

Non-Fungible Token Overview Report

Background on NFTs and the emerging digital asset economy

Presented by:



PENROSE

On Behalf of:



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Table of Contents

Background on NFTs and the emerging digital asset economy

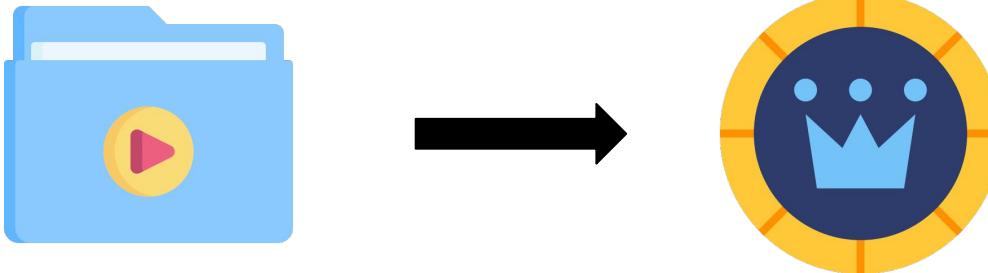
- | | | | |
|----|------------------------------|----|---|
| 01 | Definition & Taxonomy | 06 | Use Cases: Gaming Art Sports DeFi |
| 02 | Emergence & History Timeline | 07 | Key Players & Marketplaces |
| 03 | How NFTs work | 08 | Challenges to Adoption |
| 04 | Technical Components | 09 | Appendix & Resources |
| 05 | Market Overview | | |

NFTs Defined

non-fungible token (NFT) noun

non-fun·gi·ble token | \,nän-'fən-jə-bəl-'tō-kən \

1 a unique digital identifier that cannot be copied, substituted, or subdivided, that is recorded in a blockchain, and that is used to certify authenticity and ownership of a specific digital asset (such as the original version of an online photo or video).

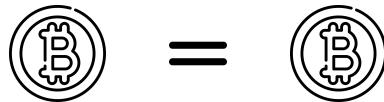


NFT Taxonomy

fungible adjective

fun·gi·ble | \ 'fən-jə-bəl \
1 being something (such as money or a commodity) of such a nature that one part or quantity may be replaced by another equal part or quantity in paying a debt or settling an account. 2 capable of mutual substitution.

\$1 USD = \$1 USD



non-fungible adjective

non·fun·gi·ble | \ ('nän-fən-jə-bəl \
1 being something (such as a painting or a concert ticket) that is not interchangeable due to the unique properties that makes them radically different from something else, even though they may look similar.



History of NFTs



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Why NFTs came into existence



As the world becomes more digitized, there is a need to replicate the properties of physical items - scarcity, uniqueness, and proof of ownership.



Non-fungible digital assets have been around since the beginning of the internet,



Domain Names



Event Tickets



In-Game Items



Social Media Handles



NFTs solve for digital ownership.

The Origin of NFTs: Colored Coins

The earliest predecessors of non-fungible tokens were colored coins in March 2012 (Steinwold, 2019). These were very small units of Bitcoin which were “colored” with specific attributes coded into metadata using Bitcoin’s scripting language. In this way, units as small as one satoshi (0.00000001 BTC) could represent any asset you can imagine. Colored coins allowed for not just the creation of NFTs, but any asset. Although the concept of colored coins was very promising and potentially powerful, they had major flaws and roadblocks:

1. The Bitcoin network didn’t officially support colored coins. Hence, it was up to wallet providers to recognize the existence of colored coins.
2. The minimum transaction size for a Bitcoin transaction back then was patched to be 5,430 satoshis (0.000543 BTC), which was much too large for the implementation of colored coins.

The creation of NFT standards in 2015 took away much of the purpose of colored coins.

Steinwold,
<https://medium.com/@Andrew.Steinwold/the-history-of-non-fungible-tokens-nfts-f362ca57ae10>

NFT Standards

Standards allow developers to build software that's compatible with other software. Think of these standards like Lego: since all of the different pieces fit together in the same ways, anyone can use them to build many different things. The first standard available was the Ethereum ERC721 standard. Ethereum was a pioneer in the NFT space and is the most widely used blockchain platform to build NFTs. Other protocols, such as Solana and Tezos, have arisen that bring other standards into the NFT space.

ERC721

Pioneered by CryptoKitties, ERC721 was the first standard for representing non-fungible digital assets. ERC721 is an inheritable “solidity” smart contract standard, meaning that developers can easily create new ERC721-compliant contracts by importing it from the OpenZeppelin library.



Ethereum

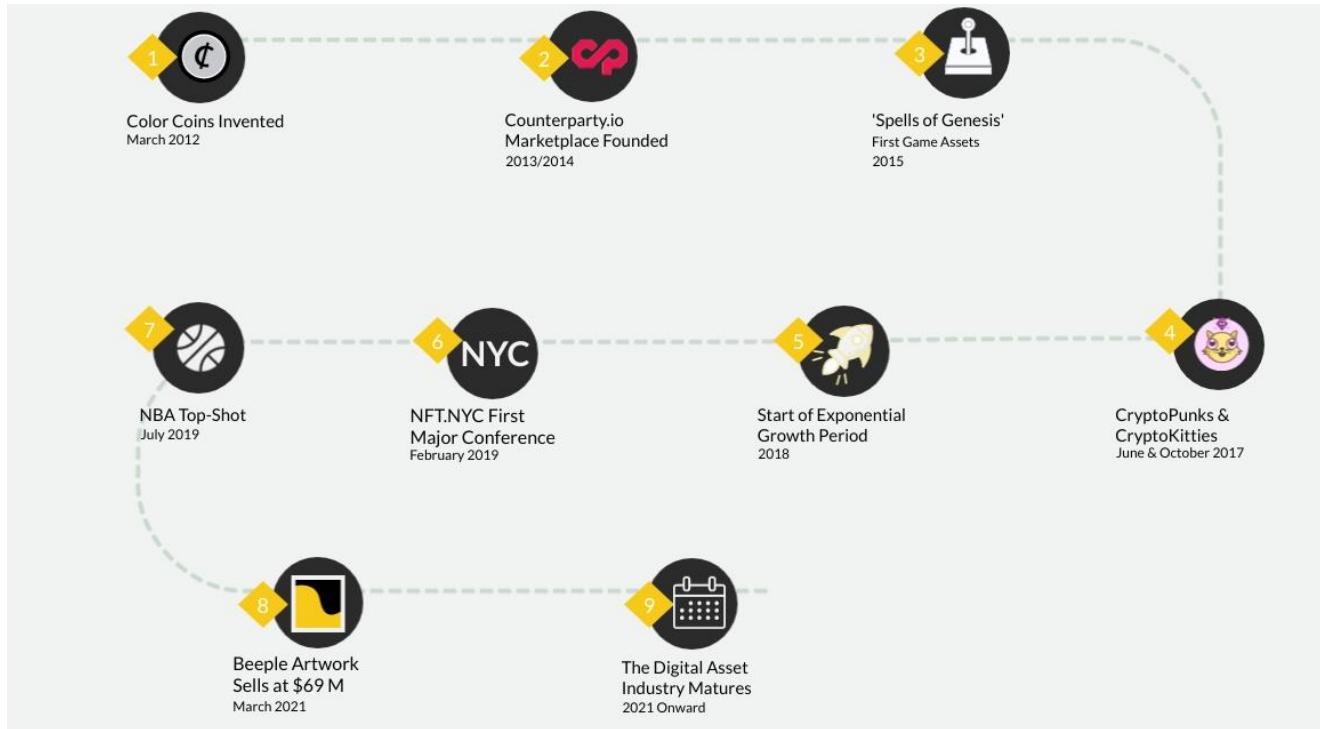


Solana



Tezos

History of NFTs



Technical Components

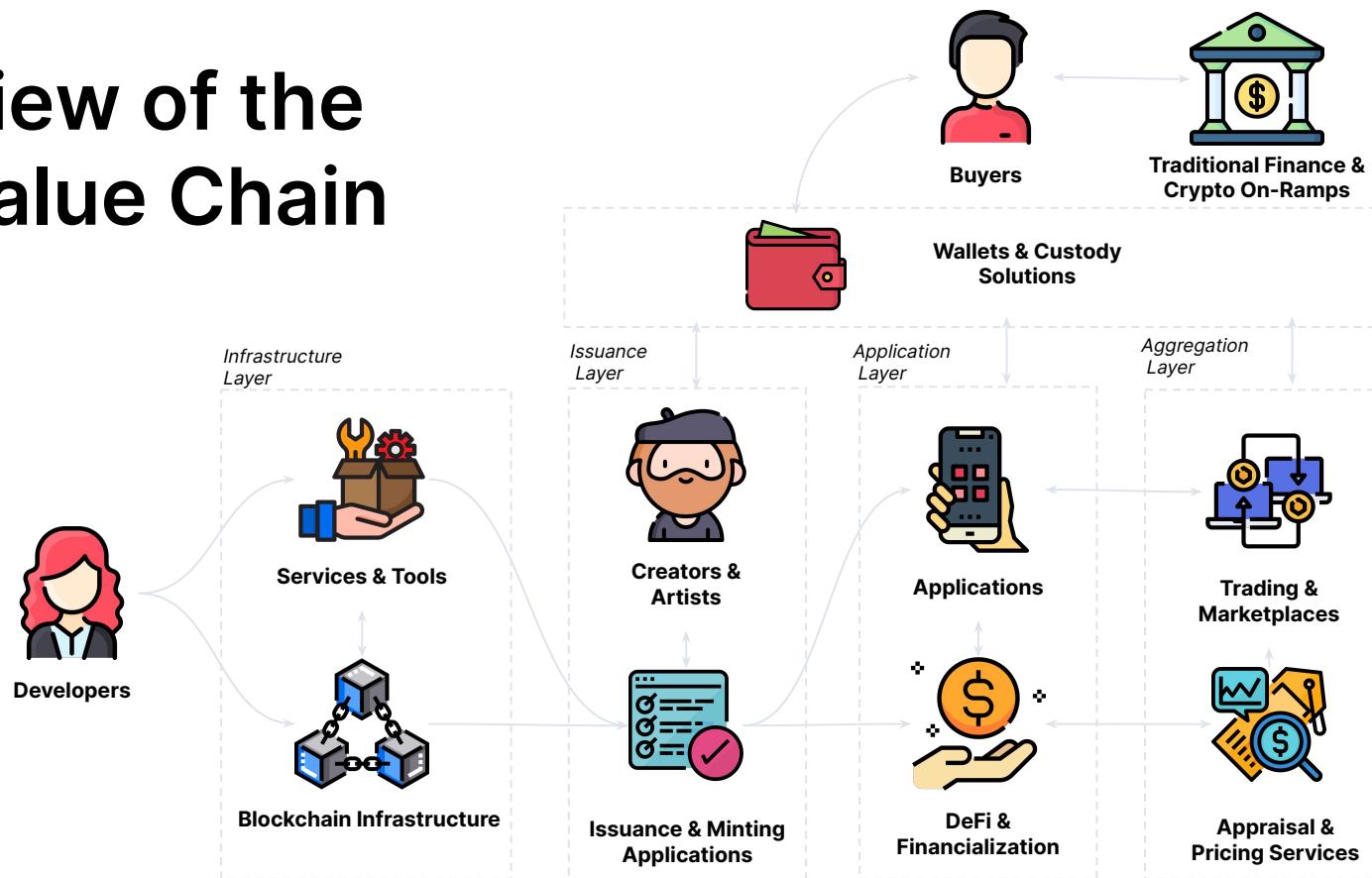


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Overview of the NFT Value Chain



Core Properties of NFTs



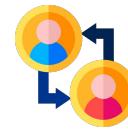
Programmable

Like all traditional digital assets and tokens built on smart contract blockchains, NFTs are fully programmable.



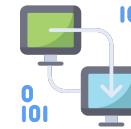
Unique

Each NFT contains code information that describes the properties of each token that makes them different to others.



Peer-to-Peer

Trading NFTs can happen peer-to-peer without needing platforms that charge high fees.



Interoperability

NFTs are built on standard frameworks that allow for NFTs to be transferred between applications with relative ease.



Secure

Once a transaction is confirmed, it's nearly impossible to manipulate that data to "steal" ownership.



Rare

NFTs are provably scarce which ensures they remain desirable over time, and that supply does not overtake demand.



Traceable

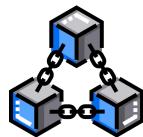
Each NFT has a record of transactions on-chain, from when it was created, including every time it changed hands. This means each token can be verifiably authentic, and not a counterfeit.



Verifiable Ownership

Verifiable proof of ownership that cannot be modified and new NFTs cannot simply be copy-and-pasted into existence.

Overview of Technical Components



Blockchain

NFTs exist on blockchain networks that certify that they are unique and non-interchangeable.



Smart Contracts

Digital contracts where the creation and transfer agreement terms for the NFT are set in code and automatically executed.



Addresses & Transactions

Blockchain addresses are used to transact NFTs between parties. The address is a unique identifier to send and receive the NFT.



Metadata

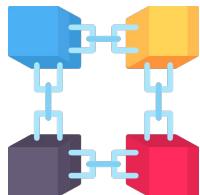
Metadata is the data that describes the properties of the NFT. It is stored within the NFT by linking to the source of where this data is stored.

NFT Metadata

Metadata provides descriptive information for a specific NFT ID. This can include attributes such as size, artist name, and scarcity.

Metadata Storage

On-Chain



- Metadata permanently resides with the NFT
- The metadata can change in accordance with on-chain logic
- On-chain logic can interact with the metadata

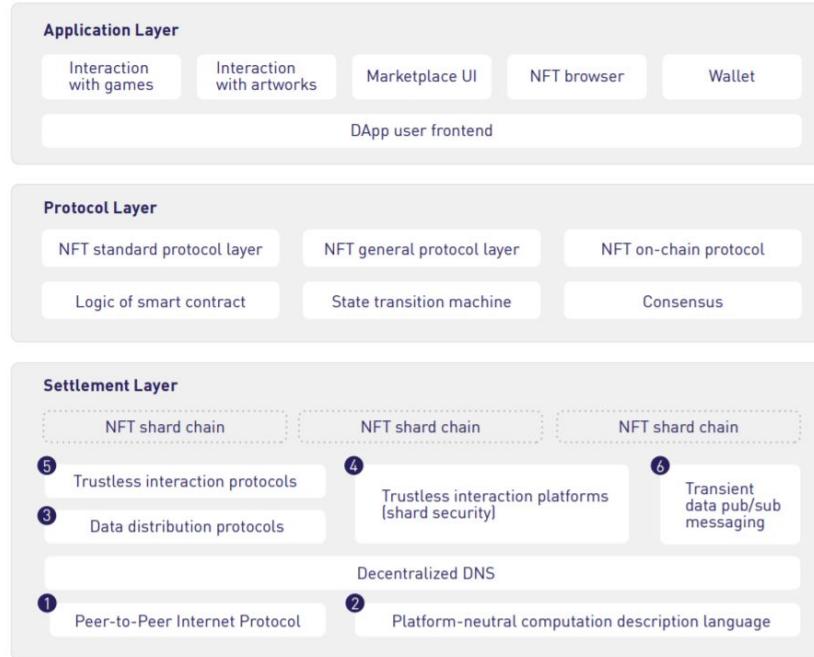
Off-Chain

- Most projects store their metadata off-chain due to the current storage limitations on the blockchain
- Store at a public URL
- Store in centralized servers such as InterPlanetary File System (IPFS)



NFT Tech Stack

NFT Tech Stack



NFT Industrial Development Report, 2021. Retrieved from:
https://www.cabin.vc/img/NFTIndustrialDevelopmentReportQ12_021-EN.pdf

How NFTs work

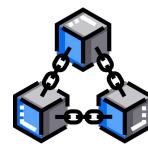
The Non-Fungible Token Process:



Creator develops product.
Creators retains copyright & right to produce.



Creator opens crypto wallet,
buys currency to pay marketplace fees.



Digital object “minted.”
Assigned unique digital token (NFT). Historical data ownership attached.



Listed for sale on marketplace.



Buyer purchases NFT with cryptocurrency.
Buyer owns NFT and “owns” the digital asset.

Creating NFTs: Verification



A NFT needs to be confirmed as an asset on the blockchain.

The transactions that confirm the creation of NFTs need to be added to a block and "immortalised" on the chain.

The NFT owner's account balance must be updated to include that asset. This makes it possible for it to then be traded or verifiably "owned".

The block needs to be confirmed by everyone in the network as "correct".

The role of miners in creating NFTs: Miners let the rest of the network know about your NFT and who owns it. This means mining needs to be sufficiently difficult, otherwise anyone could just claim that they own the NFT you just minted and fraudulently transfer ownership. There are lots of incentives in place to make sure miners are acting honestly. Once an NFT is minted by a creator, miners verify its properties on a given block of a blockchain.

Creating vs. Owning NFTs

Own

If you *own* a NFT (Ethereum, 2021):

- You can easily prove you own it.
- No one can manipulate it in any way.
- You can sell it, and in some cases this will earn the original creator resale royalties.
- You can hold it forever, knowing your asset is secured by your wallet.



Create

If you *create* a NFT (Ethereum, 2021):

- You can easily prove you're the creator.
- You determine the scarcity.
- You can earn royalties every time it's sold.
- You can sell it on any NFT market or peer-to-peer. You're not locked in to any platform and you don't need anyone to intermediate.



Purchasing NFTs

What do you need to purchase an NFT?

- Digital wallet
- Currency - fiat or cryptocurrency (depending on the marketplace)
- User account for the marketplace

Payment with Cryptocurrencies

NFT transactions usually require the use of cryptocurrency. Popular marketplaces that only accept cryptocurrency are OpenSea and SuperRare.

Payment with Traditional Fiat Currency

Popular marketplaces that accept traditional fiat currency in addition to cryptocurrencies include Nifty Gateway and NBA Top Shot.



Circle is a platform that launched to help NFT marketplaces accept credit card payments.



Challenges to accepting fiat currencies

On- and Off-Ramps

NFT marketplace and storefront providers face the challenge of efficiently building on and off-ramps for their applications. Many traditional payment processors won't directly facilitate NFT transactions, forcing buyers to purchase cryptocurrency before being able to purchase an NFT.



Fraud Prevention

Regulators have concerns that NFTs can be a conduit for money laundering and illicit financial activities, similar to how traditional art has been – and continues to be – used as a medium for money-laundering and tax evasion. NFT trading platforms will likely need to implement Know Your Customer (KYC), Anti-Money Laundering (AML) and Counter Terrorist and Proliferation Financing (CTF/PF) measures.

Custody of NFTs

A crypto wallet is an essential tool for holding NFTs, cryptocurrencies, and interacting with blockchains. There are two types of crypto wallets: Custodial and Non-Custodial wallets.



Custodial

A custodial service owns the private key to your wallet and holds your assets in custody. This third party is responsible for keeping your private keys safe. If you forget your password, customer support can help you gain access back to your wallet. Many wallets are custodial including Coinbase, Kraken, or Gemini.



Non-Custodial

Users have complete control over their wallets and digital assets. Users can trade their NFTs directly from their wallets. If a user loses their wallet keys or backup seed phrase, the wallet and funds are lost.

Blockchain.com and MetaMask are popular examples of non-custodial wallets.

Market Overview



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Benchmarks



Trading Volume & Value



Active Wallets - Unique Buyers
& Sellers



Primary & Secondary Sales
- Value and Volume



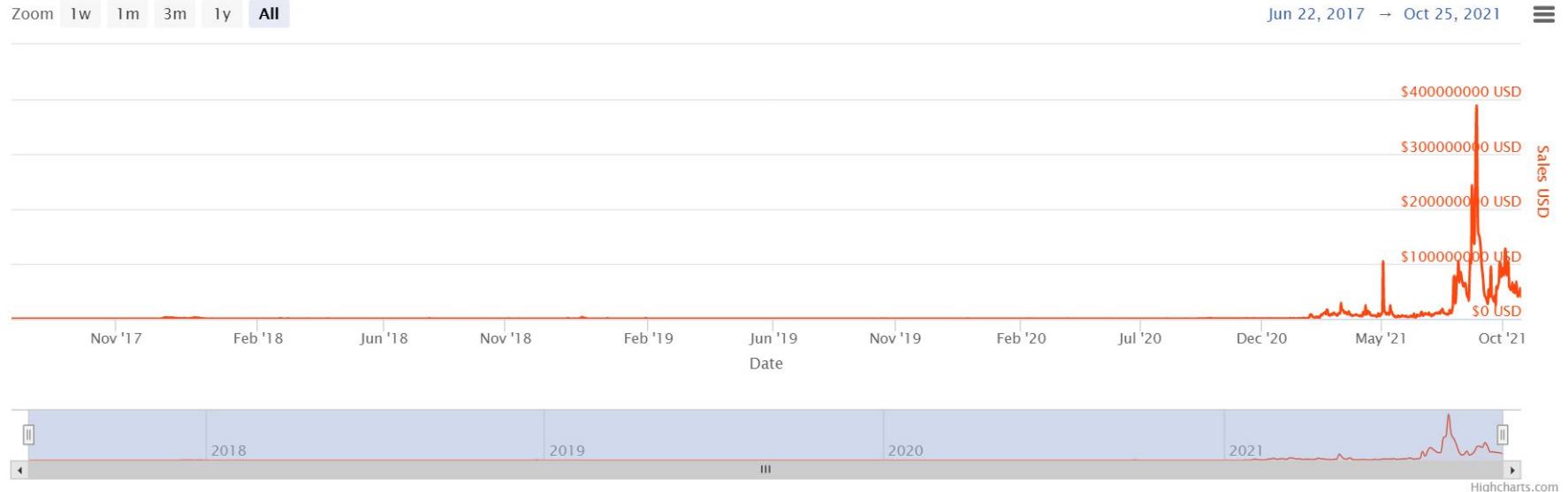
Venture Capital Investment

Benchmarks

Metric	QoQ growth Q3 TD vs. Q1 2021 (as of Oct 24, 2021)	YoY Growth 2021 TD vs. 2020 (as of Oct 24, 2021)
Trading Volume	487%	202%
Trading Value	1,038%	12,901%
Unique Wallets	415%	370%
Unique Buyers	413%	477%
Unique Sellers	391%	327%
Primary Sales Volume	380%	213%
Primary Sales Value	423%	5,253%
Secondary Sales Volume	658%	191%
Secondary Sales Value	1,399%	20,563%

Nonfungible.com

Value of NFT Sales

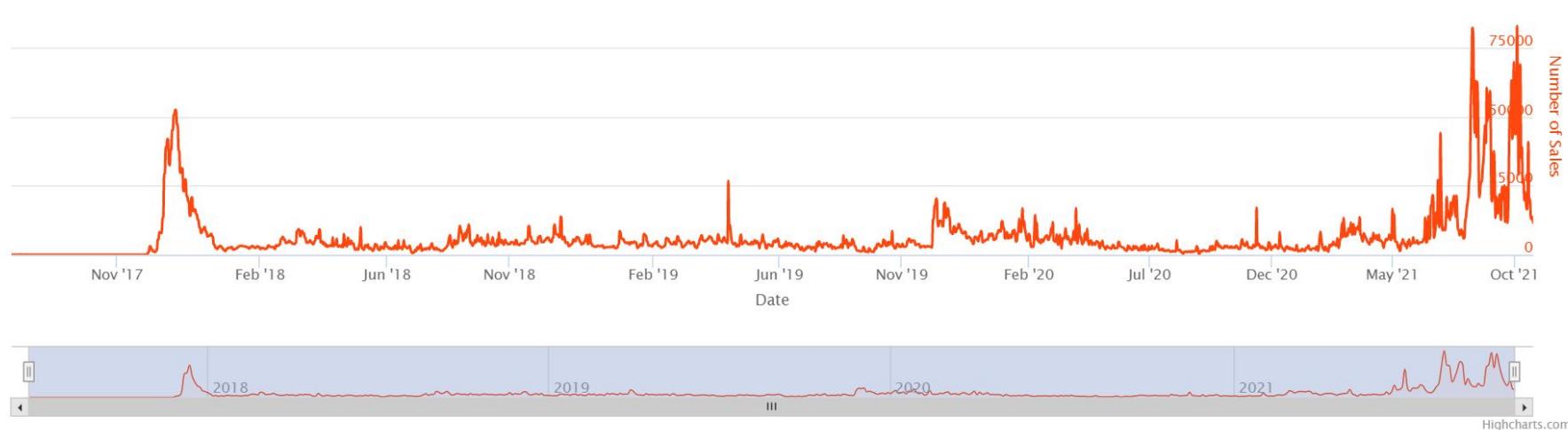


<https://nonfungible.com/market/history>

NFT Transaction Volume

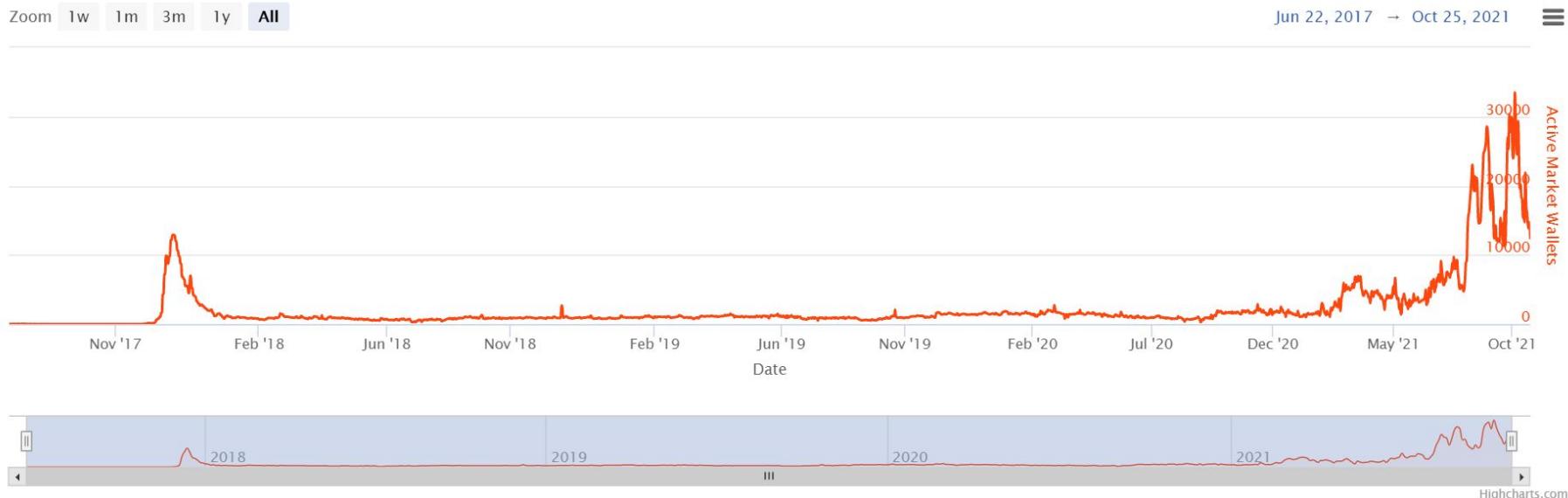
Zoom 1w 1m 3m 1y All

Jun 22, 2017 → Oct 25, 2021



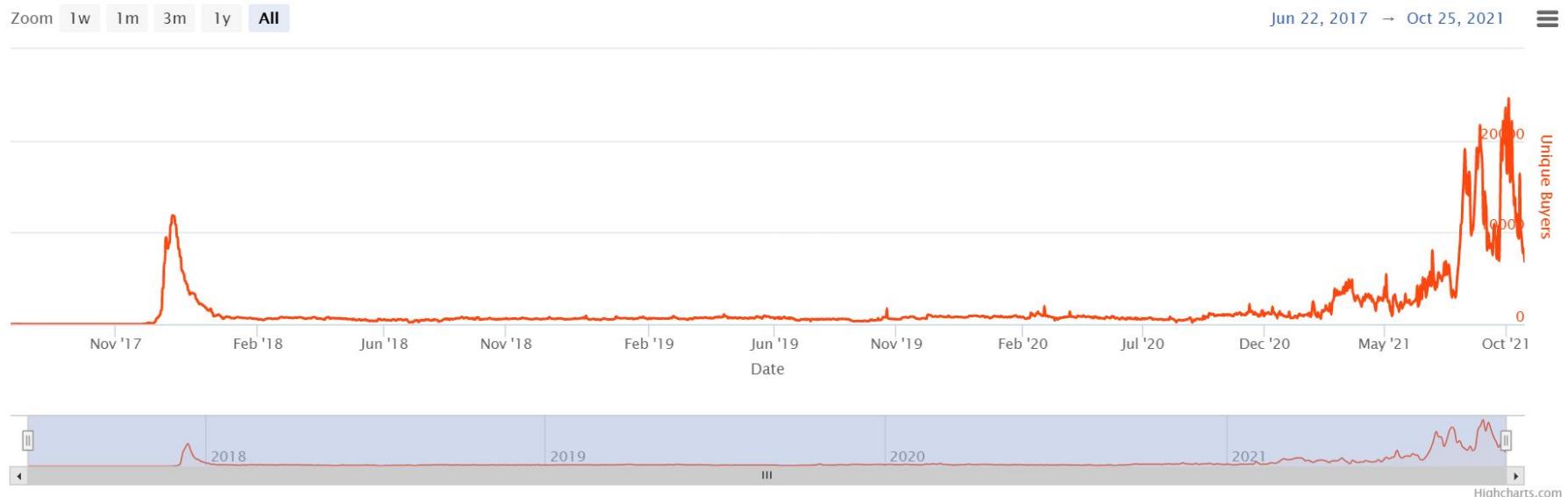
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Active Wallets Buying or Selling NFTs



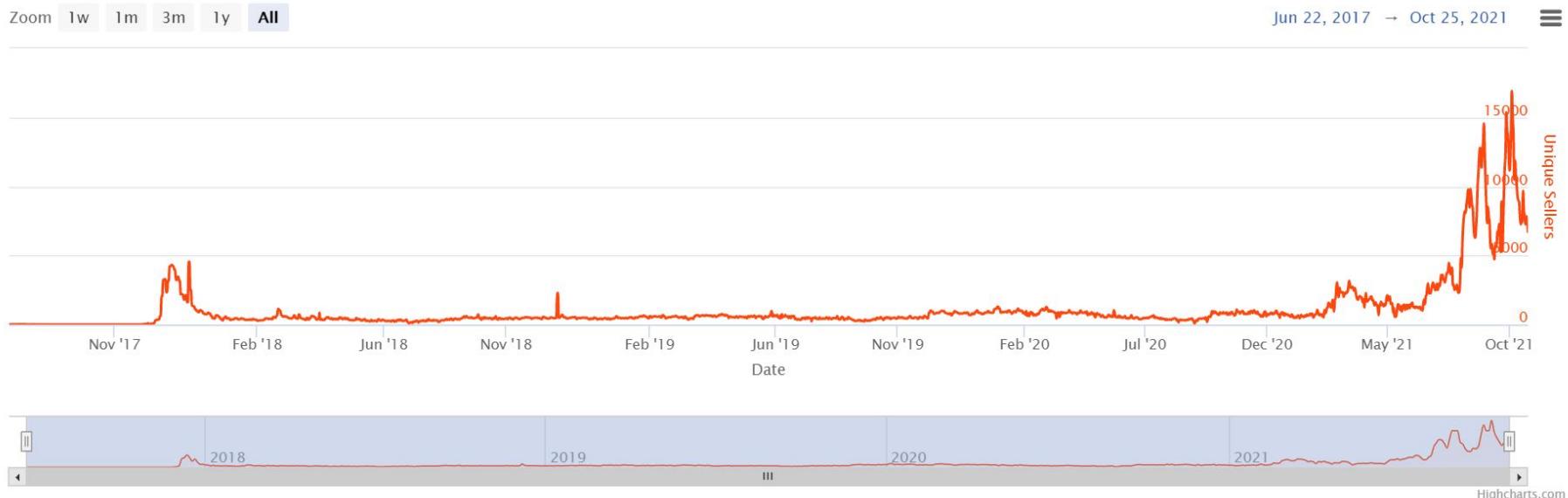
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Unique Buyers



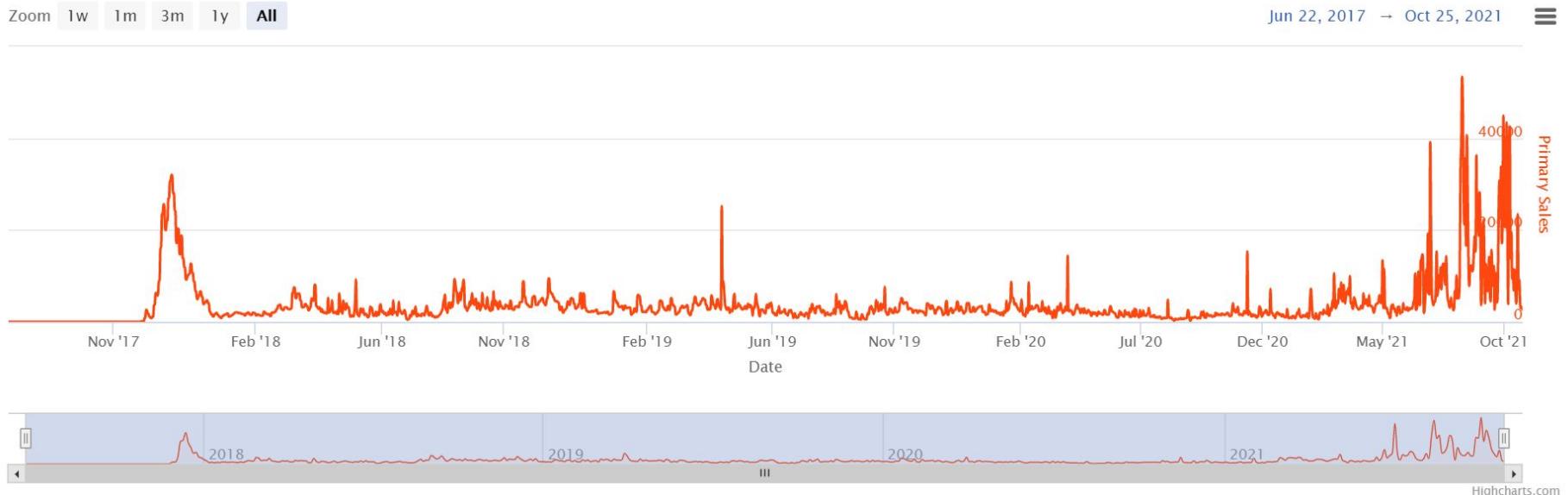
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Unique Sellers



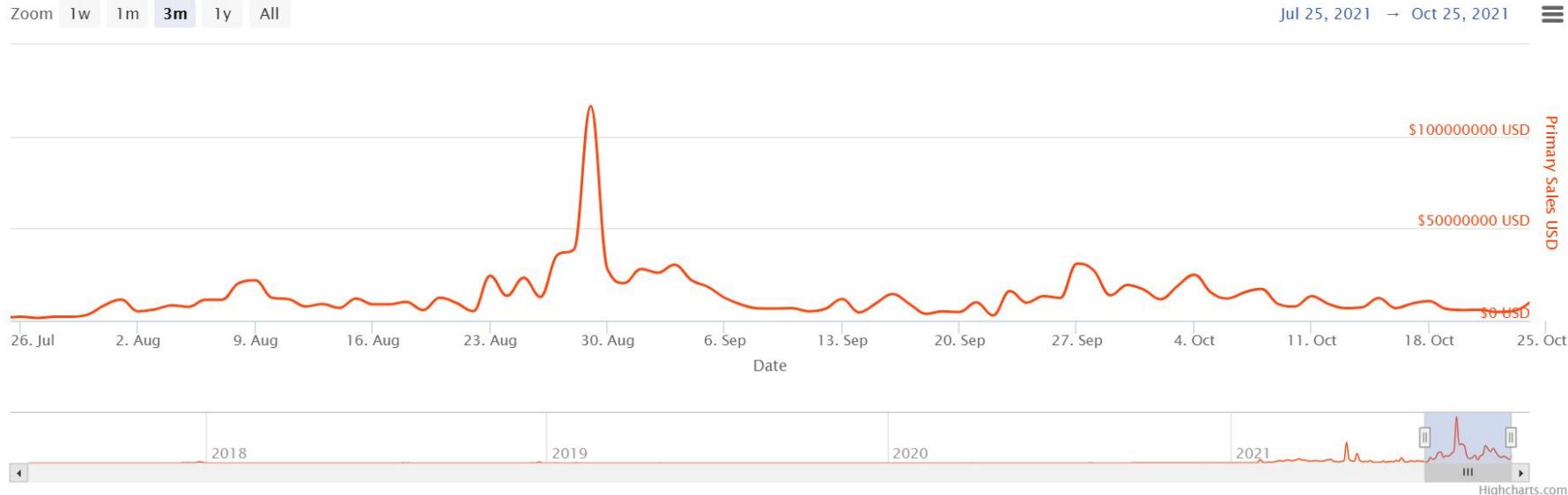
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Primary Sales of NFTs: Volume



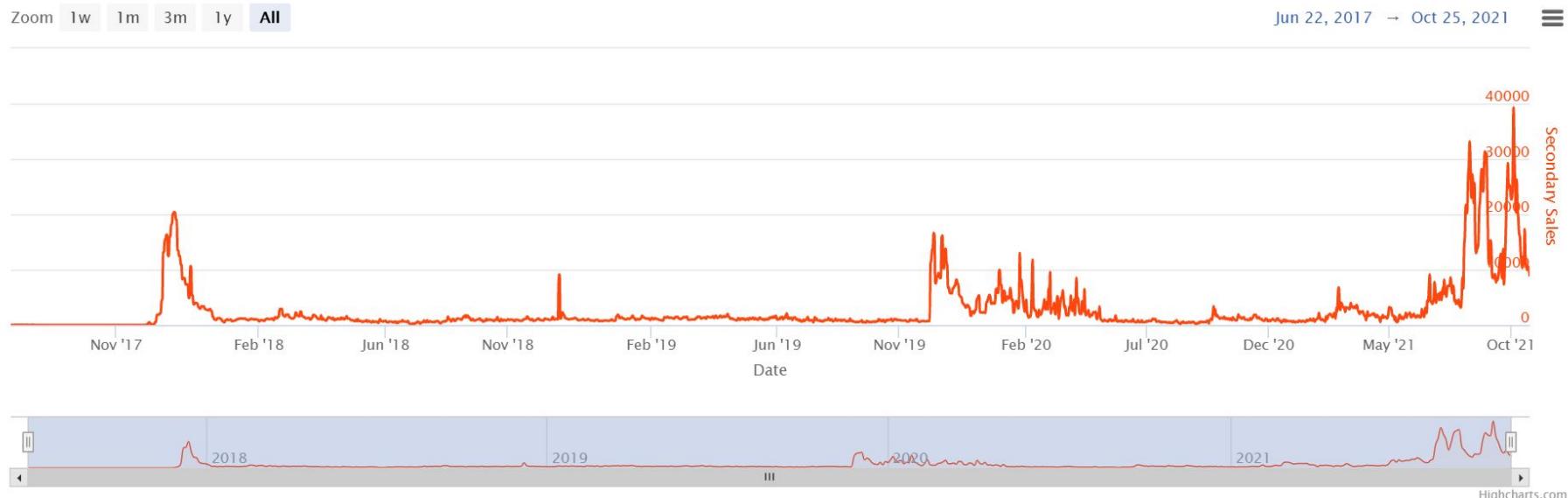
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Primary Sales of NFTs: Value



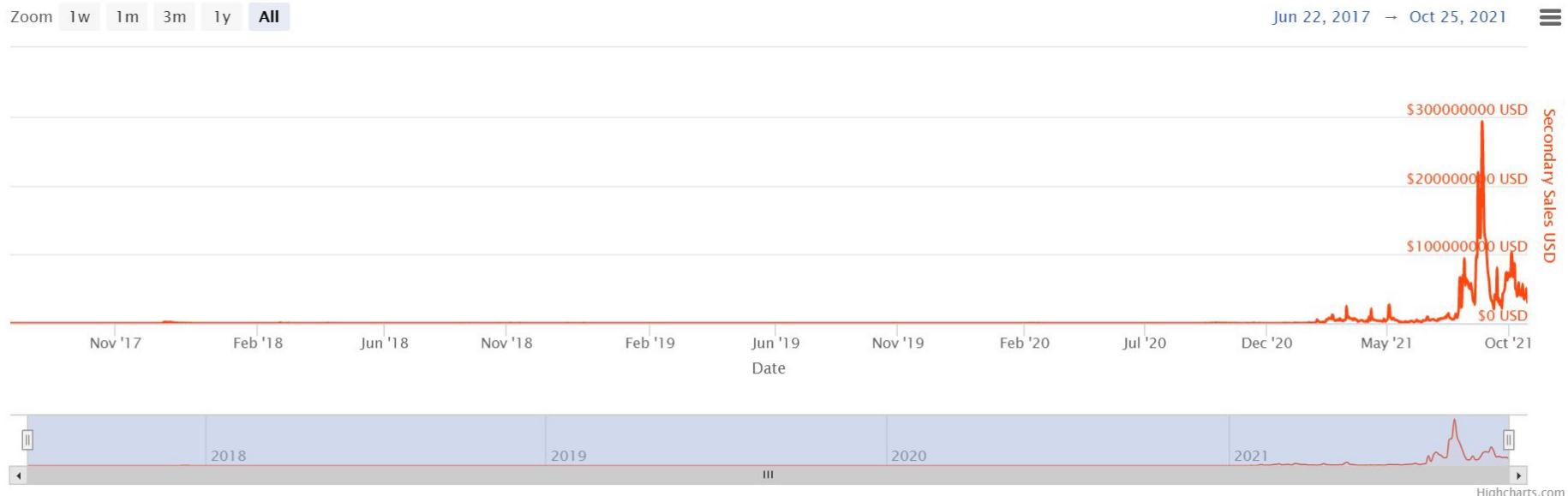
<https://nonfungible.com/market/history>

Secondary Sales of NFTs: Volume



<https://nonfungible.com/market/history>

Secondary Sales of NFTs: Value



<https://nonfungible.com/market/history>

Top Projects (By Value)

Name	Volume 7d (USD)	Last 7d sales	Volume all time (USD)	All time sales
 CryptoPunks	\$32,985,811	66	\$1,508,751,569	19,014
 Art Blocks	\$12,984,430	3,507	\$1,163,250,208	234,362
 Bored Ape Yacht Club	\$31,480,258	610	\$1,070,405,047	67,332
 Meebits	\$1,455,794	85	\$303,862,436	22,475
 SuperRare	\$6,009,896	186	\$171,880,536	26,185
 CyberKongz	\$7,426,700	441	\$154,386,163	27,392
 VeeFriends	\$1,837,885	45	\$136,048,885	11,760
 Axie Infinity			\$110,517,304	614,531
 Foundation	\$3,676,279	1,364	\$94,486,021	35,104
 Hashmasks	\$612,419	87	\$92,103,149	31,631

<https://nonfungible.com/market/history>

Top Projects (By Volume)

Name	Volume 7d (USD)	Last 7d sales	Volume all time (USD)	All time sales
 CryptoKitties	\$105,231	727	\$55,374,005	2,903,489
 Axie Infinity			\$110,517,304	614,531
 Gods Unchained	\$106	2	\$22,255,226	573,667
 Sorare	\$479	2	\$77,776,327	423,668
 Ethereum Name Service	\$1,159,421	6,743	\$19,565,224	277,842
 Art Blocks	\$12,984,430	3,507	\$1,163,250,208	234,362
 0xUniverse	\$15	5	\$728,392	166,601
 Blockchain Cuties	\$1,414	91	\$845,456	149,105
 Decentraland	\$879,743	176	\$79,617,663	127,378
 The Sandbox	\$934,110	353	\$61,379,519	115,413

<https://nonfungible.com/market/history>

Quantifying the NFT Ecosystem

Quantifying the NFT market has proved challenging due to some ill-intentioned behaviours of some actors in the NFT ecosystem.

Wash Trading & Sham Transactions

Wash trading in the context of NFTs is the purchase or sales made not for the sole purpose of buying and selling NFTs.

The result of wash trading includes:

- The illusion of artificial demand
- Creation of hype or false demand
- Artificial inflation of public metrics

It is suspected that there has been an increase of wash trading and sham transactions in the NFT ecosystem. This has impacted the reliability of statistics and metrics available (nonfungible.com, 2020).

Use Cases



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Gaming

NFTs are significantly improving the gaming experience for players and developers alike.

Play-to-Earn

NFTs in video games allow players to monetize their time ('play to earn'). Players obtain unique NFTs as digital assets for fulfilling in-game objectives. These NFTs are scarce and desirable, and can be sold to other players. Players can also be granted NFTs that represent wins, levels achieved, and other in-game milestones that serve as digital memories.



Axie Infinity is driving mainstream adoption of the play-to-earn model for games and has more than 350K daily players (Hoogendoorn, 2021).

Ownership of In-Game Items

Players and artists can create in-game digital assets such as unique swords, skins, or avatars which can be sold and traded to other players, and fueling in-game economies as a result..



CryptoKitties

An in-game NFT sold for \$170K.

Multifunctional & Transferable NFTs

Players can create a single digital identity, built as an NFT, that can be used across all games. For example, an NFT may be used as a passport or as an avatar that can be transferred and used on multiple platforms.

New Forms of Funding

Limited edition NFTs could fund game development. Players who own assets become more invested in the game and potential promoters, bringing in more players and reducing customer acquisition costs as a result.



Alien Worlds held a NFT card pack sale and raised over \$250K USD in two days (Thurman, 2020).

Art

NFTs allow artists to monetize their artwork, reach a global audience, and protect their copyright. NFT art is art, physical or digital, that has been tokenized as a unique asset on a blockchain.

Programmable Art

Artists can deploy a set of instructions for how their finished media should be rendered. These instructions can be modified via layer tokens, with abilities like state change, positional movement, or color alteration.



In February 2021, digital artist, Beeple, sold their crypto art for \$69.3M USD.

Secondary Sales

NFTs allow artists to receive royalties every time their artwork changes hands.



KnownOrigin is one of many digital art marketplaces to buy and sell digital art.

Virtual Galleries

Virtual reality galleries are being created to allow artists, collectors, and viewers to engage with one another from anywhere in the world and showcase art that is fundamentally scarce and unique, but accessible to anyone for viewing.



The world's oldest auction house, Sotheby's, created a virtual gallery in Decentraland.

Decentralized Finance (DeFi)

NFTs are an additional asset mix added to the growing decentralized finance (DeFi) ecosystem. The ability to stack NFTs and smart contracts will allow for the invention of novel financial products.

NFT-Backed Loans

NFTs can be used as collateral to secure loans. Lenders can earn income through interest fees paid by borrowers.



NFTfi is a marketplace for NFT collateralized loans. Users can put NFTs up as collateral for a loan or offer loans to other users on their NFTs.

Fractional Ownership

NFTs can be created to represent fractions of an asset so people can gain ownership without having to buy the entire asset.



NFTX facilitates fractional ownership of Non-Fungible Tokens (NFTs).

Automated Market Maker

AMMs allow digital assets such as NFTs to be traded without permission and automatically by using liquidity pools instead of a traditional market of buyers and sellers.



Uniswap is an automated market maker that is issuing non-fungible tokens (NFTs) to cryptocurrency wallets that lend assets to its market making services.

Sports

Sports teams and organizations have the opportunity to design and produce the next generation of collectibles using NFTs.

Fan Engagement

Similar to how NFT digital art is created and traded, athletes and organizations can create digital collectibles for fans. These NFTs can also be associated with unique experiences or prizes, such as courtside seats, VIP tours, and signed merchandise.



The MLB is building a NFT digital collectibles platform to increase fan engagement.

Authentic Merchandise & Game Worn Gear

NFTs can store authentic merchandise records and fans can exchange these assets on digital marketplaces. The technology will also provide trusted verification of authenticity to reduce fraud and counterfeit items.



Nike has patented a method using a NFT system to verify the authenticity of sneakers, which they call CryptoKicks.

Video Clips & Highlights

Fans can purchase, own, or sell NFT versions of specific, officially-licensed video highlights.



The NBA's Top Shot platform is a NFT-based NBA highlights system that works like trading cards and has generated over \$230M USD in gross sales.

Key Players & Marketplace



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Marketplaces

Marketplaces are platforms where NFTs can be bought and sold, and sometimes even created and displayed. There are many platforms available.

 KnownOrigin.

 OpenSea

SuperRare

AUCTIONITY
POWERED BY DOMRAIDER NETWORK

 OpenBazaar

 Rarible

as'ync.

makersplace

 Bounce

 mintable.app

 Mintbase

Nifty Gateway


 solsea

 FTX

 Foundation

 Solanart

Marketplaces

BLOCKDATA

TOP 10 BIGGEST NFT MARKETPLACES COMPARED

(BY TOTAL VOLUME) - DATE OF PUBLICATION: 19-10-2021



Name	Opensea	Axie Infinity by Axie Infinity	NBA Top Shot by NBA Top Shot	Rarible	SuperRare by SuperRare Labs	Sorare	Foundation	Aavegotchi by PixelPond Studios	Hic Et Nunc by Hic Et Nunc	Decentraland
VOLUME (all time)	\$9.24B	\$2.62B	\$706.87M	\$230.91M	\$157.5M	\$150M*	\$93.44M	\$48.68M	\$43.93M	\$42.09M
RUNS ON (Blockchain)	Ethereum	Ethereum	Flow Blockchain	Ethereum	Ethereum	Ethereum	Ethereum	Polygon	Tezos	Ethereum
FOUNDING DATE	2017	2018	2019	2020	2017	2018	2020	2020	2021	2017
TEAMSIZE	~48	~25	?	~50	~50	~50	~25	~4	1	~50
HQ	Newark, United States	Ho Chi Minh, Vietnam	Vancouver, Canada	Moscow, Russia	Newark, United States	Paris, France	San Francisco, United States	London, England	Breit	Beijing, China
TRADERS (estimated)	563,750	845,189	460,141	81,454	5,046	600,000*	20,054	6,993	39,870	6,320
BUYER FEES	2%	4.25%	5.26% (+40% FLAT FEE)	2.5%	3%	N/A	N/A	N/A	2.5%	N/A
SELLER FEES	2.5%	4.25%	5	2.5%	3%	N/A	15%	N/A	N/A	N/A
ACCEPTED FILE FORMATS	GIF, GLB, WEBP, MP4, MP3, OTW, OGG, WEBM, AVIF	N/A	N/A	JPEG, PNG, GIF	JPEG, MP4, WEBM, GLB	N/A	JPEG, MP4, SVG	SVG	JPEG, MP4, MOV, OGV, GLTF, SVC	GLTF
ROYALTIES	ARTIST CHOICE 50 TO 100%	N/A	N/A	ARTIST CHOICE	10% ON SECONDARY VALUE	N/A	10% ON SECONDARY VALUE	N/A	N/A	N/A
CURRENCIES	ETH, SWTH, BDAI	SELP SEAL, SEINC	N/A	ETH, SWTH, SOAL, SOARL, BARTI	ETH	ETH	SEHST	SEHST	SHANA, SHANIA	SHANIA, SHANIA
TOKEN	N/A	\$AXS	N/A	\$RARI	\$RARE	N/A	N/A	\$GHST	N/A	\$MANA
TOTAL AMOUNT OF FUNDING	\$127M	\$158M	\$636M	\$16M	\$9M	\$737M	\$200K	N/A	N/A	\$24M
NOTABLE INVESTORS	Fundstrat, Polychain Capital, Andreessen Horowitz, Altimeter Capital, Coatue, CAA Ventures, Coatue, Genesys One, Gitterman	Mark Cuban, Alton O’Neil, Luminus Capital	Coatue Ventures, Andreessen Horowitz	Coatue Ventures, CoinFund, Venrock, 01 Advisors	Sorare NEXT, Mark Cuban, Sound Ventures	Gary Vaynerchuk, Consensus Ventures LLC, Liquidating Holdings Group	N/A	N/A	N/A	Digital Capital Group, Besse VC, Fondo, Fundstrat, Genesys One Capital

BLOCKDATA IS A CB INSIGHTS COMPANY

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Underlying Public Chains



ethereum

Leading public chain for NFT applications.



flow

Few number but high profile NFT projects,
including NBA Top Shot.



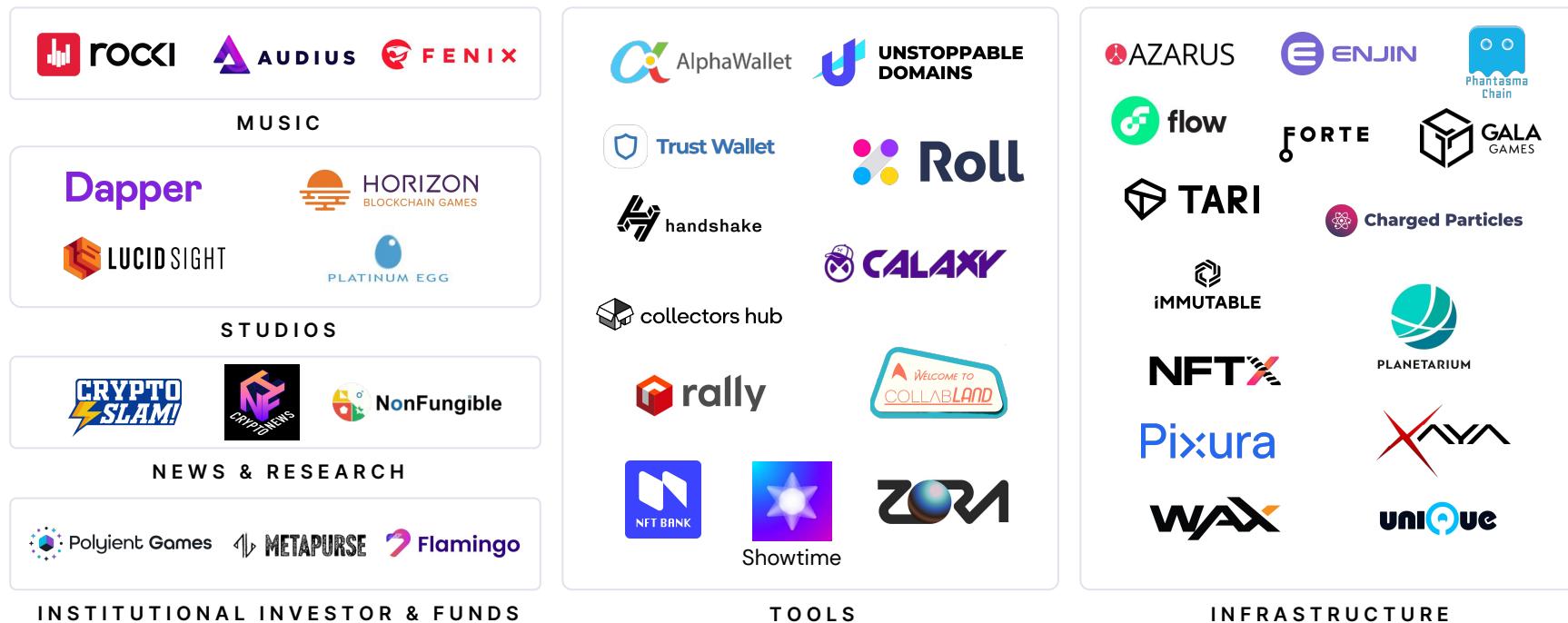
As of early September 2021, Solana is ranked seventh in marketcap due to its entry into the NFT world.



TRON

Holds half the number of NFT projects than Ethereum.

NFT Application Layer Players



Major Brands Utilizing NFTs



WARNER MUSIC



Sotheby's



Microsoft



VOGUE



VIACOMCBS

BALENCIAGA

Challenges to Adoption



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Challenges to Adoption



Novel Technology

NFTs have historically been limited mainly to veteran crypto users who know how to use dApps. The understanding around these assets is still very poor, leading to many questions about the safety and authenticity of NFTs. Current adopters of NFT technology are still within the early adopter, niche-user demographic.



Transaction Fees

Most NFTs are built on the Ethereum blockchain. Creating and transacting NFTs can depend highly on the network activity at any given moment.



Difficult Real-World Linkage

Although NFTs can represent real world assets, actually guaranteeing a NFT holders' claim to ownership on a real world asset can be tough. In order to achieve this, real world companies will have to issue their own NFTs or partner with crypto companies to achieve this.



Regulation

Since NFTs can represent real world assets, NFT projects run the risk of these tokens being considered securities and catching attention of regulators. This can be a deterrent to developers who might be on the fence about building new NFTs.

Regulation

Many existing regulatory and legal environments around the globe are not designed to accommodate digital assets, including NFTs, but governments and regulators are working to catch up to this rapidly developing space.

Securities & Tax Laws

Most NFTs currently in existence do not resemble securities. However, this may soon be changing. In some cases, NFTs may be classified as securities and will be subject to securities laws and re-sale restrictions. Additionally, many jurisdictions have not issued tax guidance yet (Dentons, 2021).

Anti-Money Laundering (AML)

Although most jurisdictions have not yet caught up, NFTs will likely become subject to AML laws and regulations. This would require NFT marketplaces to report suspicious activity and transactions.

Copyright & IP

Laws surrounding digital assets and copyright, IP, trademarks & logos, personality rights, and moral rights are lagging behind the development of the NFT industry. Enforcement of these laws and increased diligence in the space is likely coming in the near future.

Geographical Variation

Singapore, Bermuda, the EU, and the UK are establishing themselves with tailored regulations to accommodate digital assets, whereas places such as the US are working to apply existing regulatory frameworks to these emerging asset classes. Africa and India have taken steps to restrict or prohibit citizens from using NFTs and cryptocurrencies (Reuters, 2021).

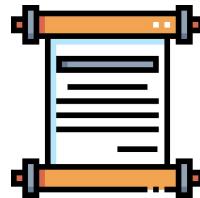
Further Questions & Risk Factors



Liquidity



Financialization &
Securitization



Digital Rights &
Regulations



Platform Popularity



Market Manipulation

Scams & Things to Look Out For



Discord & Twitter
DM Spam



Airdropped NFTs in
your wallet



Spam OpenSea
phishing emails



Fake & Duplicate NFT
Projects ("Rug Pulls")



Paid Media &
influencer scams



2FA & Security
Exploits

Recent Notable Events



Sources



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