NFT & IPFS

NON FUNGIBLE TOKEN

Inner Planetary File System

What is NFT

- An NFT, or **non-fungible token**, is a type of digital assetthat represents ownership or proof of authenticity of aunique item or piece of content. Unlike
- cryptocurrencies such as **Bitcoin** or **Ethereum**, which are **fungible** and can be exchanged on a one-to-one basis, NFTs are unique and cannot be exchanged on alike-for-like basis.
- NFTs rely on **blockchain technology**, which ensures theauthenticity, provenance, and ownership of the digital asset. The blockchain

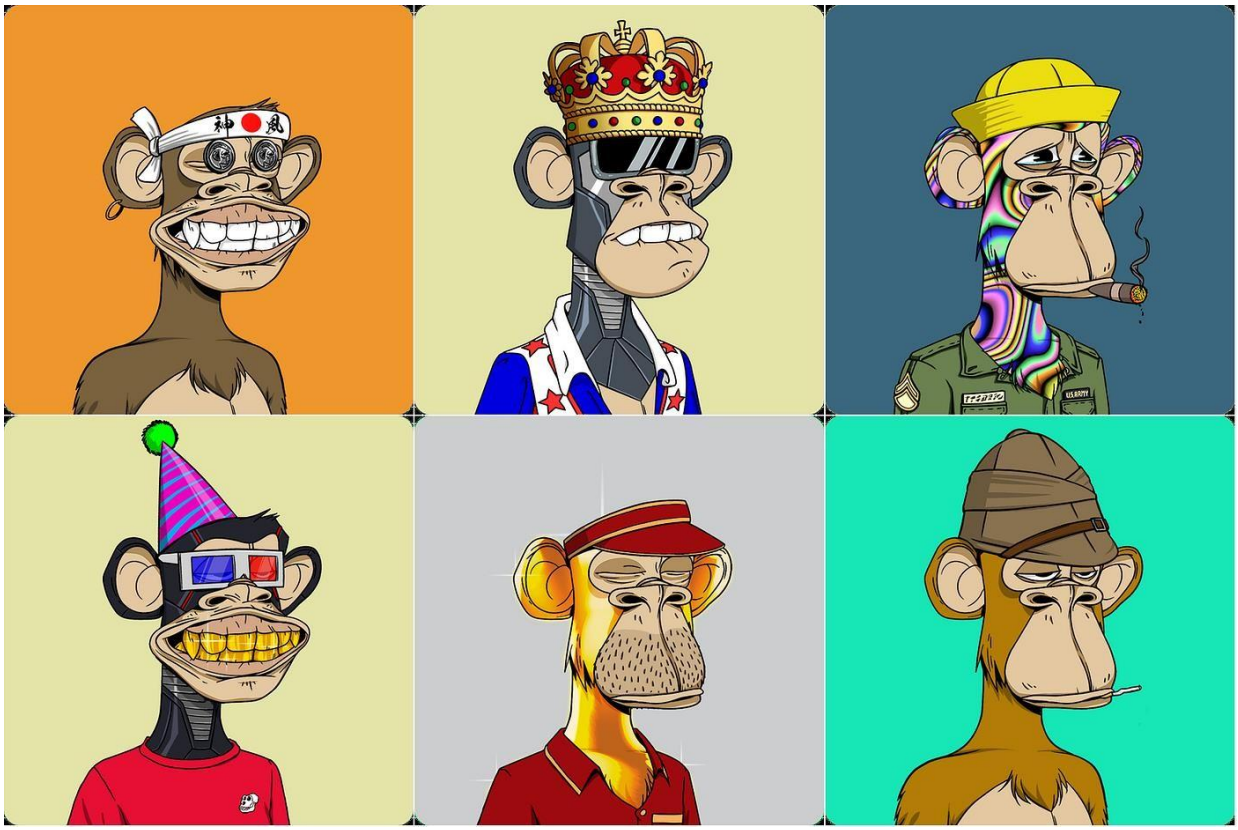
acts as a public ledger that

- records and verifies transactions, providing
- **transparency** and security for **NFT ownership**.
- People can **buy, sell,** and **trade** NFTs on various onlineplatforms.

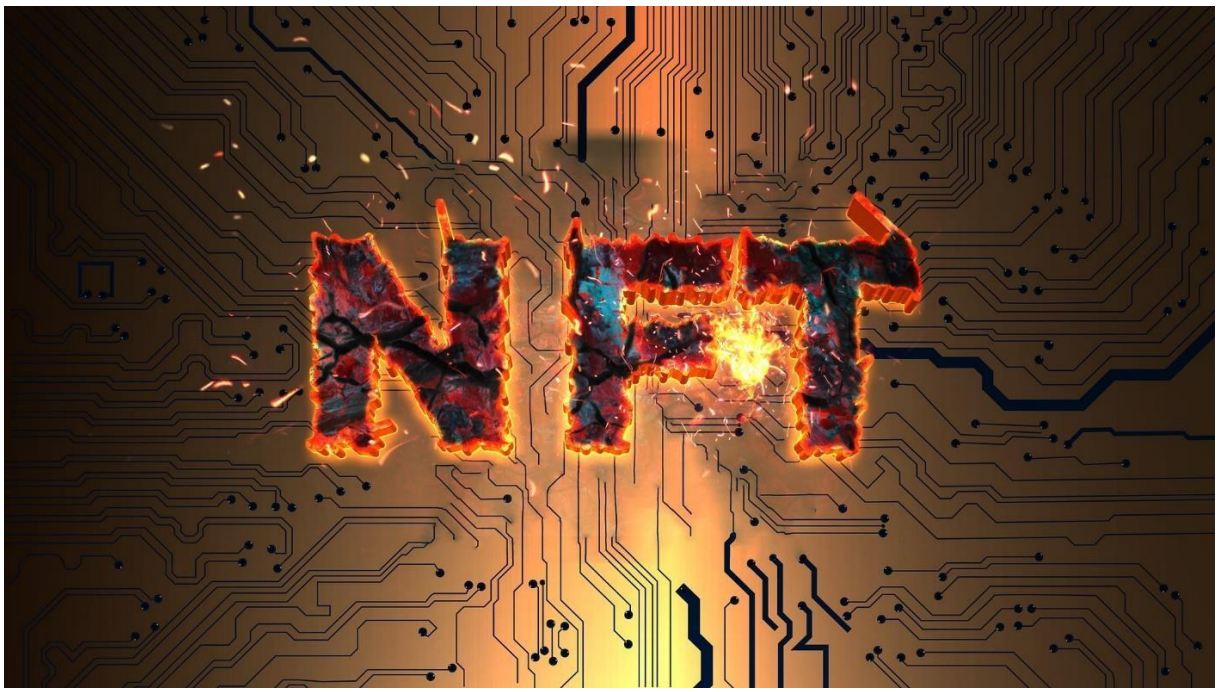
What does Non-Fungible mean

- "Non-fungible" refers to the **unique** and **indivisible** nature of an item.
- Non-fungible items are distinct and **cannot be exchanged** on a one-to-one basis with another item. Each item has its own specific characteristics, qualities,or attributes that set it apart from others.
- NFTs utilize **blockchain technology**, a decentralized andtransparent ledger, to record and validate ownership and transactions.

Examples: Non-fungible items can include digital assetslike artwork, music, videos, virtual real estate, virtual goods in video games, collectibles, and more.



Why do NFTs Matter

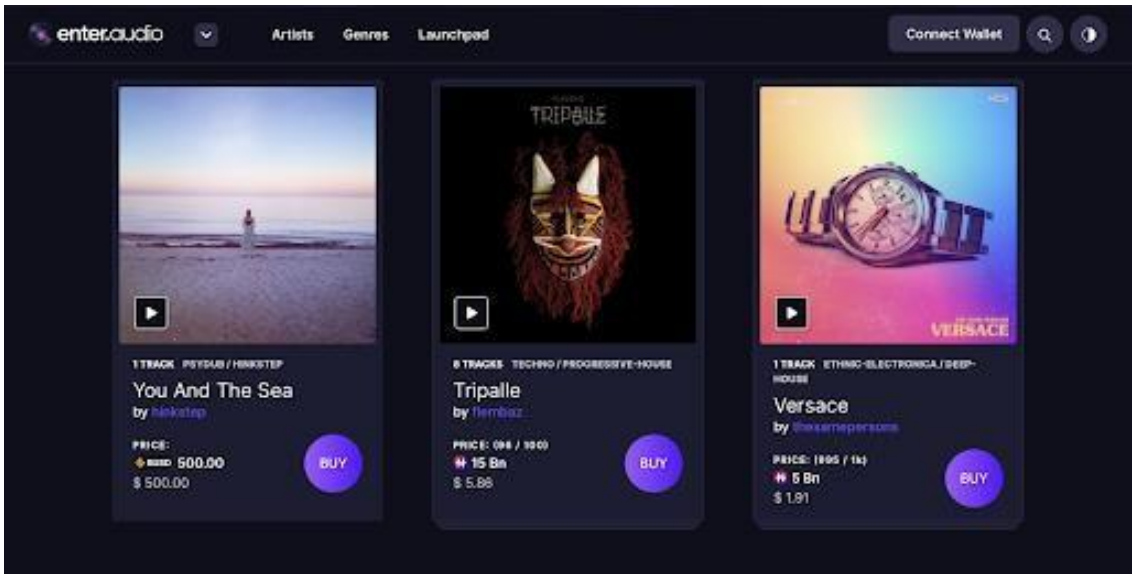


Each NFT has its own individual history that can be traced back to the original **owner**.

- This makes them perfect for collectibles, or for

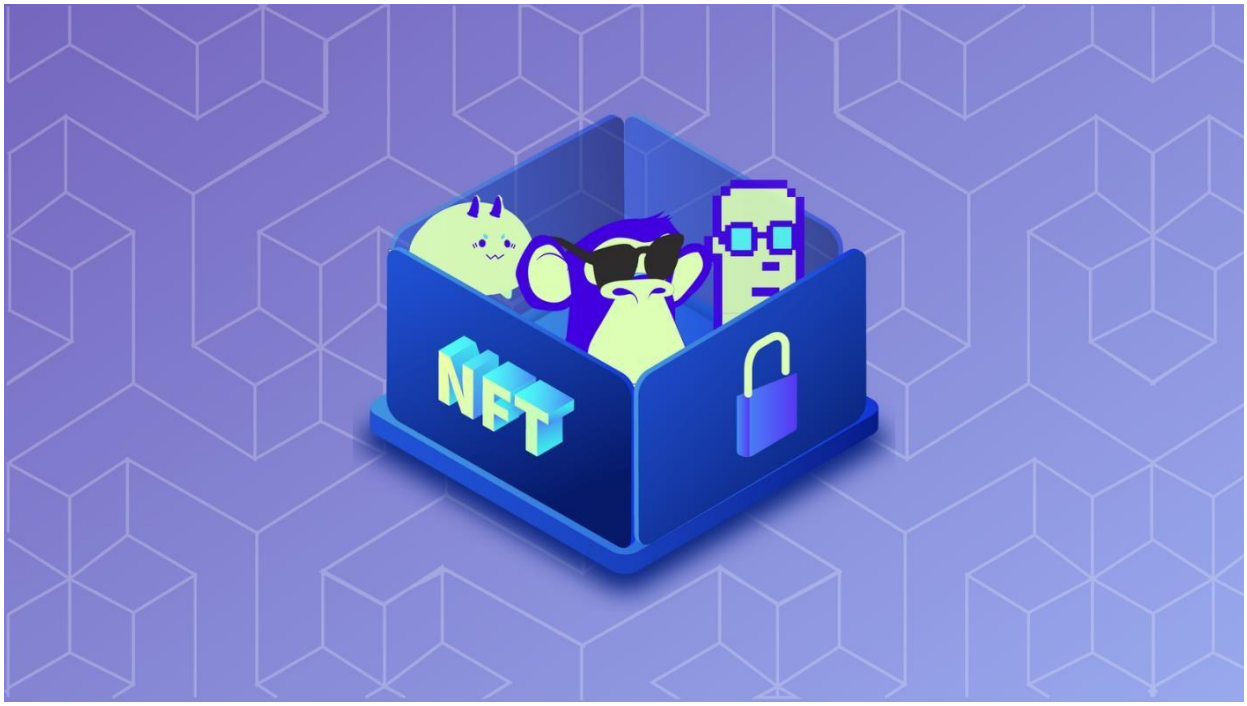
any digital asset where provenance (or ownership history)is important. The uniqueness of each NFT means that they can alsobe used to represent real-world assets.

- **For example**, an NFT could represent a deed to a pieceof land or a ticket to a concert.
- While NFTS are still a relatively new phenomenon, theyare already having a major impact on the world of digital art and collectibles.
- With more people becoming aware of NFTS, it is likely that we will see even more innovative uses for them inthe future.



How are NFTs stored?

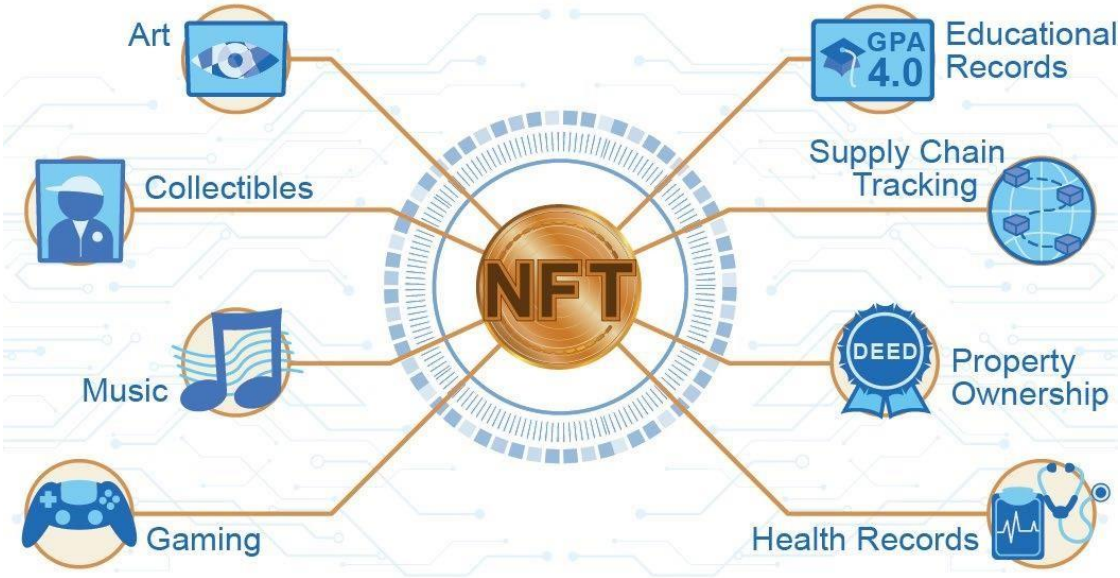
- NFTs are stored on a **Blockchain**, which is a digitalledger that records all transactions.
- While there are many different types of Blockchain, themost popular ones for NFTs are **Ethereum** and **Solana**.



How do NFTs work?

- NFTs are created using smart contracts, which are self-executing contracts that enforce the terms of a
- transaction.

- For example, let’s say you want to Buy an NFT digitalartwork.
- The smart contract would automatically transfer theownership of the artwork to you once it has been verified that you have paid for it.
- The data of this transaction is then added to theBlockchain, creating a permanent record.



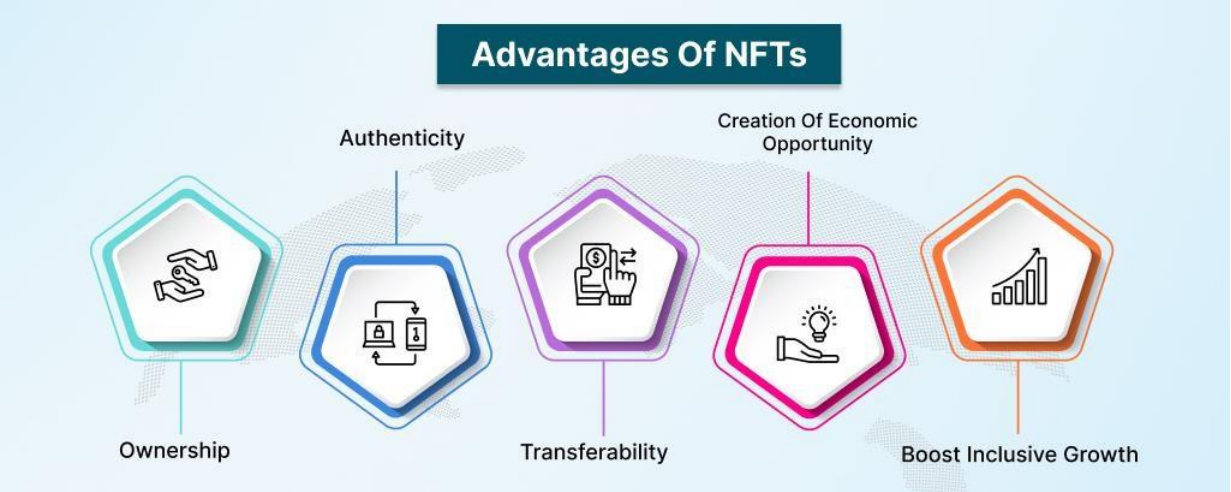
Source: GAO analysis (data). BeNeDak/stock.adobe.com (images) | GAO-22-105990

Benefits of NFTs:

- **Proof of Authenticity:** NFTs provide a way to prove the authenticity and ownership of digital assets.
  - The blockchain technology used in NFTs ensuresthat each token is unique, verifiable, and cannotbe duplicated or tampered with.
- **Monetization for Creators:** NFTs enable artists, musicians, and creators to monetize their digital

- work directly. By tokenizing their creations as NFTs,they can sell them on various platforms, allowing
- them to retain more control over their work andpotentially earn royalties from future sales.

- **Direct Engagement with Fans:** NFTs enable
  - creators to engage directly with their fanbase andcollectors. They can release limited editions,
  - interact with buyers, and offer exclusive perks orexperiences to NFT holders.
- **Ownership and Control:** NFTs give individuals true ownership and control over their digital assets.
  - Unlike traditional digital files, which can be easilyshared or replicated, NFTs provide a unique and verifiable record of ownership.
- **Preservation of Digital Culture:** NFTs can help preserve and commemorate digital culture,
  - including digital art, memes, virtual fashion, and other forms of digital expression. By tokenizing andcollecting these digital artifacts, NFTs contribute tothe documentation and recognition of digital
  - culture as a valuable and significant part of oursociety.



What are the criticisms of NFTs?

- Critics of NFTs argue that they are a waste of energy, asthe process of minting an NFT requires a lot of computational power.
- While it is true that most NFTs do not have any physicalform, many people believe that they will eventually be used to represent real-world assets, which would give
- them value.

How is an NFT different from Cryptocurrency:

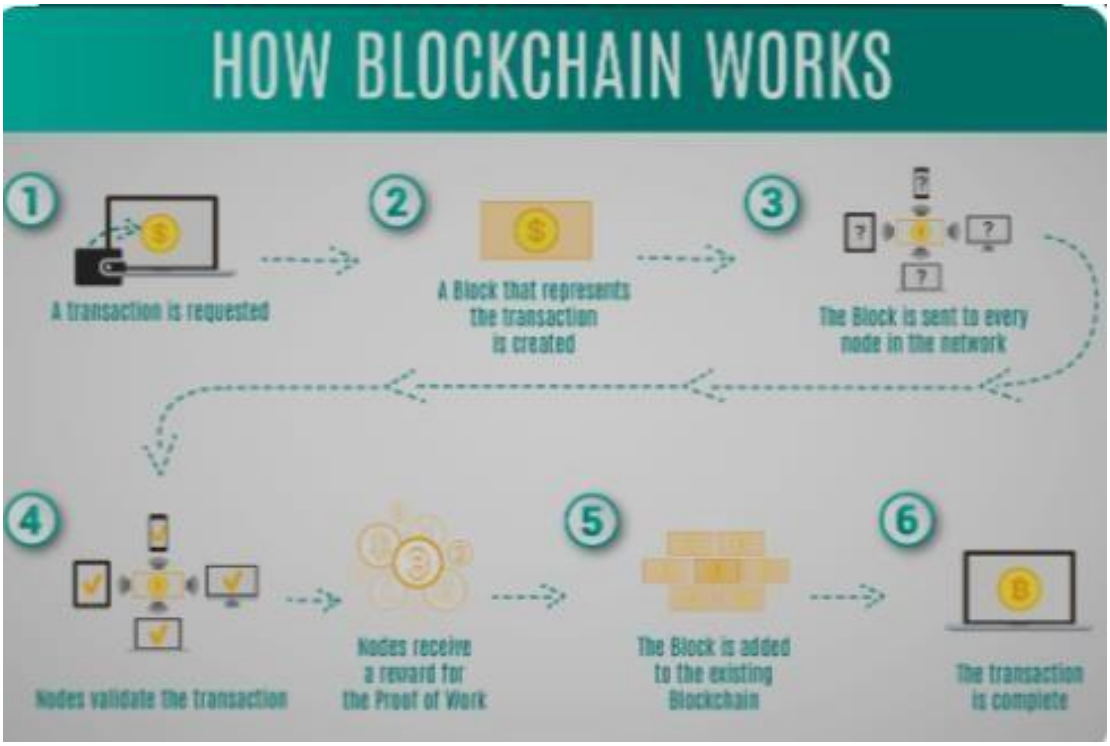
- NFT stands for **non-fungible token**.
- It's generally built using the same kind of programmingas cryptocurrency, like Bitcoin or Ethereum, but that's where the similarity ends.

- **Physical money and cryptocurrencies are "fungible,"**
- meaning they can be traded or exchanged for oneanother.
- They're also equal in value like one dollar is alwaysworth
- another dollar;
- **One Bitcoin is always equal to another Bitcoin.**
- Crypto's fungibility makes it trusted means of a conducting transactions on the Blockchain.
- **NFTS are different.**

- Each has a digital signature that makes it impossible forNFTS to be exchanged for or equal to one another
- (hence, it is non-fungible).

How does an NFT work?

NFTs exit on a Blockchain, which is a distributed ledger that records transactions.



- **Unique Digital Item:** An NFT represents a unique digital item, like a piece of art or music. It could be an image, video, music track, or any other digital content.
- **Tokenization:** The digital item is tokenized by creating a unique digital token, known as an NFT. This token is minted on a Blockchain, typically using a technology called smart contracts.
- **Blockchain Verification:** The NFT is stored and verified on a Blockchain, which is a decentralized and transparent digital ledger. The Blockchain ensures the authenticity, ownership, and

transaction history of the NFT.

- **Ownership and Transfer:** The NFT contains ownership information, linking it to the owner's digital wallet. Ownership can be transferred from one person to another by initiating a transaction on the blockchain. This transaction is recorded and cannot be tampered with, ensuring a secure transfer of ownership.
- **Proof of Authenticity:** The blockchain serves as proof of authenticity, showing that the NFT is the original and legitimate version of the digital item. It provides a public record that verifies the uniqueness and origin of the NFT.
- **Marketplace and Trading:** NFTs can be bought, sold, or traded on online platforms known as NFT marketplaces. These platforms facilitate transactions between buyers and sellers, allowing collectors to acquire NFTs and artists to monetize their creations.
- **Value Determination:** The value of an NFT is determined by factors such as the perceived uniqueness, scarcity, demand, and reputation of the creator. The market determines the price through supply and demand dynamics.
- **Interacting with NFTs:** NFT owners can interact with their tokens in various ways. They can display their NFTs in virtual galleries, use them in virtual worlds or video games, or even earn rewards and

royalties from their NFTs.

What are NFTs used for?

NFTs have various uses and applications :

- Digital Art
- Collectibles
- Music and Entertainment
- Virtual Real Estate and Virtual Worlds
- Licensing and Royalties
- Tokenized Assets
- Digital Identity and Verification
- Charitable Causes and Fundraising

How to buy NFTs?

- First, you need to get a digital wallet that allows you tostore NFTS and cryptocurrencies.
- You likely need to purchase some Cryptocurrency, like Ether, depending on what currencies your NFT provideraccepts.
- You can buy Crypto using a credit card on platforms likeCoinbase, Kraken, eToro and even PayPal and Robinhood now.
- You then be able to move it from the exchange to yourwallet of choice.

- You want to keep fees in mind as most exchanges
- charge at least a percentage of your transaction whenyou buy Crypto.
  itself.

Popular NFT Marketplaces:

Once you have got your wallet set up and funded, there’s no shortage of NFT sites to shop.

Currently, the largest NFT marketplaces are:

1. Opensea.io:

- This peer-to-peer platform bills itself a merchant of"rare digital items and collectibles."
- To get started, all you need to do is create an accountto browse NFT collections.

- You can also sort pieces by sales volume to discovernew artists.

2. Rarible:

- Similar to OpenSea. Rarible is a democratic, open
- marketplace that allows artists and creators to issueand sell NFTS.
- RARI tokens issued on the platform enable holders toweigh in on features like fees and community rules.

3. Foundation:

- Here, artists must receive "upvotes" or an invitationfrom fellow creators to post their art.
- The community's exclusivity and cost of entry artists must also purchase "gas" to mint NFTs means it mayboast higher-caliber artwork.
- For instance, Nyan Cat creator Chris Torres sold the NFTon the Foundation platform
- It may also mean higher prices not necessarily a badthing for artists and collectors seeking to capitalize. assuming the demand for NFTs remains at current
- levels,
- Although these platforms and others are host to
- thousands of NFT creators and collectors, be sure

youdo your research carefully before buying.

- Some artists have fallen victim to impersonators whohave listed and sold their work without their
- permission.
- In addition, the verification processes for creators and NFT listings aren't consistent across platforms some aremore stringent than others.
- OpenSea and Rarible, for example, do not requireowner verification for NFT listings.

Buyer protections appear to be sparse at best, so when shopping for NFTS, it may be best to keep the old adage "caveat emptor" (let the buyer beware) in mind.

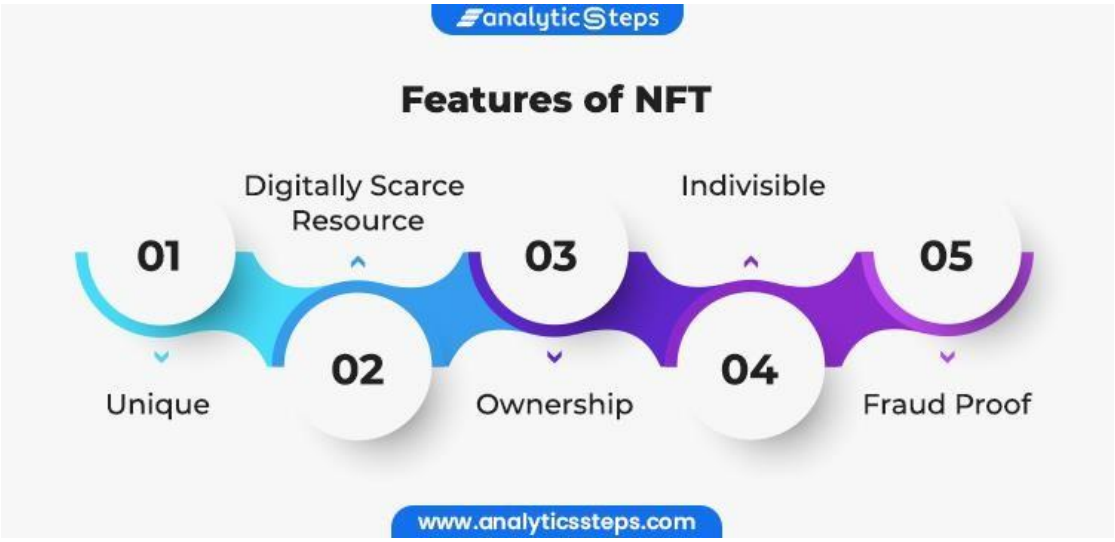
Features of NFT:

NFTs (non-fungible tokens) possess several distinctive features that set them apart from traditional digital assets.

- ✓ **Uniqueness:** Each NFT is unique and distinguishable from other tokens. They represent a specific digital item or piece of content, such as artwork, music, or virtual property.
- ✓ **Indivisibility:** NFTs are often indivisible, meaning they cannot be divided into smaller units without losing their value or essence. Unlike cryptocurrencies, which can be divided into

fractions, NFTs are typically treated as whole units.

- ✓ **Proof of Authenticity and Ownership:** NFTs utilize blockchain technology to establish proof of authenticity and ownership. The blockchain acts as a decentralized and transparent ledger that verifies the origin and ownership of the NFT, providing a tamper-proof record.
- ✓ **Interoperability:** NFTs can be designed to work across multiple platforms and ecosystems. This interoperability allows NFTs to be utilized and traded in different marketplaces, virtual worlds, or applications, enhancing their versatility and reach.



- ✓ **Smart Contract Functionality:** NFTs often leverage smart contracts, which are self-executing agreements with predefined rules. Smart contracts enable additional functionalities, such as royalties, automatic distribution of revenue to creators, or licensing terms embedded within the NFT

Myths and Reality of NFT:

Myth: NFTs are just a passing fad.

Reality: While the hype around NFTs may fluctuate, they have already made a significant impact and are likely here to stay. NFTs have revolutionized digital ownership and provided new avenues for artists and creators to monetize their work.

Myth: NFTs are only for digital art.

Reality: While NFTs gained initial popularity in the digital art space, their applications extend far beyond that. NFTs can represent various digital assets like music, videos, virtual real estate, collectibles, and more.

Myth: NFTs are expensive and only for the wealthy.

Reality: While some high-profile NFT sales have grabbed headlines, NFTs can be created, bought, and sold at various price points. There are NFTs available at affordable prices, and the market is inclusive to creators and collectors of different financial means.

Myth: NFTs have no intrinsic value.

Reality: The value of an NFT lies in its uniqueness, scarcity, and demand within the market. While the underlying digital content can often be accessed freely, the ownership and provenance provided by an NFT hold value for collectors and fans.

Myth: NFTs are a form of copyright protection.

Reality: NFTs do not automatically grant copyright protection. While they can provide proof of ownership and authenticity, copyright protection is a separate legal matter that requires proper registration and enforcement.

Myth: NFTs are environmentally unfriendly.

Reality: The environmental impact of NFTs is a valid concern due to the energy consumption of certain blockchain networks. However, not all blockchains used for NFTs have the same environmental impact, and efforts are being made to explore more sustainable solutions.

Myth: NFTs are easily copied and replicated.

Reality: NFTs utilize blockchain technology, which ensures that each token is unique and cannot be duplicated. While the digital content associated with an NFT can be copied, the token itself and its ownership cannot be replicated.

Myth: NFTs are only for tech-savvy individuals.

Reality: NFTs are becoming increasingly accessible, and platforms are working on user-friendly interfaces to simplify the process of creating, buying, and selling NFTs. Non-technical users can participate in the NFT market with relative ease.

Myth: NFTs are a bubble waiting to burst.

Reality: While the NFT market experiences fluctuations and speculative behavior, the underlying technology and concept of digital ownership hold long-term potential. The market may evolve and mature, but the fundamental principles of NFTs are likely to persist.

Examples of NFT’s:

- **CryptoPunks:** CryptoPunks are one of the earliest and most iconic NFT projects. They are 10,000 unique 24x24 pixel art characters, each with distinct attributes. CryptoPunks are highly sought after by collectors and have fetched significant prices in the NFT market.

- **Beeple's "Everydays:** The First 5000 Days": This artwork by digital artist Beeple (Mike Winkelmann) was sold as an NFT at an auction for a staggering $69.3 million. It is a collage of 5,000 digital artworks created by Beeple, representing his artistic journey over 13 years.

- **NBA Top Shot:** NBA Top Shot is an NFT platform that offers basketball fans the opportunity to collect and trade officially licensed NBA digital collectibles. These collectibles consist of moments from NBA games, such as dunks, assists, and game-winning shots, packaged as NFTs.

- **Decentraland Virtual Real Estate:** Decentraland is a virtual world built on blockchain where users can

buy, sell, and trade virtual land as NFTs. Each parcel of land in Decentraland represents a unique NFT, and owners have the ability to develop and monetize their virtual properties.

- **CryptoKitties:** CryptoKitties is a game that allows users to collect, breed, and trade virtual cats represented as NFTs. Each CryptoKitty has unique characteristics and can be bred to create new and distinct digital kittens.

- **Art Blocks:** Art Blocks is an NFT platform that showcases generative art projects. Artists create algorithms that generate unique artworks programmatically. Each generated artwork is minted as an NFT, making it a one-of-a-kind piece in the collection.

Why NFTs are becoming popular:

- There is a short-term hype surrounding the NFT space.
- No one wants to miss the NFT train the way they missed Bitcoin.
- That is why even the NFTs with no road map or visionhave been selling like hotcakes.
- For instance, someone purchased Jack Dorsey's firsttweet for a staggering $2.1M.
- When this guy came back to sell it in the open market ayear later, he could fetch a maximum bid of $200.

- However, while these examples will always try to bringa bad name to the space, people have realized that
- NFTS can't work without a utility.
- As a result, stronger use cases like community
- management, and loyalty programs using NFTs areemerging every day.
- In fact, Bored Apes, the company behind BAYC, hasnow entered the Metaverse.

- They have been a case study on how to run an

NFTproject.

- They have successfully tied up with Nike, Adidas and other major brands to benefit their community.
- And finally, the list of use cases is enormous.

- The technology is so exciting that you could very wellcreate a plethora (means a large or excessive amountof something) of applications on top of it.

Use cases for NFT's:

- **Digital Art and Collectibles:** NFTs have gained
    - significant traction in the digital art world. Artistscan tokenize their artworks as NFTs, enabling collectors to own and trade unique digital pieces.NFTs provide proof of ownership and authenticityfor digital art, revolutionizing the art market.

- **Gaming and Virtual Worlds:** NFTs are utilized in gaming and virtual worlds to represent in-game assets, virtual land, and characters. Players can buy, sell, and trade these NFTs, providing true ownership and value to virtual items.

- **Music and Media:** NFTs are used in the music industry to sell digital music, albums, concert
    - tickets, and unique experiences. Musicians can
    - release limited-edition tracks or offer special perksto NFT holders, establishing a direct connection
    - with their fan base.

- **Fashion and Virtual Goods:** NFTs have found application in the fashion industry, where virtual fashion items can be tokenized and traded as unique assets. Virtual sneakers, accessories, and clothing can be owned and showcased by
    - individuals in virtual environments.

- **Virtual Real Estate and Metaverses:** NFTs are used to represent ownership of virtual real estate and spaces within metaverses (virtual worlds). Users can buy, sell, and develop virtual properties,
    - creating virtual economies and communities.

- **Licensing and Intellectual Property:** NFTs can be used to establish ownership and manage licensing rights for digital content. Artists and creators can
    - tokenize their work, define usage rights, and earnroyalties from subsequent sales and usage.

- **Charity and Fundraising:** NFTs have been
    - employed for charitable initiatives and fundraisingefforts. Artists and creators can auction or sell
    - NFTs, with a portion or all of the proceeds going tocharitable organizations or causes.

- **Identity Verification and Certification:** NFTs can provide secure identity verification and
    - certification for individuals. They can representdiplomas, certificates, or proof of ownership forphysical assets like luxury goods or collectibles.

Understanding NFT Standards:

NFT standards are sets of rules and protocols that define how non-fungible tokens (NFTs) are created, stored, and interacted with on different blockchain platforms. These standards ensure compatibility, interoperability, and ease of use across various NFT applications and platforms.

- **ERC-721:** ERC-721 is one of the earliest and most widely adopted NFT standards, based on the Ethereum blockchain. It defines a set of rules for

creating and managing unique tokens. Each ERC-721 token represents a distinct asset and has its own identifier, allowing for easy ownership tracking and transfer.

- **ERC-1155:** ERC-1155 is an NFT standard that supports both fungible and non-fungible tokens. It provides more flexibility by allowing multiple token types to be managed within a single smart contract, reducing gas costs and enhancing efficiency.

- **ERC-20:** Although primarily used for fungible tokens (such as cryptocurrencies), ERC-20 can also be utilized for creating fractional or divisible NFTs. While ERC-20 tokens are not inherently non-fungible, they can represent partial ownership or fractional shares of an NFT.

- **TRC-721:** TRC-721 is a NFT standard used on the TRON blockchain. It is similar to ERC-721 but

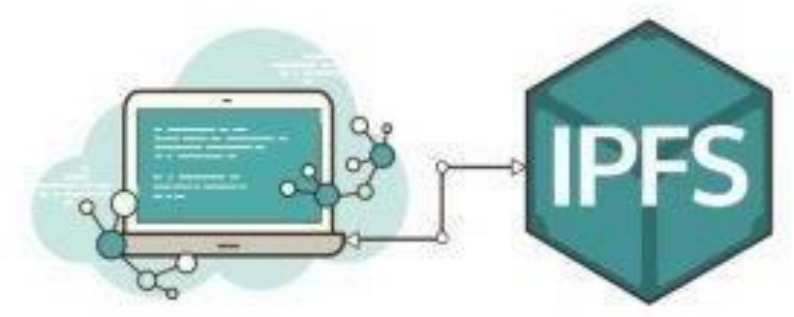
tailored for the TRON ecosystem. TRC-721 tokens follow the same principles of uniqueness and ownership tracking.

- **NEP-11:** NEP-11 is an NFT standard for the NEO blockchain. It provides guidelines for creating and managing non-fungible tokens on the NEO platform, allowing for the representation and ownership of unique assets.

- **Binance Smart Chain (BEP-721):** BEP-721 is an NFT standard specific to the Binance Smart Chain (BSC). It is based on the same principles as ERC-721 and allows for the creation and management of non-fungible tokens on the BSC network.

(IPFS)

What is an IPFS in Blockchain?



- IPFS stands for Interplanetary File System, and it is adistributed file system designed to create a
- decentralized and permanent method of storing andsharing files on the internet.
- While IPFS is often associated with Blockchain technology, it is not a Blockchain itself but a complementary protocol that can be used in conjunction with Blockchain networks.


IPFS

- **Decentralization:** IPFS aims to decentralize file storage and distribution by using a peer-to-peer network. Instead of relying on a centralized server, files are distributed across multiple nodes in the network, reducing the risk of single points of failure and censorship.

- **Content Addressing:** IPFS utilizes content addressing, where files are identified and referenced based on their content, using a cryptographic hash. This means that each file has a unique identifier derived from its content, ensuring that identical files are stored only once in the network.

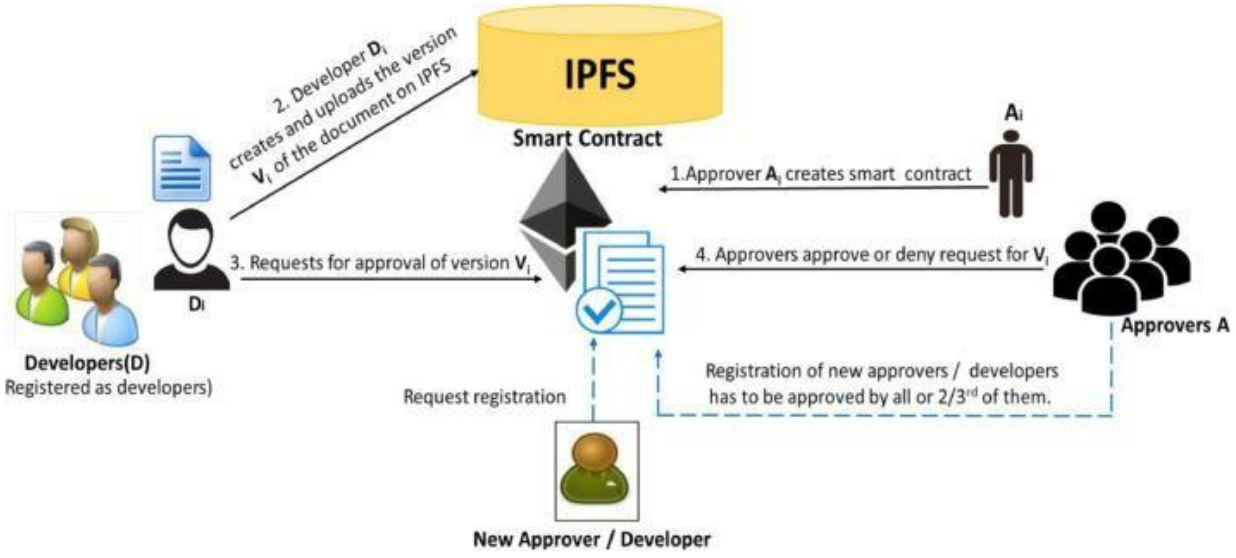
- **Distributed File System:** IPFS creates a global, distributed file system where files are divided into smaller chunks and stored across multiple nodes. This allows for faster and more efficient file retrieval, as files can be fetched from multiple sources simultaneously.

- **Versioning and Permanent Web:** IPFS enables versioning of files, allowing users to access

previous versions and ensuring that files remain accessible even if the original uploader goes offline. This contributes to the concept of a "permanent web," where files are stored and accessible indefinitely.

- **Blockchain Integration:** IPFS can be integrated with blockchain networks to store and distribute large files, such as media assets or smart contract data. By leveraging IPFS, blockchain systems can reduce the storage and bandwidth requirements on the blockchain itself, improving scalability and reducing costs.

Why we need an IPFS in Blockchain?



IPFS (InterPlanetary File System) can complement and enhance blockchain technology in several ways.

Decentralized and Resilient Storage: IPFS provides a decentralized file storage solution, where files are distributed across a network of nodes.

By integrating IPFS with blockchain, the decentralized nature of IPFS complements the decentralized nature of blockchain, creating a more robust and resilient storage infrastructure.

Scalability and Reduced Storage Costs: Storing large files directly on a blockchain can be inefficient and expensive due to the replication of data on every node. By using IPFS, blockchain networks can offload the storage of large files to the IPFS network, reducing the storage burden on the blockchain and improving scalability.

Faster Data Retrieval: IPFS utilizes content addressing, where files are identified by their cryptographic hash. This enables efficient and fast retrieval of files from IPFS, as the file can be fetched from multiple nodes simultaneously. By using IPFS, blockchain applications can benefit from faster data retrieval, improving the user experience and performance of decentralized

applications.

File Versioning and Integrity: IPFS allows for versioning of files, meaning that previous versions of files can be accessed and referenced. This can be useful in blockchain applications where maintaining historical versions of files or data is important .

Censorship Resistance: IPFS, with its distributed and decentralized nature, contributes to the censorship-resistant properties of blockchain applications. Files stored on IPFS cannot be easily censored or taken down by a central authority, as they are replicated across multiple nodes.