



## An Introduction to Cardano Standards

Cardano's commitment to decentralization, security, and scalability extends to how it handles NFTs. Unlike other blockchains, Cardano NFTs are embedded directly into the blockchain's ledger, requiring no additional smart contracts for their core functionality. To manage this unique approach, Cardano leverages a series of standards known as Cardano Improvement Proposals (CIPs).

Cardano's decentralized approach enables the community to propose and shape the standards that govern its NFTs. All of the CIPs described in this chapter were drafted and are maintained by the community.

CIPs are technical guidelines that ensure NFTs are created, traded, and displayed consistently across the Cardano ecosystem. Think of them as blueprints that wallets, marketplaces, and other tools follow to understand and interact with NFTs.

In this chapter, we'll dive into the key CIPs that shape the Cardano NFT landscape:

**CIP 25 - The NFT Metadata Standard**: This cornerstone CIP defines how essential details like your NFT's name, image, and description are stored alongside the asset itself.

**CIP 27 - Community Royalties**: CIP 27 streamlines the royalty process, allowing creators to set ongoing royalty terms for their NFTs without complex smart contracts.

**CIP 68 - Beyond Basic Metadata**: CIP 68 makes NFT metadata available to smart contracts. It allows for dynamic metadata, on-chain interaction, and the creation of unique hybrid asset types.

**CIP 86 - Metadata Updates**: CIP 86 offers flexible ways to modify metadata efficiently and securely. It allows metadata changes for dynamic projects without the need for burning or re-minting tokens.

**CIP 88 - Token Policy Registration**: CIP 88 enables you to register official details, descriptions, project images and links directly on the blockchain - reducing chain bloat and decentralising token registration.

**CIP 102 - Flexible Royalties**: CIP 102 builds upon CIP 68. It's ideal for collaborations as it enables complex royalty splits and customizable distribution rules baked right into your NFTs.

## **Why Standards Matter**

CIPs benefit the entire Cardano NFT ecosystem - creators, collectors, and marketplaces alike:

- Standards ensure that NFTs are authentic, their metadata is secure, and royalties flow as intended.
- Marketplaces, wallets, and other tools can easily understand and display NFT information, providing a seamless user experience.
- CIPs help maintain a level of consistency that enables the ecosystem to function efficiently and grow.
- CIPs can evolve as new use cases for NFTs emerge, future-proofing assets on the Cardano blockchain.

By understanding these CIPs, you'll gain deeper insight into how Cardano NFTs work. This knowledge will enable you to create assets with confidence, knowing they will be recognized and supported throughout the ecosystem.



## CIP 25

[CIP 25, the \*\*Media Token Metadata Standard\*\*](#), provides a way to attach detailed information to tokens on the Cardano blockchain. Unlike Ethereum, and similar blockchains, where tokens and their associated data are managed through smart contracts, Cardano's architecture stores tokens natively on the blockchain ledger itself. This structural difference requires a unique approach to linking metadata to a token. CIP 25 does this by leveraging Cardano's ability to include metadata within a token's minting transaction.

Essentially, CIP 25 states that metadata for a token will be included in the same transaction that mints the token, creating an immutable and traceable connection between the token and its metadata.

The metadata structure defined in CIP 25 supports multiple tokens and policies to be minted within a single transaction, allowing for efficiency and flexibility. The standard requires certain fields, such as the token's name and image - specified as a URI - and allows for additional optional fields to capture more detailed attributes. This could include descriptions, file details, and other properties that give context or enhance the token.

CIP 25 sets a precedent for backward compatibility, with a version property included to manage future updates and changes to the standard. This ensures that as the Cardano ecosystem evolves, the tokens minted under this standard will continue to be supported and understood across various platforms and services within the ecosystem.

### **CIP 25 Key Points:**

- Transactions that contain NFT metadata are tagged with the special label "721". This makes finding them easy.

- CIP 25 has a clear JSON format defining essential metadata, including:
  - name: Your NFT's title
  - image: A link to the image representing the NFT
  - description (optional): A space for a description of the NFT
  - version: This ensures compatibility as the standard may evolve over time.
- As long as the token policy is open, the metadata can be updated. Mint more of the same token with new metadata (still using label "721"). This new information becomes the official metadata for the token.
- The format is intentionally simple. CIP 25 provides a flexible foundation, allowing more details to be added as different NFT use cases emerge.



## CIP 27

[CIP 27, the \*\*CNFT Community Royalties Standard\*\*](#), provides a straightforward way to ensure creators get royalties on Cardano NFTs, without requiring complex smart contracts. It's built for ease of use, leveraging metadata alone, but it can be used with smart contracts if needed.

CIP 27 introduces a new metadata tag, "777," dedicated to royalty information. This tag marks a new metadata entry on a minted asset, capturing the royalty percentage and the payment address for royalties. The "rate" field denotes the royalty percentage, ranging from 0.0 to 1.0, and the "addr" field specifies the address where royalty payments are to be sent.

The CIP's process flow starts with the creation of an asset policy, followed by minting a "no-name" token that contains the royalty metadata, and then potentially burning this token to free up the UTxO space, though burning is not mandatory. Thereafter, assets can be minted under this policy, with all markets instructed to recognize the first minted asset under the policy as the authoritative source for royalty information.

One of CIP 27's central tenets is the immutability of royalty terms once they are set, ensuring buyers and owners can foresee the resale value of their assets.

CIP 27 allows artists and creators to be compensated fairly in the ongoing value exchange associated with their work. It underscores the Cardano community's commitment to fostering a creator-friendly ecosystem where artists are duly rewarded for their contributions.

### **CIP 27 Key Points:**

This standard establishes a clear, metadata-based method for setting and tracking royalties on NFT sales.

- No smart contracts required. By including special metadata tags within the transaction, royalties work without complicated extra code.
- "777" specific tag. When marketplaces see this tag, they know this contains the royalty information.
- The metadata under the "777" tag specifies:
  - rate: The royalty percentage (e.g., "0.10" for 10%)
  - addr: The address where the royalties should be sent (this could even be a smart contract for complex distribution rules)
- To avoid last-minute changes, only the first asset minted under a policy is considered the official royalty definition.

### **How to implement CIP 27:**

- Start with a fresh token policy for the NFTs that will have royalties.
- Mint a single token with no name, using the new policy, and including the "777" metadata with the royalty details.
- Now, you can create the actual NFTs under this same policy.
- Marketplaces will automatically look at that first token, recognize the "777" tag, and enforce the royalty as the NFT is resold.



## CIP 68

[CIP 68, the Datum Metadata Standard](#), introduces a significant upgrade to how token metadata is handled on Cardano. By storing metadata within datums on the blockchain, this standard allows for more flexible, programmable, secure, and dynamic asset representation compared to CIP 25.

Unlike CIP 25, which primarily focuses on NFT metadata, CIP 68 utilizes output datums - a feature of the extended UTXO model - allowing metadata to be an integral part of the output that holds the asset. This serves not only NFTs but also fungible tokens (FTs), presenting a more versatile standard that can adapt to various use cases.

CIP 68 introduces the concept of a 'reference NFT' locked in a script alongside a 'user token.' The 'user token' can be an NFT, FT, or any asset representing value. Metadata is located by finding the output where the 'reference NFT' is held. Asset issuers can decide the locking script's logic for the 'reference NFT.' This flexibility allows for immutable metadata or updatable metadata, depending on the use case. Each asset name must be prefixed by a label, as defined by CIP 67, to identify the token's purpose, enhancing the recognition of token types and their functionalities. To ensure the metadata's integrity, CIP 68 specifies conditions that must be met, such as the 'user token' and 'reference NFT' being under the same policy ID, and the asset names of both tokens following a standard naming pattern with respective prefixes. This approach secures the link between the 'user token' and its metadata, safeguarding against metadata spoofing and promoting authenticity.

The standard supports different kinds of tokens right out of the box:

222: Standard NFTs (similar to CIP-25)

333: Fungible Tokens (representing quantities)

444: Rich Fungible Tokens (think fractionalized NFTs, blending NFT and FT)

concepts)

### **CIP 68 Key Points :**

- CIP 68 unlocks the potential to directly access an NFT's details from within Cardano smart contracts. This opens the door to all sorts of on-chain interactions.
- CIP 68 breaks away from the old way of storing metadata directly within the NFT transaction. Instead, it introduces two tokens:
  - **Reference NFT:** It acts as a locked container holding the metadata, securely linking it to the user token.
  - **User Token:** This is the "real" NFT that lives in someone's wallet. It's associated with the Reference NFT to fetch its metadata.
- Each token has a special tag at the start of its name to identify its purpose.
- The Reference NFT's lock contains a special "datum" - this is where the metadata lives. The datum also has a version number to manage updates.
- Offers the capacity for metadata to be programmable, which was not possible with CIP 25.
- Allows for updates or changes to metadata without being constrained by the limitations of the minting transaction. This is a major step forward for representing things that evolve, like game assets.
- Makes NFT and asset details readily accessible for marketplaces, wallets, and other Cardano tools.
- Provides a system for classifying tokens so wallets and third parties can easily recognize the type of token.
- A clever design ensures NFT information is tamper-proof.



### **CIP 86**

[CIP 86, the NFT Metadata Update Oracles](#), introduces flexible ways to update token information on Cardano without minting or burning, addressing a limitation

of CIP 25, the original NFT metadata standard. It required minting or burning tokens to modify their details. This was inefficient and costly, especially for frequently changing data. CIP 86 proposes a way to update NFT metadata directly through transactions, thus bypassing the need for minting/burning.

With CIP 86, you can assign an official metadata updater ("oracle") to a token policy. This oracle is like a librarian who can make changes to the official records. Oracles can add, remove, or change specific details within the metadata without having to redo everything. Think of it like editing a single line in a book instead of rewriting the whole book.

CIP 86 proposes three update types for different situations:

- **Simple Updates:** Edit one token at a time.
- **Regex Updates:** Update many tokens matching a pattern all at once (e.g., "Update the age of all characters between numbers 5000-5999").
- **Tabular Updates:** Bulk edits for many fields across lots of tokens (great for game stats)

For artists and developers, CIP 86 offers a more nuanced way to manage NFTs - imagine a digital artist updating the details of their artwork or a game developer modifying in-game assets without needing to issue new tokens. This can lead to a richer, more interactive NFT experience on Cardano.

### **Example of how CIP 86 can be used:**

Imagine a virtual world where your character's attributes evolve with each quest. CIP 86 makes it possible for these changes to be reflected in the NFT metadata, making every achievement an integral part of the asset's history, enhancing the gameplay experience and ensuring transparency and traceability.

### **An overview of how it works in practice:**

- Mint your NFTs (using the existing CIP 25 standard).
- Assign an oracle to decide who gets to update the metadata and put that info in a special transaction.
- When you want to change the metadata of your NFT, the designated oracle updates the metadata within a special area of a transaction. Wallets and other tools can then easily find and display this up-to-date info.



## CIP 86 Key Points:

- Avoid the transaction fees of minting/burning just to change a few details.
- Perfect for projects where NFT details might change over time, like game items that get upgrades.
- CIP 86 is backward compatible, meaning that, CIP 25 metadata works just fine.
- You can choose the update method that fits the situation, from three predefined mechanics.
- Only the designated oracle can make changes, keeping the info trustworthy.
- Cardano ecosystem tools will track the updates to ensure wallets and marketplaces display the most up-to-date information



## CIP 88

[CIP 88, Token Policy Registration](#), introduces a systematic method for registering token policies, details and intent directly on chain. CIP 88 proposes a structure that includes a hybrid information schema, maintaining flexibility for the variety of use cases native assets might embody. This stands in contrast to current practices where token details are often centralized, in NFT marketplace databases or the Cardano Token Registry managed by the Cardano Foundation, which holds information such as display details, project information, and logos for FTs. By making use of this standard token projects can directly register and update their feature sets and metadata details, overcoming the concerns of centralization and security. It also addresses a vulnerability in the original NFT metadata standard (CIP 25), which linked metadata to the minting transaction, posing potential risks of malicious metadata injection.

Moreover, CIP 88 simplifies the management of token data by moving project-specific information, such as project names, social handles and links to a different level within the blockchain's ledger. This strategy contributes to reducing ledger

size by eliminating redundant data across tokens.

The specifications within CIP 88 support future extensions, with placeholders for additional scopes like stake pools and dApps. It includes provisions for backward compatibility, ensuring seamless integration with existing standards such as CIPs 25, 26, 27, and 68.

### **Practical Application:**

Imagine a digital art collection where the artist regularly updates the descriptions, the collection banner, and properties of the artworks. With CIP 88, he can securely update NFT metadata to reflect current themes or events, directly on the blockchain, without needing third-party approval or undergoing additional processes.

### **An overview of how it works in practice:**

- Project owners gather all the details they want to register (name, description, social links, thumbnails, banners etc.).
- They put this info into a special format defined by CIP-88.
- They sign the information using their token's policy key.
- This signed metadata gets included in a Cardano transaction.

### **CIP 88 Key Points:**

- CIP 88 defines a structured way to include project details directly in a transaction. This info includes things like:
  - Project name and description
  - Social media links
  - Details about what other Cardano standards (CIPS) the token uses.
- The project owners sign the metadata with their keys. This proves they're the real creators and helps prevent fake project information from being spread.
- CIP 88 is designed to adapt as new standards and use cases emerge. Projects can provide additional information in a way that existing tools can still understand.
- Marketplaces, explorers, and wallets can easily find the official information about a token project, ensuring they're showing correct data to users.
- CIP 88 is backward compatible - it works with your existing NFTs/FTs.

- Projects can register and share info without having to rely on a single website or repository.
- As new ways to use native tokens develop, CIP 88 can be updated to support them.



## CIP 102

[CIP 102, Royalty Datum Metadata](#), introduces a new standard to enhance royalty handling on Cardano, particularly for CIP 68 tokens.

This standard proposes a method to ensure trustless on-chain royalty validation by utilizing the metadata patterns established in CIP 68. By addressing some of the limitations of the previous royalty management system under CIP 27, CIP 102 aims to provide greater flexibility, security, and efficiency for NFT creators and collectors. CIP 102 allows for the storage of royalty information (who gets paid, the percentage, etc.) with the ability to customize royalty distributions among multiple addresses. The new standard is designed to support multiple royalty policies within a single collection, applicable at the level of individual tokens. It's also designed to be backward compatible with existing standards and minimizes storage requirements by utilizing efficient data structures.

### **Example Use Case:**

Consider a digital art project where artists collaborate on collections and require a flexible royalty distribution system. Using CIP 102, they can specify unique royalty rates and payout addresses for each piece, which are then embedded in the Royalty NFTs. When a piece is sold, the Cardano blockchain automatically handles the royalty split, ensuring each artist receives their share according to the predefined terms.

### **An overview of how it works in practice:**

- The project mints a special single NFT with royalty details locked within its datum.
- Each regular NFT is minted (or updated) to include a "royalty flag" in its metadata, pointing to the Royalty NFT.
- When an NFT is sold, the marketplace's smart contract looks for the royalty flag, finds the Royalty NFT, and reads the rules stored inside.
- The smart contract calculates and distributes royalty payments as programmed within the Royalty NFT's data.

### **CIP 102 Key Points:**

- Royalty info is on the blockchain and can't be easily changed without permission.
- Supports complex royalty distribution schemes, including splitting royalties among multiple addresses, which caters to collaborative projects and partnerships.
- Minimizes the need for creators and marketplaces to manually manage or adjust royalties, as these details are embedded within the NFTs themselves and handled by the protocol.
- If they opt into the standard, marketplaces and wallets can easily find the Royalty NFT, decode its information, and process royalties automatically.
- Builds upon the existing CIP-68 standard to keep it familiar to NFT projects.