



Intro👤duction to NFTs for Identity.

by walt.id

TL;DR

What are NFTs?

A non-fungible token (NFT) is **a digital thing that represents ownership of something** and can be traded. As such, NFTs have three important properties:

- NFTs are **non-fungible** which means that an NFT is unique or one of a kind.
- NFTs **represent ownership** which means they are treated as the thing they stand for.
- NFTs **can represent anything** from physical things (like a house) to natively digital assets (like a crypto punk) or even ideas (intellectual property).

Why use NFTs?

As the world is going digital, it becomes necessary to model ownership in a digital way. NFTs allow us to do just that by **encoding ownership of any type of asset in a digital format**.

As a result, NFT use cases can be found wherever there's a need to digitally model ownership. In other words, the list of use cases is long and NFTs will likely be among the most important **building blocks on which the digital world** (or something like a metaverse) **will be built**.

How NFTs work

From a functional perspective, **anyone can create** ("mint") **and issue** ("drop") **NFTs** to others who can then **manage, share and trade NFTs via digital wallets**.

From a technical perspective, NFTs require a number of concepts (like registries, keys, smart contracts, token IDs, metadata) which can be thought of as building blocks that can be put together in different ways. As a result, there are different "flavors" or ways to implement NFTs which makes a basic understanding of the technologies particularly important.

NFTs for identity?

Using NFTs for identity use cases comes with issues (privacy, compliance, costs, scalability), because ownership and identity are different things and require different solutions. However, NFTs are perfectly suitable for **ownership-based access management** - the idea that ownership of an asset comes with access to services, products or other benefits. This is exciting because **access rights are becoming tradable** and are no longer tied to a person or their identity.

How to get started?

Based on our experience, **building a pilot** is the best way to get started and the most effective way to quickly **build-up knowledge** and **prove the value (ROI) of SSI for your organization**.

Further Readings

Introductions to [Digital Identity](#) and [Self-Sovereign Identity \(SSI\)](#)

What are Non-Fungible Tokens (NFTs) ?

In a nutshell, **a non-fungible token (NFT) represents ownership of something.**

Let's unpack this:

First, **non-fungible** means that a token is unique in a sense that there is no other thing just like it. This means that **every NFT is one of a kind** just like there is only one painting that is the real Mona Lisa. A *fungible* token, on the other hand, is not unique. It would not make any difference if a fungible token would be exchanged for another token of the same kind such as a Bitcoin.

Second, representing ownership implies that **an NFTs is treated as the actual thing that it stands for** so that by selling an NFT you are also selling "the real thing" that it represents.

Third, **NFTs can represent anything** from physical things (like a house) to natively digital assets (like a crypto punk) or even ideas (think of intellectual property).

Once you put these properties together you can understand why people are excited about NFTs: Until recently, everyone thought that digital assets are necessarily fungible because any digital asset can simply be copied. In other words, the mainstream assumption was that digital assets are inherently abundant and cannot be scarce. As a result, digital assets could not really be "owned" by someone (since anyone can just make a copy) and if they cannot be owned, then they cannot really have value like scarce physical things do. **NFTs change that. They introduce digital scarcity, which means that digital assets can be just as valuable** (or even more valuable) **than physical things because they can be unique:**

For example, there can be NFTs that represent physical things and, therefore, have the same value as the thing they represent like an NFT that represents my actual car. However, there can also be NFTs that represent natively digital things. Their value would not be bound to any physical thing at all, which means that they could have any value. For example, an NFT that represents a handbag of which there is only one kind could be worth more than any physical handbag simply because of its uniqueness.

To sum up, **NFTs are a natively digital way to model ownership of any type of asset.**

Why use NFTs?

The **digitization of our world** is a phenomenon that **is unfolding globally and across industries**. This process is driven not only by technological innovations but also other factors that have nothing to do with technology, such as the outbreak of COVID which forced digitization of every industry. Today, people do everything online.¹

Now, **in an increasingly digital world, it is necessary to model ownership in a digital way. NFTs allow us to do just that.** Due to their unique properties, NFTs offer a way to encode ownership of any type of asset in a digital format. Moreover, since NFTs are anchored on blockchains, they are grounded in an immutable registry of records that cannot be manipulated or controlled by any single entity or by malicious actors, which gives NFTs reliability in the sense that anyone can trust that they show the correct ownership distribution of assets.

Obviously, potential **use cases for NFTs are endless** and can be found wherever there's a need to digitally model ownership. As a result, NFTs will be among the most important **building blocks on which the digital world** (or something like a metaverse) **will be built upon**. Remember, NFTs can be anything which means that any type of asset will likely be encoded in NFTs, from something as intangible as ideas to physical assets that are digitized or natively digital assets that are given the quality of scarcity.

How it works

To build a mental model of NFTs and understand how they work, you must consider two perspectives:

The **functional perspective** which is about understanding the implications of NFTs for its adopters and for the market, particularly what NFTs enable one to do (that could not be done without NFTs).

The **technical perspective**, which is about understanding the technologies on which NFTs are built and their properties which give rise to NFT's functionality in the first place.

Functional Perspective

NFTs allow us to have digital representations of potentially anything in a way that these representations are unique, trustworthy (or at least a tamper proof record of ownership) and can be traded.

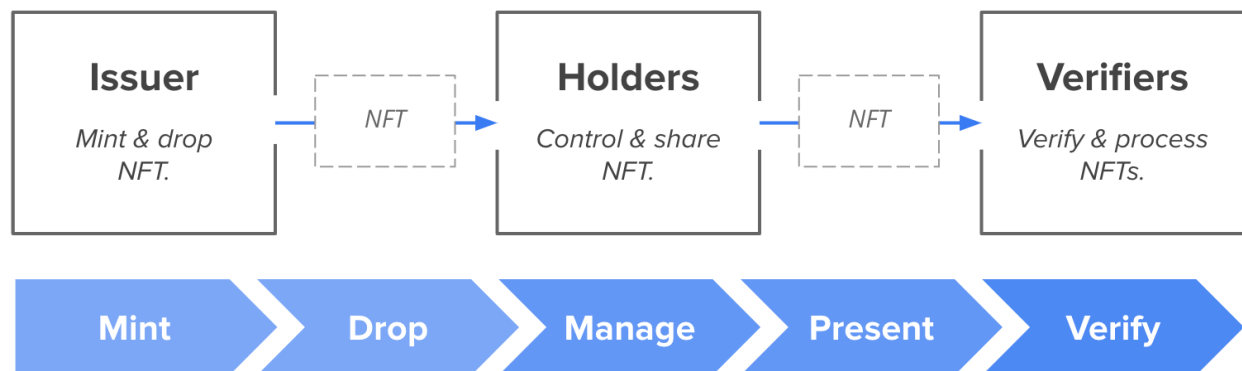
¹ According to McKinsey [1], COVID accelerated the process of digitisation by several years: Today, more than 58% of customer interactions are digital and the majority of products and services are partly or fully digitised. In relative terms, this is a 40% increase in less than 3 years (2018-2021).

Borrowing terminology from Self-Sovereign Identity (SSI), we can distinguish the following roles or functionalities:

- **Issuers** - Parties who create (“mint”) NFTs and issue (“drop”) them to someone else (“Holders”). Issuers are the original sources of an NFT. *For example, an artist who mints her art as an NFTs and transfers it to a buyer.*
- **Holders** - Individuals or organizations who receive a NFT from someone else (but not necessarily from the original “Issuer”, considering that NFTs are transferable).

When we think about identity use cases for NFTs like ownership-based access management (more on this below), there is a third role that must be considered:

- **Verifiers** - Parties who verify NFT ownership by a Holder in order to provide access to information, services, products or other benefits.

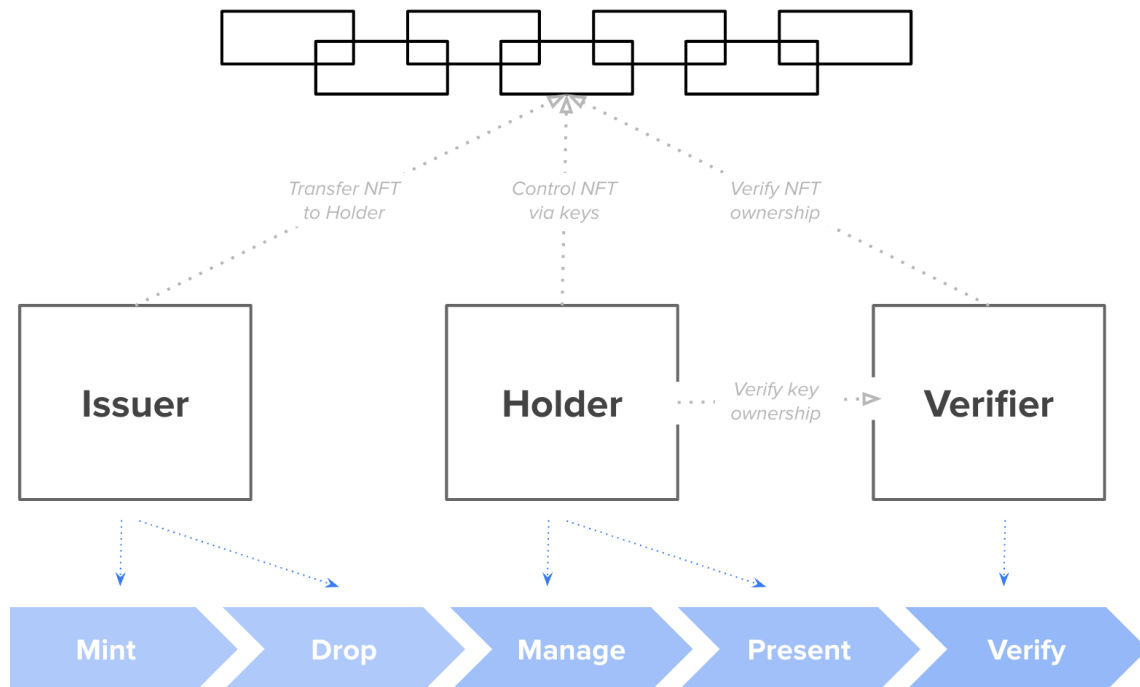


Technical Perspective

Understanding NFTs from a technological perspective requires the understanding of a **few core concepts**:

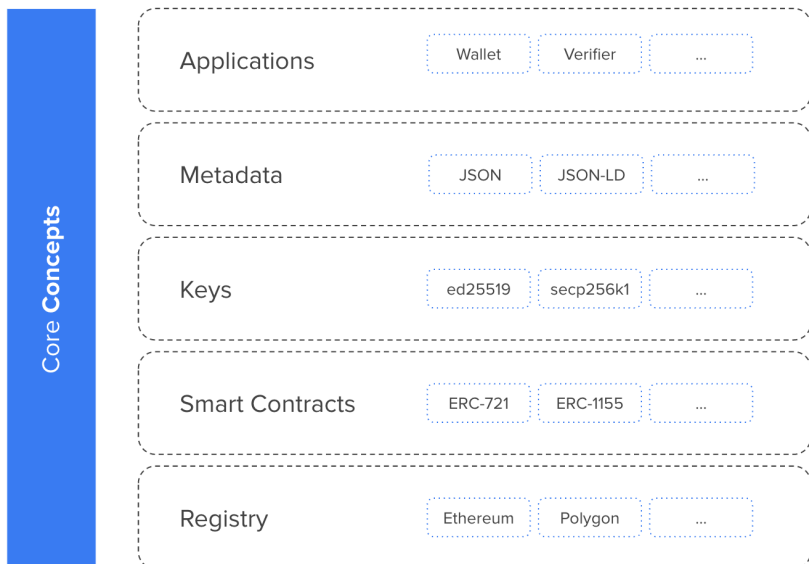
- **Registries**, typically blockchains, which serve as a shared and trusted record of information. In other words, they serve as a “layer of trust” and a “single source of truth”.
- **Cryptographic keys**, which convey control over NFTs and enable core functionality such as encryption and authentication.
- **Token IDs** are used to distinguish NFTs in a smart contract instance on a blockchain. Each token ID is linked to a unique address (establishing a public key infrastructure) and to metadata. This way different parties can easily find and interact with each other as well as benefit from blockchains’ unique properties like immutability.
- **Metadata**, which can be anything (e.g. a piece of digital art, a digital representation of a physical good). Importantly, metadata can be stored on-chain or off-chain.
- **Smart contracts**, which can be thought of as the programs or apps that run on a blockchain and are responsible for “minting” (creating) NFTs.
- **Wallets**, which are used to store keys (control) or potentially even metadata. Also, they enable the management and sharing of NFTs via easy-to-use applications.

[Contact us](#) if you have questions or remarks. We’re happy to help.



You can **think of these core concepts as different building blocks** that are **available in different variations** and **can be put together in different ways**. (A similarity that NFTs share with *Self-Sovereign Identity*.) For example:

Different blockchains can be used to establish Registries (e.g. Ethereum, Polygon, Solana, Avalanche, Polkadot, Tezos) just like metadata can be stored in different ways (e.g. on a blockchain, IPFS, filecoin, traditional or proprietary databases). Similarly different smart contract development standards can be used such as ERC-721 or ERC-1155 for EVM compatible chains.



As a result, there are different “flavors” of NFTs depending on which variations of which building blocks have been used and how they have been put together. The fact that such different flavors exist shows that interoperability is a crucial topic, that is why the development and use of **open standards** are **vital for technology and vendor selection**.

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NFTs for identity?

While NFTs are increasingly used to model digital identity, there are a number of issues that come with this approach. At their core, all issues are rooted in the fact that **ownership and identity are two entirely different creatures**:

Ownership vs. identity

For ownership it is fine to exclusively rely on decentralized systems like blockchains, because **all you need is an immutable record of transactions**. If you have such a record you can simply view the history of all transactions to verify the state of ownership at any given point in time. **You do not need to trust anyone else**. You only need to trust the technology (and incentive structures).

With identity this is not the case. Having an immutable history of records is not enough. Consider the following example:

If I tell you that my name is Luke Skywalker, you probably won't believe me, regardless of whether there is a record of this on a blockchain. Even if I manage to find a couple (or even thousands) of people to confirm that I'm Luke Skywalker, you cannot be sure that this is true. To be sure, you need to see an official identity document, like my passport, which was issued by an authority that you trust.

Here's the problem. You cannot rely on people to tell the truth about their own identity, which means that **identity must always be asserted or vouched for by someone else**, typically an authority that enjoys very high levels of trust in the given context - like a government for your core identity or a university for your diploma.

A blockchain can only tell you about the ownership distribution of things anchored on it. It cannot tell you whether the things are in a sense "true". (Garbage in, garbage out.) This is also the reason why plagiarism is a big problem for NFTs: While a blockchain can tell you that there is only one NFT and who owns it, it cannot tell you whether the NFT represents, for example, a real crypto punk or merely a copy. To know this you need a trusted authority that verifies a crypto punk's authenticity such as by verifying if the crypto punk has really been minted by the original artist.

Why you should not use NFTs for digital identity

There are at least four reasons why NFTs are typically not a good solution for identity use cases:

- **Insufficiency:** While NFTs are good for modeling ownership of assets, they are not sufficient for modeling digital identity in all its facets.
- **Privacy:** NFTs are typically anchored on *public* blockchains which creates obvious privacy issues if used for any type of identity data.
- **Compliance:** Using NFTs to model the identity of *individuals* will typically violate data protection regulations considering the tensions between individual data rights (e.g. GDPR's right to be forgotten) and blockchains inherent properties (e.g. immutability).

- **Costs and scalability:** The use of blockchains in the context of NFTs implies transaction costs and potential scalability issues.

In a nutshell, **NFTs are good for modeling what you own, but not for modeling who you are.**

Identity use cases for NFTs

Even though NFTs are not the right solution for most identity use cases, there is at least one set of use cases that makes a lot of sense: **Ownership-based access management.**

When we talk about ownership-based access management, we mean **use cases where access to information, services, products** or any other benefits **depend only on what you own, not on who you are.** Here are some examples to illustrate the diversity of applications:

- Content, like articles or podcasts, that can only be accessed by people who already hold NFTs from the respective creator.
- Special discounts for or early access to new products that can only be claimed by holders of NFTs from a special series.
- New maps or challenges in online games that can only be played by holders of NFTs that represent certain digital assets like skins or trophies.

Also, there is a very important difference between ownership- and identity-based access management that completely changes the dynamics for use cases:

In the first case (ownership) the **right to access and benefits is tradable**, which is not possible if access rights are tied to one's identity. In other words, NFTs allow us to model access rights as a commodity that can be bought and sold **and exists independently of its owner's identity.**

Picking up the examples above, creators may choose to create content, art, gaming experiences or offer discounts that can only be accessed by a limited number of people without determining who these people are. Clearly, NFTs that come with special access rights can become incredibly valuable. Just think about what someone would pay for the privilege of being one in only a hundred people on this planet able to hear a special song by their favorite artist or to play a special map or challenge in an online game.

Next to ownership-based access management, NFTs could be used for **use cases which do not involve people and their personal data** and, therefore, do not trigger privacy and compliance issues. In other words, NFTs could be used for modeling the digital identity of **legal entities or machines** (IoT), however, even here NFTs are usually not the best option considering the advantages of other approaches like Self-Sovereign Identity.

How to get started?

Based on our experience, the best way to get started is to **collect practical experience by building pilot projects**. This will help you to quickly **build-up knowledge** and **prove the value (ROI) of NFTs for your organization**.

If you are thinking about implementing identity-related use cases, we suggest you read our [Introduction to Self-Sovereign Identity](#). To help you understand if NFTs are actually the right technology for the problem you are trying to solve.

If it turns out that NFTs are not the right technology for solving your problem (which is typically the case if you're trying to solve identity-related problems) you check out our **Pilot Playbook** which guides you through the process of planning and building pilots with SSI in five steps:

1. **Identify Use Cases:** A framework and examples to help you discover opportunities.
2. **Select Use Cases:** A matrix and different selection criteria will help you analyze and prioritize use cases.
3. **Select an Ecosystem:** An elaboration of ecosystems and a simple approach for selecting the right one for your organization's operating model.
4. **Plan your Implementation:** Guidance on setting project requirements and the technology selection and the question of "buy vs. build".
5. **Implement your Pilot:** Guidance to ensure the successful implementation of your project.

View and download a [free copy of the Pilot Playbook](#).



[Walt.id](#) offers developers and organizations an easy and fast way to adopt decentralized identity.

All products are open source (Apache 2), based on open standards (W3C, DIF, OIDF, EBSI) and used by governments, public authorities and businesses across industries (e.g. banking and financial services, web3, education, HR, marketplaces).

To ensure client's success, industry-leading experts provide holistic services from conception over the implementation of pilots and production system to enterprise support and managed cloud services.

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