



The ecosystem of non-fungible tokens



KPMG technology risk insights



Introduction

Non-fungible tokens (NFTs) are a type of cryptoasset that have redefined the models of ownership and methods in which companies engage with their customers.

Interest in NFTs has continued to increase, both in the crypto community and with legacy companies such as Nike and Adidas. This innovation has allowed companies such as NBA Top Shot to sell ownership of player pictures and video clips to fans and collectors leveraging blockchain technology. Additionally, NFTs have paved the way for digital art such as the Bored Ape Yacht Club, which has seen celebrities such as Eminem, Snoop Dogg, and Madonna pay upward of \$3,000,000 to own one of these rare collectibles. These assets are typically bought and sold through NFT marketplaces such as OpenSea and Rarible. This fast-growing sector saw its market cap reach \$41 billion in 2021.

NFTs have gained in popularity leading to an approximately

\$41 billion market cap.

Source: Business Insider, "NFTs ballooned to a \$41 billion market in 2021 and are catching up to the total size of the global fine art market," 2022.

What are NFTs?

NFTs were the result of several experiments to create unique digital assets on a blockchain that cannot be replicated. Broadly defined, they are unique tokens that denote ownership of a digital file or real-world asset, in which cryptography and open-source software distribute the information on a public ledger, known as a blockchain.

While the primary use case for NFTs has primarily been to reflect ownership of digital art or media, many new use cases have started to emerge. As a result, over the past year, NFT investment has accounted for the most blockchain/crypto venture capital deals, beating out Web3 and DeFi.¹

This paper will describe some of the basic characteristics of NFTs, the different participants within the ecosystem, and some of the key risks that accompany them. We'll then describe how the KPMG suite of advisory, audit, and tax services can help our clients navigate the complex challenges that cryptoassets present and how to address and mitigate these risks.

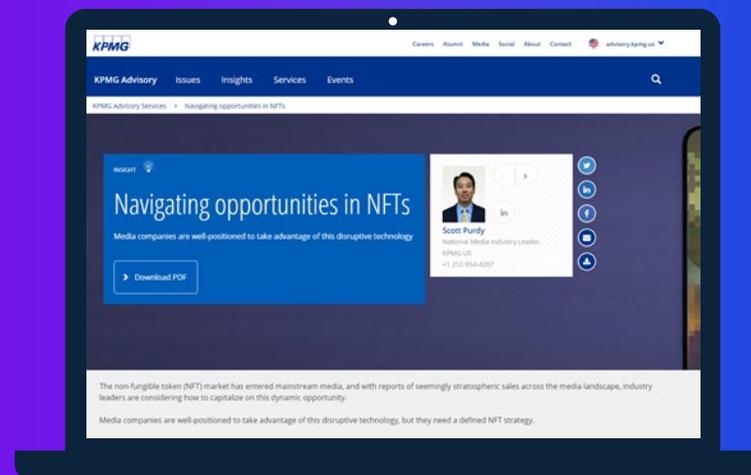
¹ theblockresearch.com



NFTs

Unique tokens that denote ownership of a digital file in which cryptography and open-source software distribute the information on a public ledger, known as the blockchain

Learn more about NFTs by reading our accompanying article [Navigating opportunities in NFTs](#)



NFT characteristics



Online experiences are changing. Blockchain and NFTs are creating a world of digital assets that are built to be interoperable throughout the web. Permissionless and immersive experiences are bringing data and value back to the individual and redistributing ownership.

Ownership

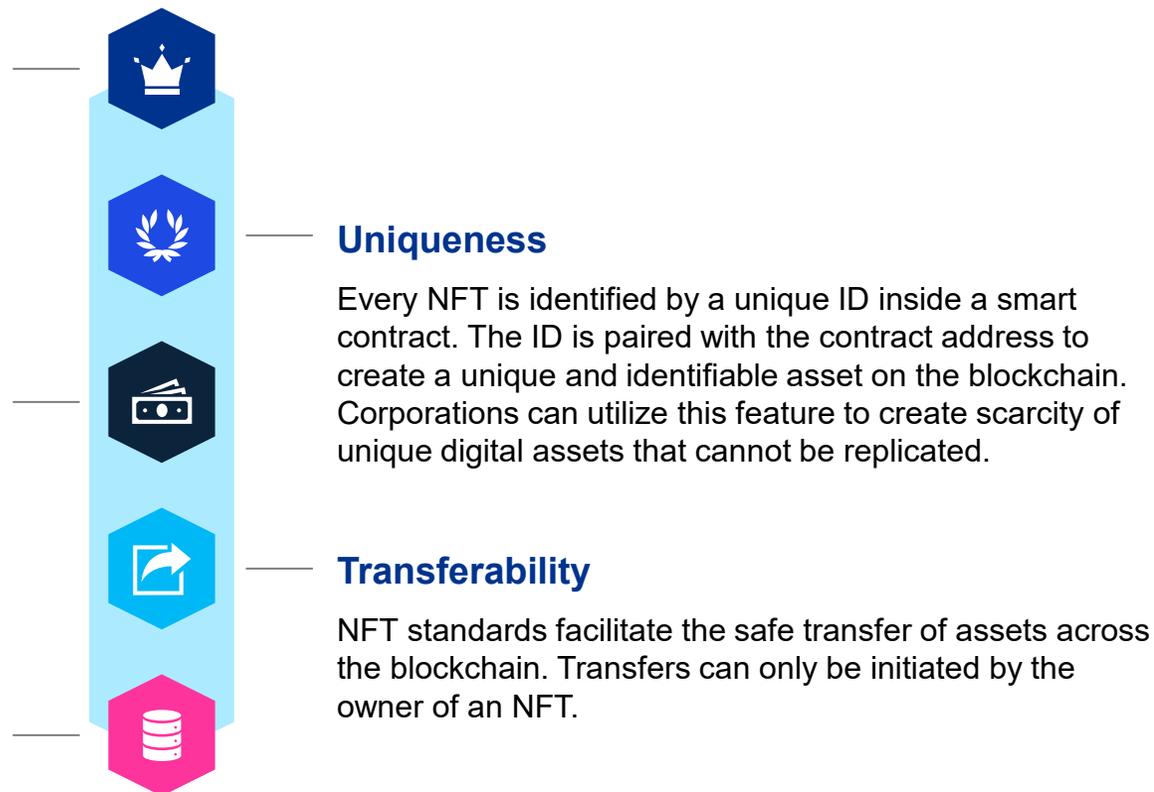
NFTs are tokens that denote ownership of a digital or physical item. NFTs can change the way content is owned, consumed, and distributed.

Revenue

NFTs create incentives for both institutional and retail markets via new monetization channels around digital assets by changing the way companies engage with their customers.

Metadata

Metadata allows the smart contract to integrate with details about assets such as image, description, and other attributes. Metadata is typically stored with a third-party intermediary, on-chain, or in a distributed file storage system such as InterPlanetary File System (IPFS).



The ERC-721 standard

Ethereum is the leading blockchain protocol for minting (creating) and transferring NFTs, and there are multiple token standards, each of which addresses different issues and use cases.

The ERC-721 standard provides the set of standards to build Non-fungible or unique tokens on the Ethereum blockchain. The standard defines a minimum set of attributes or criteria that a smart contract must implement to allow unique tokens to be managed, owned, and traded. Metadata and other supplemental functions can also be written into the code.

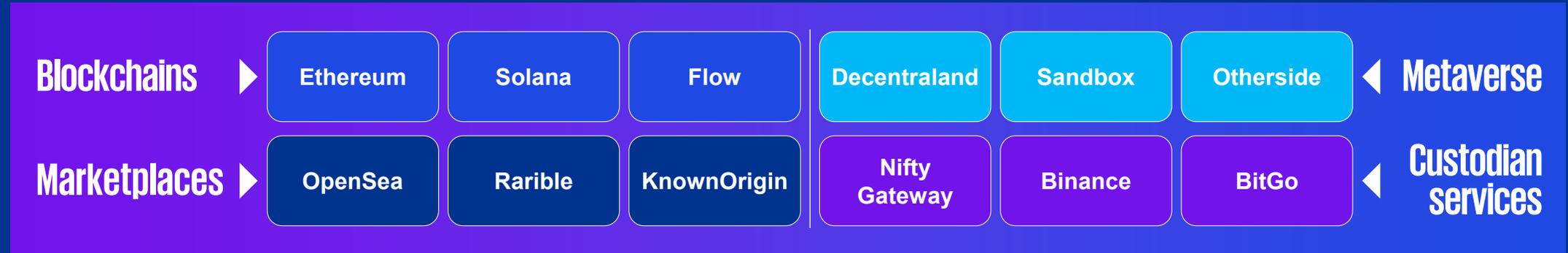
- ◆ ERC-721: A class of unique tokens
- ◆ ERC-1155: Manage multiple token types, including ERC-20 and ERC-721
- ◆ Soulbound Tokens: Nontransferable unique token IDs



The ERC-721 standard describes how to build unique or Non-fungible tokens on the Ethereum blockchain. The smart contract standard allows for protocol implementation around ownership, uniqueness, revenue, transferability, and metadata.

Participants in the NFT ecosystem

The NFT ecosystem has evolved to include a number of different participants.



Despite Ethereum’s ERC-721 standard being the most widely used, NFTs can be deployed on top of other layer 1 and layer 2 protocols via smart contracts. By definition, smart contracts are computer programs stored on a blockchain that automate the rules and interactions via source code. Since smart contracts are stored on a blockchain, they inherit a number of blockchain properties such as immutability and decentralization.

Protocols such as Solana, Flow, and Polygon are starting to gain traction in the marketplace. These protocols differ by their degree of decentralization, scalability, and security. The Blockchain Trilemma, termed by Ethereum founder Vitalik Buterin, describes the challenges faced in optimizing these three attributes when thinking about blockchain infrastructure. As seen in the next slide, some blockchains sacrifice decentralization for lower transactions fees and faster throughput.

Protocol considerations

Different protocols are being used by both retail users and institutions to create and manage NFTs based on the trade-offs that each chain provides.

	Ethereum	Solana	Flow	Polygon
General	Layer 1 decentralized, open source with smart contract functionality	Layer 1 decentralized, open source with smart contract functionality	Layer 1 decentralized, open source with smart contract functionality	Layer 2 scaling solution that supports Ethereum virtual machines
Total NFT sales (as of July 29)	\$28 billion	\$2.5 billion	\$1 billion	\$452 million
Transaction times (as of July 29)	15–25 transactions per second	3,333 transactions per second	100 transactions per second	7,000 transactions per second
Transaction costs (as of July 29)	Average \$2.45	Average \$0.00025	Average \$0.0003	> \$0.01
Nodes (as of July 29)	Average 9,000	Average 9,000	Average 400	100
Programming language (as of July 29)	Solidity	C or Rust	Cadence	Go
Consensus mechanism/algorithm (as of July 29)	Proof of Work	Proof of History	Multirole Architecture	Modified Proof of Stake
Notable projects (as of July 29)	Bored Ape Yacht Club	Solana Monkey Business	NBA Top Shot	Zed Run

NFT risk considerations

There are many challenges facing organizations as they implement NFTs across their services. NFT risks are very similar to those of traditional cryptoassets such as bitcoin and Ethereum given that the assets reside on a blockchain and are controlled through private keys. Companies will need a comprehensive framework and crypto-specific capabilities to introduce NFTs into their existing business model.



Digital rights

Defining who has ownership of the rights to mint and sell the IP in an NFT format



Cyber protection

Working with information technology (IT) to protect the NFTs and their supporting platforms to prevent hacking and unauthorized use



Tax and compliance

Managing and adhering to the regulatory compliance of the cryptocurrency world



Marketing

Promoting/advertising the organization's NFTs across social media channels and in the digital marketplace



Governance

How NFT rights, licensing, purchases, and sales are monitored and governed across and over/customer community to protect and preserve the organization's brand

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Financial reporting

Defining the reporting needed, including royalty reporting to artists when NFTs are sold to other users



Contracting

Defining the future contractual requirements and rights to enable NFT minting/selling



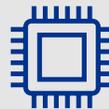
Data

Defining what data is needed to support the NFT initiative



Talent

Attracting the talent needed to support and maintain the NFT lifecycle within the organization

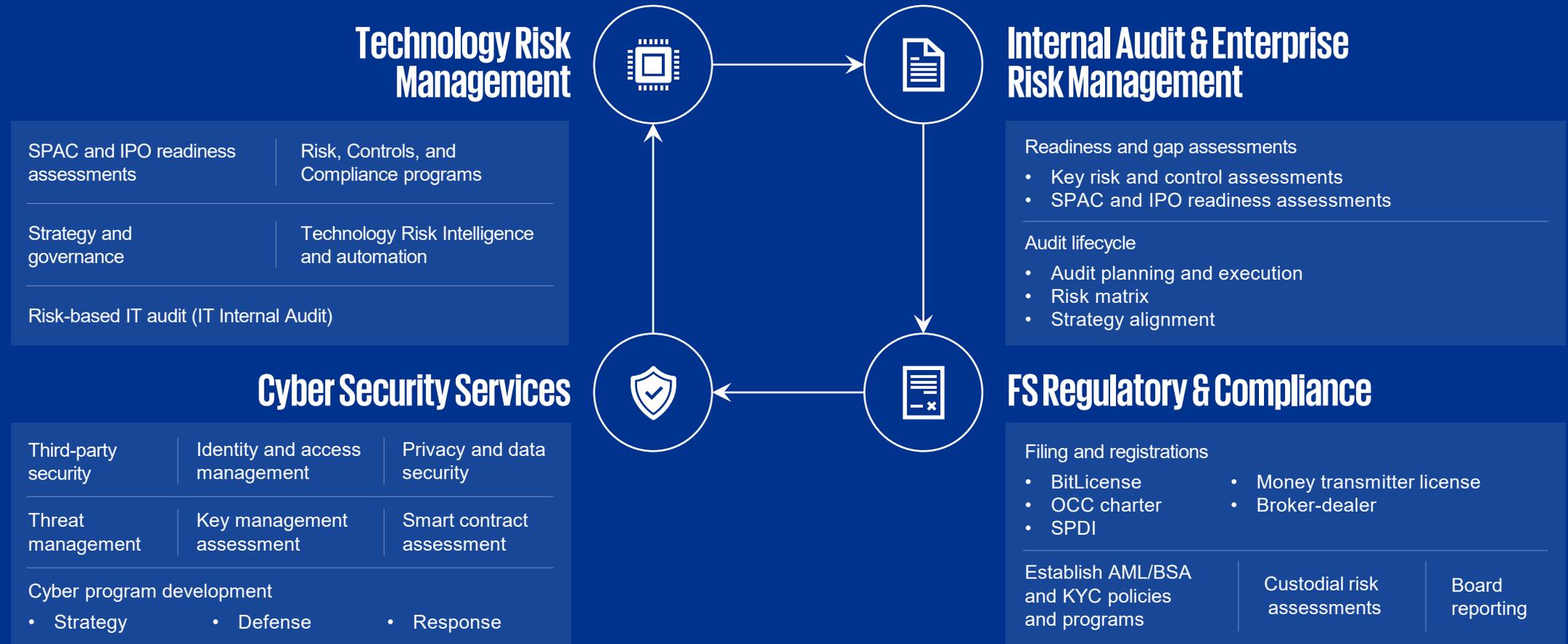


Enabling technology

Defining the platforms, internally and externally, to support NFTs

How KPMG can help

KPMG offers a broad set of services to help enable our clients to identify, manage, and mitigate risks posed by the adoption of NFTs. Whether it be legacy companies that are routinely subjected to regulatory compliance activities or start-ups looking to build out their risk management framework, our extensive experience in this space can accelerate your company's crypto strategy and help ensure that risk is aligned with business objectives.



Contact us

For more information, visit read.kpmg.us/TRM.



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KPMG Technology Risk Modernization Centers of Excellence

The threat landscape in today's volatile environment continues to evolve shifting attack vectors and variable risks. As digital transformations accelerate in business functions at a record pace, our Technology Risk Management network has developed the KPMG Technology Risk Modernization to provide insights and help organizations evolve their capabilities to respond to digital acceleration, cloud transformation, and emerging technologies.

Learn more at:
visit.kpmg.us/TRMCOE



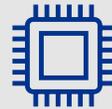
Cryptocurrency and NFTs



Low Code Platforms, Digital Process Automation, and Quantum Computing



Governance and Observability for DevSecOps



APIs and Microservices



5G and Connected Devices (IoT)



Cloud Technologies and Governance





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