prototypical adversary in a DLT system is an entity that attempts to exploit the consensus rules to transfer assets without authorization, censor others' transactions, or otherwise disrupt the network. Adversaries may operate inside or outside the system. (Rauchs, et al., 2018)

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