NON-FUNGIBLE TOKENS (NFTS)

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BACKGROUND

This research memorandum provides background information regarding non-fungible tokens (NFTs) and further identifies the relationship between trademark registration and NFT ownership. An NFT is a digital representation of a unique asset that cannot be exchanged for another asset of equal value. NFTs can represent a wide range of tangible and intangible goods such as art, collectible sports cards, tweets, gifs, music, property in the virtual world, or ownership records for physical assets.[1] Each NFT is individually recorded and authenticated through a public blockchain, like a cryptocurrency transaction, permitting individuals to purchase, sell, or trade the digital good.[2] This system makes it difficult for others to falsify or modify the asset but easy to authenticate ownership.[3]

NFTs differ from other crypto assets in that cryptocurrencies are easily interchangeable and divisible where NFTs are distinctive, one-of-a-kind goods that sellers or buyers cannot replace with another identical item.[4] This difference raises the issue of fungibility. A fungible commodity or good is something that is exchangeable with other units of the same kind. Examples of fungible assets in the finance realm include physical currencies, as well as cryptocurrency such as Bitcoin and Ethereum. A non-fungible asset refers to something that is unique and irreplaceable, like a house or used car.

In the first quarter of 2021, NFT technology gained heightened attention from crypto, financial, and mainstream media, with trading volumes (peer to peer sales of NFTs) increasing over 25 times

[1] Ollie Leech, "What Are NFTs and How Do They Work?," CoinDesk, March 23, 2021.
[2] Jennifer Hahn, "NFTs Will Usher in a 'Creative and Artistic Renaissance' Say Designers," Dezeen, April 19, 2021.
[3] Christine Kim, "Q1 2021 Industry Trends: NFTs Rise to Fame, DeFi Consolidates 2020 Gains," CoinDesk, April 21, 2021.
[4] Devin Finzer, "The Non-Fungible Token Bible: Everything You Need to Know about NFTs." OpenSea blog. OpenSea, January 11, 2021.

since December 2020, and valuations over $2 billion for certain marketplaces.[5] Some suggest tokenizing everything might create some initial hype, but others maintain NFTs are the future of the decentralized finance industry and may represent assets that have long-term value.[6] See **Appendix A** to view NFT trading volumes from October 2020 to March 2021.

NFT TECHNOLOGY

Prior to the development of NFTs, other types of non-fungible assets existed on the internet such as domain names, digital event tickets, frequent flyer miles, and video game items. Traditionally, buyers purchased digital assets on closed platforms, such as a video game where someone buys a particular gear set or outfit, but that asset is not easily transferrable to another game or marketplace. Blockchain facilitates an open platform or ecosystem for the transfer of digital assets from one person to another and further provides a "coordination layer" for digital assets, giving users both ownership and management permissions. [7]

To comprehensively understand NFT technology, it is first essential to have a high-level awareness of blockchain technology in general. The essential premise underlying blockchain is that it is a particular database structure that stores data in blocks that are linked together, and it contains a ledger of time-stamped information. Blockchain is particularly innovative because the ledger is distributed among many different computers connected to the same network, which is significant as the ledger exists in many interconnected copies. Developers have based financial structures on distributed ledgers to incentivize people to maintain the ledger through a consensus mechanism. The people who track the ledgers solve computing puzzles and receive cryptocurrency in return. While the details of blockchain technology are far more complex, blockchain fundamentally is a method of relaying knowledge through time-stamping mechanisms and trust is enabled through a distributed system rather than a sole, central authority. [8]

Significance of Tokens

A token can depict any asset or good that is digitally transferable between two people.[9] Tokens also illustrate ownership of something for a particular user, and this application establishes the foundation for NFT technology.[10] NFTs exist on a blockchain by developers tokenizing or "minting" NFTs to create a certificate of ownership that original creators can sell across open platforms.[11] The Ethereum blockchain is the most popular network that enables NFT technology and Ethereum makes NFTs highly valuable in that transaction history and token metadata is

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[5] Ibid.
[6] **"DappRadar: Dapp Industry Report Q1 2021," CoinDesk (DappRadar, April 17, 2021).**
[7] **Amy Whitaker. "Art and Blockchain: A Primer, History, and Taxonomy of Blockchain Use Cases in the Arts." Artivate: A Journal of Enterprise in the Arts 8, no. 2 (2019): 21–47.**
[8] Ibid.
[9] **"What Is a Token?," (Coinhouse, 2021), accessed May 3, 2021.**
[10] Ibid.
[11] Ibid.

publicly verifiable, making it exceedingly straightforward to prove ownership history.[12] The NFT market is not exclusive to Ethereum, other blockchain networks (Neo, Tron, etc.) can support NFTs.[13]

NFT Standards[14]

Given that the Ethereum blockchain is distributed and not controlled by one central authority, developers within the Ethereum community can introduce, revise, comment, and accept various standards through an Ethereum Improvement Proposal (EIP). Once the community accepts an EIP, an Ethereum Request for Comments (ERCs) becomes a technical document Ethereum developers can use. ERCs ultimately define a set of rules required to implement tokens for the Ethereum ecosystem and contain information about protocol specifications.

ERC721 (Ethereum Request for Comments 721) is a commonly used NFT standard that describes how to create NFTs on the Ethereum blockchain and was the first standard for representing non-fungible digital assets. CryptoKitties, a type of NFT that is described at greater length later in the paper, is one of the most popular use cases for ERC721.[15] ERC721 identifies a "[…] minimum interface a smart contract must implement to allow unique tokens to be managed, owned, and traded."[16] ERC721 further offers functionality to transfer and track NFTs.[17] Numerous projects currently use ERC721 throughout the Ethereum ecosystem.

Another NFT standard, ERC1155, provides the ability for developers to create, sell, or trade multiple tokens in a single contract.[18] By employing the ERC1155 standard, a contract may contain any combination of fungible tokens, non-fungible tokens, or other token configurations (*i.e.*, semi-fungible tokens).[19] The primary motivation behind the creation of this standard is that previously, ERC721 solely allowed the deployment of separate contracts per token type.[20] Today, ERC1155 enables developers to have more flexibility and transfer multiple kinds of tokens at once.[21]

WHY COLLECT NFTS?

Proponents of the NFT market advocate that placing digital assets on the blockchain allows artists and other content creators to verify the authenticity of digital artworks and other types of digital

[12] **"Non-Fungible Tokens (NFTs)," Ethereum, April 26, 2021.**
[13] **Elena Martinique, "8 NFT Marketplaces To Be Familiar with Right Now," Widewalls, March 29, 2021.**
[14] **"ERC Token Standards," EthHub (Ethereum, 2021).**
[15] **Devin Finzer, "The Non-Fungible Token Bible: Everything You Need to Know about NFTs." OpenSea blog. OpenSea, January 11, 2021.**
[16] **Dieter Shirley, "ERC-721," ERC-721 (Axiom Zen and Dapper Labs, 2017).**
[17] **"The Ultimate List of ERC Standards You Need to Know," 101 Blockchains, February 24, 2021**.
[18] Ibid.
[19] **Witek Radomski et al., "EIP-1155: ERC-1155 Multi Token Standard," Ethereum Improvement Proposals, June 17, 2018.**
[20] Ibid.
[21] Ibid.

assets.[22] Prior to the establishment of NFTs, artists and other creators had no way of validating their original product and they were not getting paid for the distribution of their content.[23] Others participate in the NFT industry to simply acquire ownership of something they are subjectively interested in, while some find it as a way to support artists of all types and engage in a different mode of creation and innovation. Additionally, people find NFTs appealing as they represent new investment opportunities and business models.[24]

One important concept to note regarding NFT ownership is when someone purchases an NFT, they purchase the token or code independently from the actual digital asset the creator linked to the NFT.[25] The cryptographic code for the NFT does not necessarily constitute the transfer of rights or obligations for the asset, depending on the contract between the creator and collector.[26] For some digital collectible items, the purchase of an NFT results in the ability of the collector to obtain a limited license to use, copy, and display the items associated with the NFT for personal, non-commercial use only.[27] Additionally, anyone can still view, copy, and download video clips or image files of an NFT. The NFT is exclusively a record demonstrating the item has one owner and does not restrict a third party from making a copy of the asset.[28] Moreover, in some situations original content creators can claim resale royalties directly whenever someone sells the NFT.[29]

NFT MARKETPLACES

NFT marketplaces provide opportunities for content creators to sell their NFTs to potential buyers by producing a unique digital token and preserving it in a digital locker or wallet.[30] Popular NFT marketplaces include Nifty Gateway, OpenSea, SuperRare, NBA Top Shot, and Rarible.[31] Each NFT marketplace uses different technology to authenticate, promote, and sell tokens. OpenSea launched in 2017 and was the first open marketplace for digital assets. It is also currently the largest decentralized NFT marketplace that offers trading through smart contracts.[32] In the first three months of 2021, the NFT market generated approximately $1.5 billion in transaction volume, with the largest contributors being NBA Top Shot, CryptoPunks, and OpenSea.[33]

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[22] **"Beeple's Masterwork: The First Purely Digital Artwork Offered at Christie's: Christie's," Beeple: A Visionary Digital Artist at the Forefront of NFTs Christie's, March 11, 2021.**
[23] **"CoinDesk Quarterly Review 2021 Q1," CoinDesk (CoinDesk Research, April 3, 2021**).
[24] Ibid.
[25] **Lance Koonce and Sean M Sullivan, "What You Don't Know About NFTs Could Hurt You: Non-Fungible Tokens and the Truth About Digital Asset Ownership," Davis Wright Tremaine, March 24, 2021.**
[26] Ibid.
[27] Ibid.
[28] Ibid.
[29] **"Non-Fungible Tokens (NFTs)," Ethereum, April 26, 2021.**
[30] **Christine Kim, "Q1 2021 Industry Trends: NFTs Rise to Fame, DeFi Consolidates 2020 Gains," CoinDesk, April 21, 2021.**
[31] **Elena Martinique, "8 NFT Marketplaces To Be Familiar with Right Now," Widewalls, March 29, 2021.**
[32] **"CoinDesk Quarterly Review 2021 Q1," CoinDesk (CoinDesk Research, April 3, 2021**).
[33] **"DappRadar: Dapp Industry Report Q1 2021," CoinDesk (DappRadar, April 17, 2021).**

NFT APPLICATIONS

Art

Before the creation of NFTs, it was nearly impossible to verify and own digital art, as it was remarkably easy for others to screenshot or download a file. Accordingly, as NFTs provide a unique, tamper-resistant digital signature or certificate, the acquisition of digital artwork is now a far more lucrative and realistic investment.[34]

To date, the highest-valued NFT is "EVERYDAYS: THE FIRST 5000 DAYS" by the artist Mike Winkelmann "Beeple," which sold for $69.3 million at the British auction house Christie's on March 11, 2021.[35] Following the record-breaking sale, another auction house Sotheby's, announced on March 16, 2021, that it plans to host its own NFT art sale.[36]

Collectibles

CryptoPunks. CryptoPunks launched in June 2017 as one of the first NFTs based on the Ethereum blockchain and also served as the inspiration for the ERC721 standard. [37] Larva Labs developed CryptoPunks, 10,000 small (24x24 pixel), algorithm-generated unique images portraying a variety of faces and entities. When Larva Labs first created CryptoPunks, anyone with an Ethereum wallet could claim them for free, but collectors rapidly obtained all 10,000. [38] To acquire a CryptoPunk today, potential buyers must purchase them from someone on a marketplace supported by Ethereum. Most of the CryptoPunks are human, but some depict zombies and aliens. [39]

To demonstrate the value of the CryptoPunk market, CryptoPunk 7804, one of the aliens, sold in March 2021 for roughly $7.57 million based in Ethereum. [40] The seller originally purchased the Punk in 2018 for $15,000. [41]As of April 30, 2021, the least expensive CryptoPunk available is 21.49 ETH (Ethereum) ($59,497 USD) and the total value of all sales over the lifetime of the CryptoPunk project is 163.22K ETH ($451.88 million USD). [42]

CryptoKitties. CryptoKitties initially released in November 2017 and served as one of the first conventional applications of the ERC721 standard.[43] CryptoKitties is a blockchain-based game where people can breed, raise, and trade virtual cats on the Ethereum network. Developer Dapper

[34] **Natalia Karayaneva, "NFTs Work for Digital Art. They Also Work Perfectly for Real Estate.," Forbes (Forbes Magazine, April 8, 2021).**
[35] **"Beeple's Masterwork: The First Purely Digital Artwork Offered at Christie's: Christie's," Beeple: A Visionary Digital Artist at the Forefront of NFTs Christie's, March 11, 2021.**
[36] **Christine Kim, "Q1 2021 Industry Trends: NFTs Rise to Fame, DeFi Consolidates 2020 Gains," CoinDesk, April 21, 2021.**
[37] **"CryptoPunks," Larva Labs, 2021.**
[38] Ibid.
[39] Ibid.
[40] **"CryptoPunks Market History," NFT Market History (NonFungible Corporation, 2021).**
[41] Ibid.
[42] Ibid.
[43] **Rakesh Sharma, "Cryptokitties Are Still a Thing. Here's Why," Investopedia, September 12, 2020.**

Labs established several inventive in-game mechanics such as building an "on-chain breeding algorithm" within a smart contract that determined the genetic code of a cat, which then influenced its "cattributes."[44] Each cat represents its own NFT, and collectors can breed two CryptoKitties to produce a new cat that has its own distinctive genetic qualities. Collectors value CryptoKitties according to their rarity, generation, exclusivity, whether they are "Fancy Cats" or "Founder Cats," and if they have a low ID number.[45] Currently, there are approximately two million cats, or NFT assets, on the OpenSea marketplace,[46] with Dapper Labs observing a total, all-time trading volume of over 66,000 ETH[47] (approximately $221 million USD).[48]

Digital trading cards. Another successful venture in the NFT collectible market includes digital trading cards. The NBA, MLB, and other football, golf, and soccer professional athletes recently entered the NFT industry by developing and selling digital cards or "moments" that feature video highlights of an athlete.

NBA Top Shot officially launched in October 2020 and is the highest-volume NFT platform, with approximately $500 million in transactions throughout the first quarter of 2021.[49] Dapper Labs (the same developer as CryptoKitties) in collaboration with the NBA operates the marketplace, where basketball fans and collectors buy and sell officially licensed highlights from NBA games. Specifically, the NBA selects and edits the game highlights, and Dapper Labs determines how many highlights to sell, which in turn creates scarcity. Each NFT contains video clips, player statistics, and information about the NFT trading history.[50] Dapper Labs most recent valuation is over $2 billion and one of the more notable Top Shot sales is a video highlight of Lebron James dunking that sold for over $200,000 in February 2021.[51]

Outside of the NBA, the MLB recently released NFT baseball cards in April 2021, through the Topps marketplace.[52] Tom Brady, Patrick Mahomes, and Rob Gronkowski also joined the NFT industry, with Rob Gronkowski being the first, by commemorating notable Super Bowl moments.[53] See **Appendix B** for a timeline of notable NFT events.

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[44] **Devin Finzer, "The Non-Fungible Token Bible: Everything You Need to Know about NFTs." OpenSea blog. OpenSea, January 11, 2021.**
[45] **Jordan Castro and Cassidy Robertson, "Value of Kitties," CryptoKitties (Dapper Labs, 2019).**
[46] **"CryptoKitties Marketplace on OpenSea: Buy, Sell, and Explore Digital Assets," CryptoKitties (OpenSea, 2021).**
[47] **Matthew Lam, "9 Nonfungible Token Projects Leading the Top NFT Use Cases," OKEx, March 26, 2021.**
[48] Cryptocurrency conversion as of May 5, 2021.
[49] **"DappRadar: Dapp Industry Report Q1 2021," CoinDesk (DappRadar, April 17, 2021).**
[50] **Nicole Willing, "Best NFT Projects: 10 Names Everyone Should Know in 2021," Capital.com, April 9, 2021.**
[51] **Kevin Reynolds, "NBA Top Shot, CryptoKitties Firm Dapper Labs Raising $250M+ at $2B Valuation: Report," CoinDesk, February 16, 2021.**
[52] **Ari Levy, "How Baseball Card Mania Is Colliding with NFT Boom to Revive Topps and Change the Game for Dealers," CNBC, April 11, 2021.**
[53] Ibid.

Other Applications for NFTs

While the CryptoKitties and CryptoPunks use scenarios may seem trivial at first glance, the application of NFTs could have far more practical implications. NFTs can represent official documentation like birth and death certificates, academic credentials, warranties, and medical histories.[54] Developers can tokenize personally identifiable information documents, credentials, and licenses to preserve and authenticate the ownership of the documents. One of the growing areas of tokenization is the representation of physical assets through NFTs. Since NFTs are essentially contracts, it is possible that one day consumers will purchase a physical asset such as a car or house using Ether and receive the contract as an NFT in return. [55] Correspondingly, someone's Ethereum wallet becomes the key to their physical asset, by accessing the asset through cryptographic proof of ownership.[56] Altogether, developments in this category are at an early stage and fairly rare.

TRADEMARKS AND NFTS

In early discussions on the regulation of NFTs in Wyoming, some consideration has been given to the idea of registering NFTs as trademarks. The purported benefits of this practice would be to provide public notice about the ownership status of NFTs and to facilitate the identification and distribution of assets during probate. However, registering an NFT with a governmental entity may also prove incompatible with the anonymized, decentralized nature of NFT ownership. This section is intended to provide a high-level overview on the trademarking process in the context of NFT ownership and registration.

Generally speaking, trademarks can be, "any word, phrase, symbol, design, or a combination of these things" that identifies particular goods or services and are used by customers to identify those goods and services in the marketplace.[57] Trademarks can be registered federally, with the U.S. Patent and Trademark Office, or at the state level, through the Wyoming Secretary of State's Office. According to the U.S. Patent and Trade Office, the primary benefits of registering a trademark include:

- *Public notice*. Trademarks are listed in a publicly available database of registered and pending trademarks;
- *Infringement protection*. Trademark registration grants registrants the right to prevent infringing uses of their trademark and to bring lawsuits concerning their trademarks; and

[54] **Rakesh Sharma, "Non-Fungible Token (NFT)," Investopedia, March 8, 2021.**
[55] **"Non-Fungible Tokens (NFTs)," Ethereum, April 26, 2021.**
[56] Ibid.
[57] **"What Is a Trademark?," U.S. Patent and Trademark Office (U.S. Department of Commerce, March 31, 2021).**

- *Presumption of ownership*. Trademark registration creates the legal presumption that the registrant owns the trademark.[58]

One point to note with respect to these benefits is that trademark registration is optional. No one is required to file a trademark, but the decision to register and the level at which you file (*i.e.*, state or federal) will determine the scope of your rights. Since this process is entirely optional, the benefits conferred by trademark registration on NFT ownership ought to be sufficiently distinct and significant to justify the time and expense of trademark registration. Comparing the optional benefits of trademark registration with the inherent qualities of NFTs will be instructive on the merits of developing a process for registering NFTs as trademarks.

Public notice. Interestingly, a primary benefit of both trademark registration and NFT ownership is public notice. Trademarks are stored on a state or federal database and are searchable by anyone looking for a similar trademark. The database, in essence, functions to record and authenticate trademarks in a particular jurisdiction. Analogously, NFTs are also publicly available; each NFT is individually recorded and authenticated on a public blockchain. Whether duplicating this process through government intervention would confer some additional benefit on individual NFT owners or the public generally is an open question.

Infringement protection. While preventing infringement is central to why individuals and businesses register trademarks, this notion is essentially incompatible with NFTs. In a literal sense, nothing prevents a non-owner of an NFT from copying, using, viewing, or downloading the video or image file for which an NFT signifies ownership, nor does the sale of an the NFT claim to come with these protections. As such, there is little merit to the notion of registering a trademark for an NFT for infringement protection.

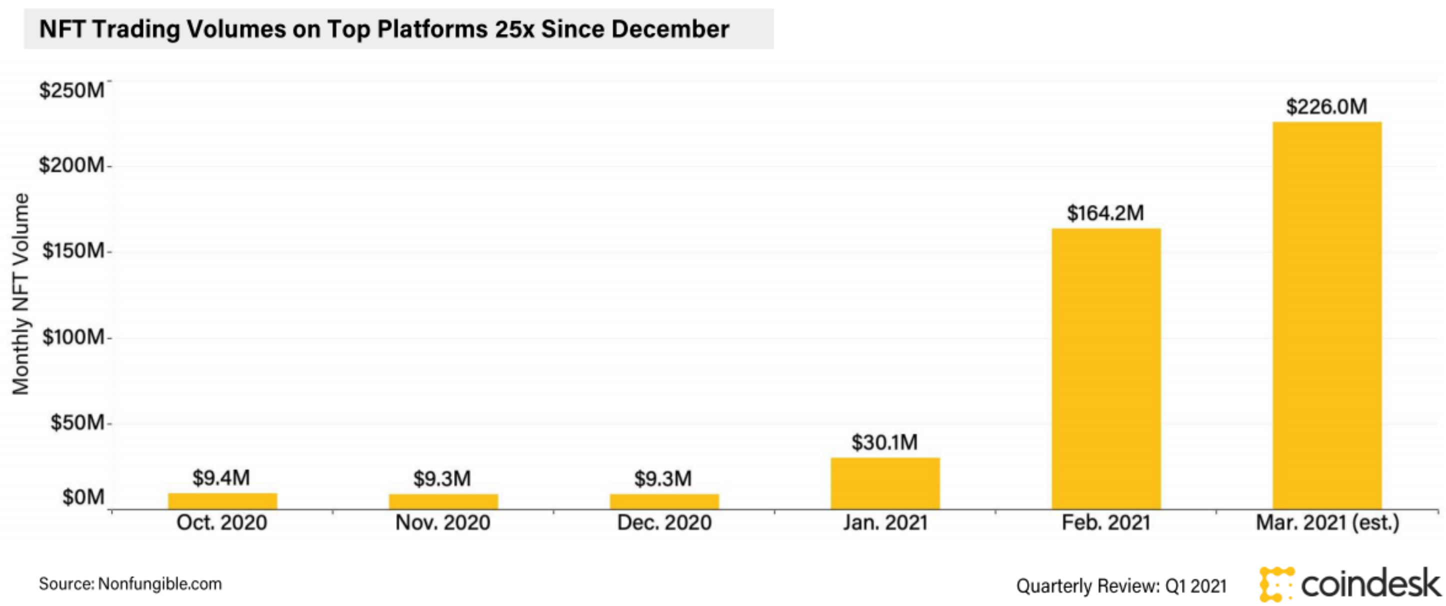
Presumption of ownership. Of the benefits of trademark registration, the presumption of ownership is perhaps the most applicable to NFT ownership. Given the quasi-anonymous nature of NFT ownership, there could be some merit to registering an NFT as a trademark. Doing so would formally document the ownership of an NFT with a governmental entity. This formal registration and concurrent de-anonymization of the NFT ownership would streamline the legal process with respect to the distribution of the owner's assets, particularly during probate.

Other considerations. Another consideration in the context of NFTs and trademark registration is the time scale of the process. The buying and selling of NFTs reflects an immediate transfer of ownership. As soon as the digital asset is transferred, that transfer is viewable on the publicly available blockchain, essentially without delay. Conversely, the process of registering a trademark with a governmental entity can be time consuming. Not only does it take the registrant time to

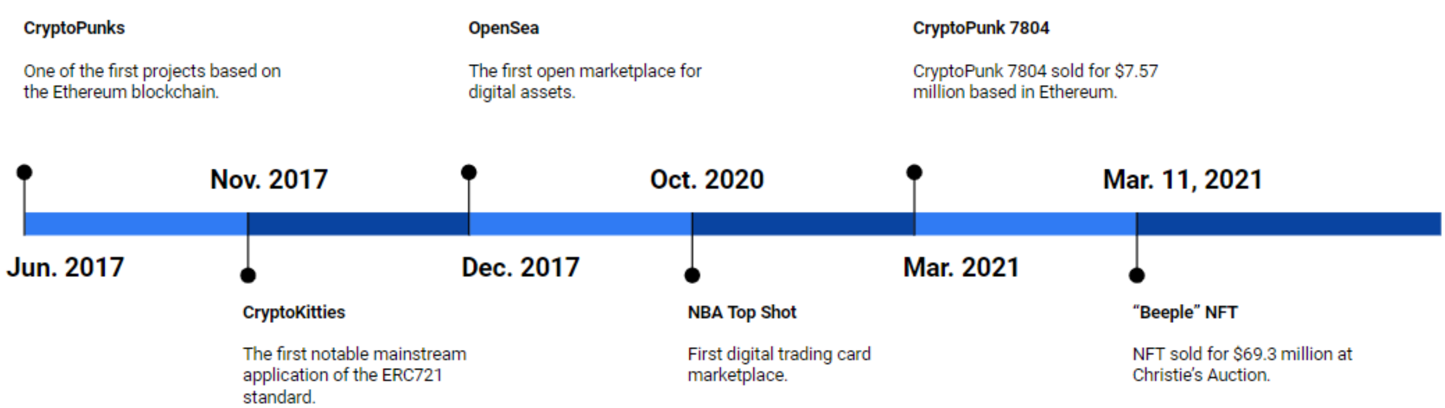
[58] **"Why Register Your Trademark?," U.S. Patent and Trademark Office (U.S. Department of Commerce, March 31, 2021).**

compile and submit registration materials, but it takes time for the governmental entity to review and post that information to the database.

APPENDIX A – NFT TRADING VOLUME[59]



APPENDIX B – NFT TIMELINE



[59] "CoinDesk Quarterly Review 2021 Q1," CoinDesk (CoinDesk Research, April 3, 2021).