

Blockchain

Create and Deploy an ERC721 Token

2024

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What is an ERC-20 Token?

- ERC-20 是在 2015 年提出，最終於 2017 年與以太坊上正式安裝完成。在去中心化的生態系統中，這種制式的代幣標準被廣泛的使用在多種用途上。由於 ERC-20 本身就是一套規範區塊鏈行為的標準，使得它不但被大多數個人使用者接受，也相當受到一些組織或是機構的歡迎，可以說在ERC-20規範下的以太幣，對於以太坊上的ICO、眾籌、穩定幣建立等活動來說是非常有利的。
- 簡單來說，一個代幣如果是基於ERC-20標準，那它最重要的特性就是代幣間的「同質化」，就好比說你手上的50塊錢硬幣，和我錢包內的50塊錢硬幣一樣，兩者價值完全相同，沒有哪一枚硬幣比較特殊的問題，ERC-20同質化代幣具有兩種特性。
 - 可替代性：表示每顆加密貨幣就有同等價值、功能相同，不同用戶手中的以太幣並沒有區別，彼此之間可以任意交換使用，可以使用公定的價格進行交易。
 - 可分割性：與我們經常使用的法幣不同，法幣購買時的最小單位是1元，加密貨幣雖然使用顆或者枚作為單位，但卻不是以整數進行交易，例如使用以太幣購買NFT時，就能以0.02顆以太幣進行交易，這就是它的可分割性。

What is an ERC-721 Token?

- 和前者ERC-20不同，ERC-721旨在創造具有**不可替代性**以及**不可分割性**的代幣(**Token**)，也就是大家所熟悉的**非同質化代幣—NFT (Non-Fungible Token)**。
 - **不可替代性**：每個NFT都具有它的獨特性，獨一無二且無法取代，同樣被儲存在鏈上後，也无法隨便刪除。
 - **不可分割性**：除非智能合約允許，否則NFT是沒辦法像加密貨幣一樣，被拆成更小的份數進行交易。
- 其實只要一個物件能**具有特殊價值**，就適合以**NFT**這種代幣標準被創造出，比如藝術創作、音樂，或者是目前最常見的個人頭像、**PFP(Profile Picture)**，一般來說是沒辦法找到另一個價值完全對等的ERC-721代幣。
- NFT也可以看做一個數位創作或資產的所有權，與以往的藝術作品不同，NFT作為獨特的數位代幣，**創作者可以透過版費(royalties)的方式**，在每一筆交易中持續獲得收入，就算買賣雙方沒有創作者參與也是如此。

ERC-721 - 9 Mandatory Functions

- **ownerOf:** This function returns the address of the owner of a specific token. Each ERC721 token is unique, represented by an ID. This function allows users or applications to determine the owner of the token based on its unique ID.
- **balanceOf:** This function is used to return the number of NFTs (Non-Fungible Tokens) owned by a specific address..
- **safeTransferFrom(without data):** This function safely transfers the ownership of a specific token from one address to another. This function checks if the recipient is a smart contract. If it is, it must implement a specific function (onERC721Received) to accept the transfer.
- **safeTransferFrom(with data):** This function is similar to safeTransferFrom (without data) but with an additional data parameter. This extra data can be used to pass additional information during the transfer if the recipient is a smart contract. This function also checks if the recipient is a smart contract and whether it implements the onERC721Received.

ERC-721 - 9 Mandatory Functions

- **approve**: This function is used to give approval to an address to transfer a specific token. This allows for delegated transfers, where an owner can allow another party to transfer a token on their behalf.
- **getApproved**: This function is used to get the approved address for a specific token. If there is no approved address for the token, this function will return a null address.
- **transferFrom**: This function is used to transfer the ownership of a token from one address to another. It is generally used when the sender has been approved to transfer the token.
- **setApprovalForAll** : This function allows an owner of one or more tokens to approve or revoke approval for an operator to manage all of their tokens.
- **isApprovalForAll** : This function is used to check if an operator is approved to manage all of an owner's tokens.

ERC-721 - 3 Events

- **Transfer:** This event is emitted when the ownership of a token changes from one address to another. The event includes details about the sender (from), the recipient (to), and the specific token (by ID) that was transferred. This event allows external listeners, like UIs or other contracts, to react to the transfer.
- **Approval:** This event is triggered when an address is approved to transfer a specific token. It includes the current owner of the token (owner), the approved address that can now transfer the token (approved), and the specific token (by ID) that has been approved for transfer. This event enables applications to track approvals of tokens and react accordingly.
- **ApprovalForAll:** This event is emitted when an owner either approves or revokes the approval for an operator to manage all of their tokens. It includes the owner's address (owner), the operator's address (operator), and a boolean indicating whether the operator was approved or not (approved). This event enables applications to track which addresses have been given rights to manage all tokens of a certain owner.

NFT – Metadata Standards

Here's an example of metadata for one of the OpenSea creatures:

JSON

```
{  
  "description" : "Friendly OpenSea Creature that enjoys long swims in the ocean.",  
  "external_url" : "https://openseacreatures.io/3",  
  "image" : "https://storage.googleapis.com/opensea-prod.appspot.com/puffs/3.png",  
  "name" : "Dave Starbelly", "attributes": [ ... ]  
}
```

1. ERC-721 smart contract 中，只儲存了「tokenID -> owner address」和「tokenID -> tokenURI」的 mapping，裡面並沒有放如 NFT 所代表的圖片、標題等等資訊，此時就需要透過外部的 Metadata 來實現，並透過 tokenURI 指向 Metadata 所在的位置。
2. Metadata 其實就是一份 JSON 檔，由 EIP-721 所定義，記錄這張 NFT 的資訊。

NFT – Metadata Standards

properties	Description
image	This is the URL to the image of the item. Can be just about any type of image (including SVGs, which will be cached into PNGs by OpenSea), IPFS or Arweave URLs or paths. We recommend using a minimum 3000 x 3000 image.
image_data	Raw SVG image data, if you want to generate images on the fly (not recommended). Only use this if you're not including the image parameter.
external_url	This is the URL that will appear below the asset's image on OpenSea and will allow users to leave OpenSea and view the item on your site.
description	A human-readable description of the item. Markdown is supported.
name	Name of the item.
attributes	These are the attributes for the item, which will show up on the OpenSea page for the item. (see below)
background_color	Background color of the item on OpenSea. Must be a six-character hexadecimal <i>without</i> a pre-pended #.
animation_url	A URL to a multi-media attachment for the item. The file extensions GLTF, GLB, WEBM, MP4, M4V, OGV, and OGG are supported, along with the audio-only extensions MP3, WAV, and OGA. Animation_url also supports HTML pages, allowing you to build rich experiences and interactive NFTs using JavaScript canvas, WebGL, and more. Scripts and relative paths within the HTML page are now supported. However, access to browser extensions is not supported.
youtube_url	A URL to a YouTube video (only used if animation_url is not provided).

NFT – Metadata Standards



[View on OpenSea Creature](#)

PROPERTIES

Googley
98% has this property

Jelly
98% has this property

OpenSea Creatures

Herbie Starbelly

Owned by [583232](#)

A friendly OpenSea creature ready to adventure.

RANKING

Stamina
 3 of 13

Jelliness
 7 of 201

Generation
 3 of 13

BIRTHDAY

Wednesday, March 23, 2018

ERC721 Contract

```
pragma solidity ^0.5.0;
```

```
contract Creature is ERC721 {
    function ownerOf(tokenId) returns address;
    function tokenURI() returns string;
}
```

The **tokenURI** function in your ERC721 or the **uri** function in your ERC1155 contract should return an **HTTP or IPFS URL**.

Metadata

```
{
  "name": "Herbie Starbelly",
  "description": "A friendly OpenSea creature ready to adventure.",
  "external_link": "https://opensea creatures.com/1234"
  "traits": [
    {
      "trait_type": "Stamina",
      "value": 3
    },
    {
      "trait_type": "Jelliness",
      "value": 7
    },
    {
      "trait_type": "Generation",
      "value": 3
    }
  ]
}
```

NFT – Metadata Standards

PROPERTIES

PERSONALITY
Sad
29% have this property

MOUTH
Surprised
29% have this property

EYES
Big
20% have this property

BASE
Starfish
20% have this property

BOOSTS



Stamina Increase
10% boost



Puff Power
+40 boost

RANKINGS

Stamina 1.4 of 90.2

Level 5 of 8

STATS

2 Generation
Out of 2

NFT – Metadata Standards

```
...
{
  "attributes": [
    {
      "trait_type": "Base",
      "value": "Starfish"
    },
    {
      "trait_type": "Eyes",
      "value": "Big"
    },
    {
      "trait_type": "Mouth",
      "value": "Surprised"
    },
    {
      "trait_type": "Level",
      "value": 5
    },
    {
      "trait_type": "Stamina",
      "value": 1.4
    },
  ],
}
```



```
...
{
  "trait_type": "Personality",
  "value": "Sad"
},
{
  "display_type": "boost_number",
  "trait_type": "Aqua Power",
  "value": 40
},
{
  "display_type": "boost_percentage",
  "trait_type": "Stamina Increase",
  "value": 10
},
{
  "display_type": "number",
  "trait_type": "Generation",
  "value": 2
}
]
```

NFT – Freezing Metadata

- You can indicate to OpenSea that an NFT's metadata is **no longer changeable by anyone** (in other words, it is "**frozen**") by emitting this event from the smart contract:

```
event PermanentURI(string _value, uint256 indexed _id);
```

NFT – Metadata updates

- To refresh token metadata on OpenSea, you can emit on-chain events as defined in ERC-4906:
`event MetadataUpdate(uint256 _tokenId);`
`event BatchMetadataUpdate(uint256 _fromTokenId, uint256 _toTokenId);`
- To refresh a whole collection, `emit _toTokenId` with `type(uint256).max`
- For ERC1155, metadata updates are supported via the specification for the event URI:
`event URI(string _value, uint256 indexed _id);`

Popular NFT - 1

- **Etherscan NTF Tracker** : List the top NFT on Ethereum by transfers volume.
 - <https://etherscan.io/nft-top-contracts>

The screenshot shows a browser window titled "Top NFTs | Etherscan" with the URL "etherscan.io/nft-top-contracts" highlighted in a red box. The page displays a table of the top 100 NFTs. The columns include: #, Collection, Type, Volume, Change (%), Sales, Min Price (24H), Max Price (24H), Transfers, Owners, and Total Assets. The data for the top 6 NFTs is as follows:

#	Collection	Type	Volume	Change (%)	Sales	Min Price (24H)	Max Price (24H)	Transfers	Owners	Total Assets
1	BoredApeYachtClub	ERC-721	34.46 ETH	5.49%	2	0.0000 ETH	77 ETH	296,414	5,348	10,000
2	EmblemOpen	ERC-721	29.02 ETH	0.00%	1	29.02 ETH	29.02 ETH	130	33	53
3	Beeple Round 2	ERC-721	12.5 ETH	0.00%	1	12.5 ETH	12.5 ETH	492	72	100
4	0x DCA91409...072969861	ERC-1155	11.5 ETH	0.00%	1	11.5 ETH	11.5 ETH	4,856	724	0
5	Beeple Round 2 Open Edition	ERC-721	10.26 ETH	0.00%	1	6.5 ETH	10.26 ETH	2,564	299	601
6	MutantApeYachtClub	ERC-721	8.6857 ETH	-2.79%	4	2.0678 ETH	3 ETH	442,940	11,697	19,500

Use Cases of Non-Fungible Tokens (NFTs)

- **Digital art (or physical art)** : Art pieces are the most popular use cases of NFTs. Digital art auctions were the first application of NFTs and continue to grow.
- **Gaming**: Providing in-game purchases and collectibles of games.
- **Real estate**: Tokenizing properties and smart contracts and carry buying and selling.
- **Finance**: Financial instruments like loans, futures, and other responsibilities.
- **Software titles**: Software licenses to ensure anti-piracy and privacy.
- **Concert tickets/Sports match tickets**: To ensure that no fraud happens in ticket selling and fans can have a single place to view past experiences.
- **KYC compliance**: Creating a token for a specific user's KYC(Know Your Customer).



Create an ERC-721 Token

ERC-721 Token

```
// SPDX-License-Identifier: MIT  
pragma solidity ^0.8.0;
```

預設使用目前
最新版本v5.1.0

```
import "@openzeppelin/contracts/token/ERC721/ERC721.sol";  
import "@openzeppelin/contracts/utils/Counters.sol";  
import "@openzeppelin/contracts/access/Ownable.sol";  
import "@openzeppelin/contracts/token/ERC721/extensions/ERC721URIStorage.sol";
```

```
contract SaluNFT is ERC721URIStorage, Ownable(address(msg.sender)) {  
    using Counters for Counters.Counter;  
    Counters.Counter private _tokenIds;  
  
    constructor() ERC721("SaluNFT", "NFT") {}
```

By default, the owner of an **Ownable contract** is the account that **deployed** it, which is usually exactly what you want.

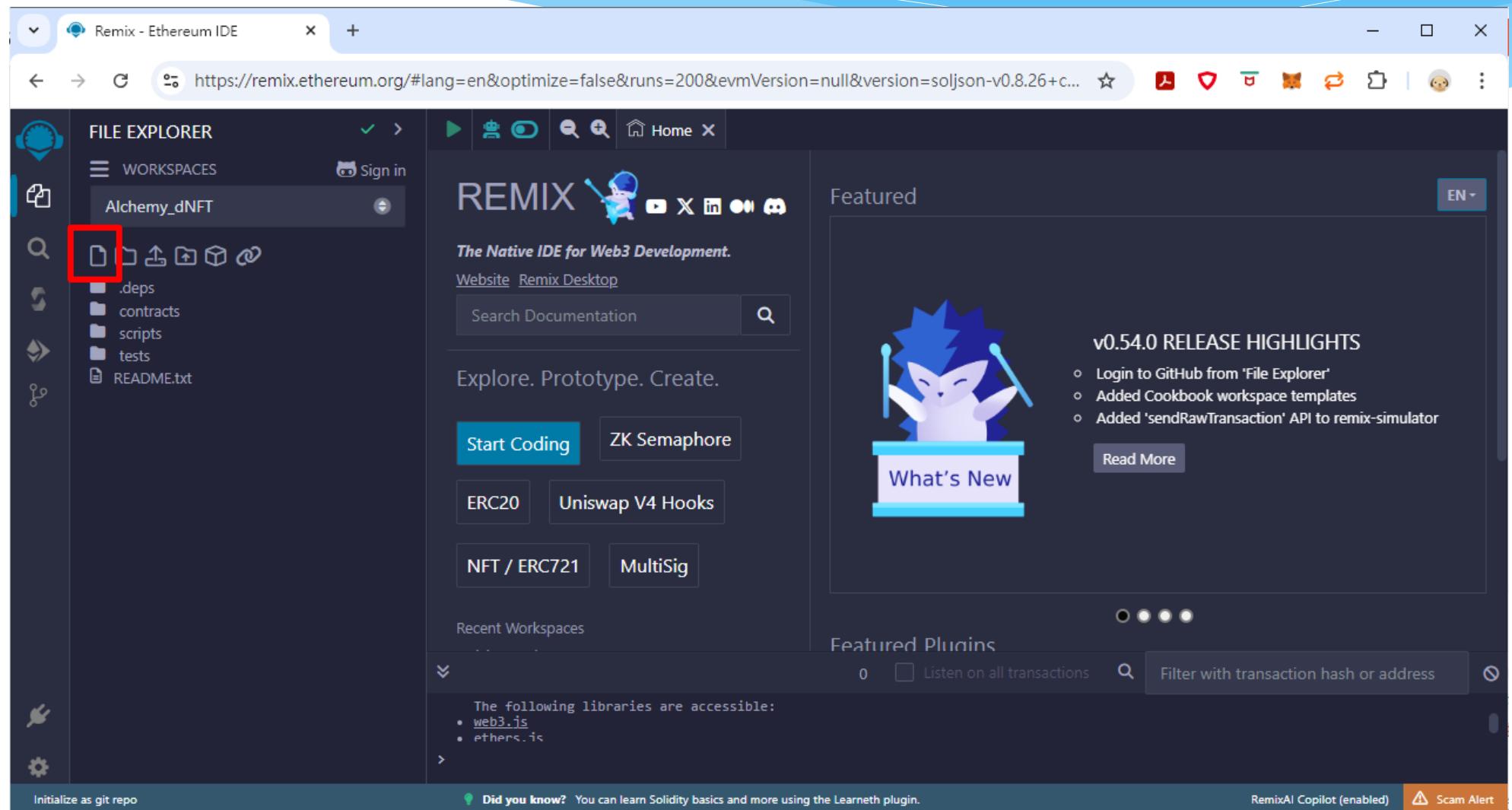
```
function mintNFT(address recipient, string memory tokenURI)  
    public onlyOwner  
    returns (uint256)  
{  
    _tokenIds.increment();  
  
    uint256 newItemId = _tokenIds.current();  
    _mint(recipient, newItemId);  
    _setTokenURI(newItemId, tokenURI);  
  
    return newItemId;  
}
```

onlyOwner will run every time **mintNFT()** gets called, verifying if the caller is the owner of the contract.



Case 1

Create an ERC-721 Token



The screenshot shows the Remix Ethereum IDE interface. On the left, the **FILE EXPLORER** panel displays a workspace named **Alchemy_dNFT**. A red box highlights the copy icon (a clipboard with a plus sign) in the toolbar of this panel. The central area features the **REMIX** logo and the tagline "The Native IDE for Web3 Development". Below the logo are buttons for **Start Coding**, **ZK Semaphore**, **ERC20**, **Uniswap V4 Hooks**, **NFT / ERC721**, and **MultiSig**. To the right, there's a **Featured** section with a cartoon character, release highlights for v0.54.0, and a "What's New" button. At the bottom, there are sections for **Recent Workspaces**, **Accessible Libraries** (listing `web3.js` and `ethers.js`), and **Featured Plugins**.

Modify SaluNFT.sol

The screenshot shows the Remix Ethereum IDE interface. The left sidebar has a 'FILE EXPLORER' section with a 'WORKSPACES' dropdown set to 'Playground'. Below it is a file list with 'SaluNFT.sol' highlighted by a red box. The main area is a code editor titled 'SaluNFT.sol' with the following Solidity code:

```
// SPDX-License-Identifier: MIT
pragma solidity ^0.8.0;

import "@openzeppelin/contracts/token/ERC721/ERC721.sol";
import "@openzeppelin/contracts/utils/Counters.sol";
import "@openzeppelin/contracts/access/Ownable.sol";
import "@openzeppelin/contracts/token/ERC721/extensions/ERC721URIStorage.sol";

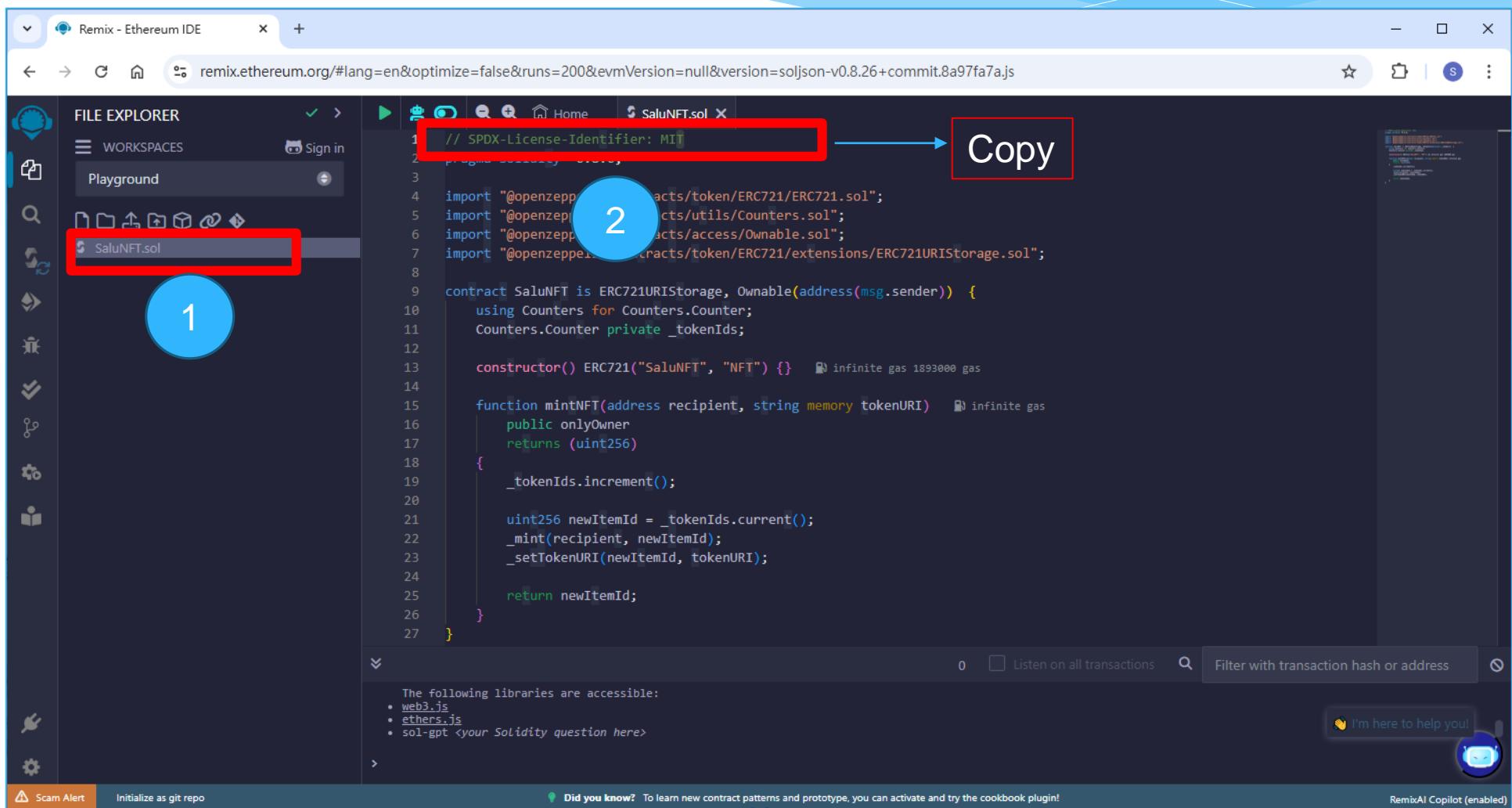
contract SaluNFT is ERC721URIStorage, Ownable(address(msg.sender)) {
    using Counters for Counters.Counter;
    Counters.Counter private _tokenIds;

    constructor() ERC721("SaluNFT", "NFT") {} infinite gas 1893000 gas

    function mintNFT(address recipient, string memory tokenURI) infinite gas
        public onlyOwner
        returns (uint256)
    {
        _tokenIds.increment();
        uint256 newItemId = _tokenIds.current();
        _mint(recipient, newItemId);
        _setTokenURI(newItemId, tokenURI);
        return newItemId;
    }
}
```

The code editor has line numbers from 1 to 27. A red box highlights the entire constructor and the first part of the mintNFT function. The bottom of the screen shows a help message, accessible libraries (web3.js, ethers.js), and a 'Did you know?' section. A 'RemixAI Copilot (enabled)' status is also visible.

Copy SPDX-License



Flatten SaluNFT.sol

The screenshot shows the Remix Ethereum IDE interface. The top bar displays the title "Remix - Ethereum IDE" and the URL "remix.ethereum.org/#lang=en&optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.26+commit.8a97fa7a.js". The left sidebar contains icons for File Explorer, Workspaces, Search, and other tools. The main area is the "FILE EXPLORER" showing a workspace named "Playground" with a file named "SaluNFT.sol". A context menu is open over the "SaluNFT.sol" file, with two specific steps highlighted:

- Step 1: A red box highlights the "SaluNFT.sol" file in the list, with a blue circle containing the number "1" to its left.
- Step 2: A red box highlights the "Flatten" option in the context menu, with a blue circle containing the number "2" to its left.

The code editor shows the Solidity source code for the "SaluNFT" contract, which inherits from "ERC721URIStorage" and "Ownable". It includes imports for various OpenZeppelin contracts and defines a constructor, a "mintNFT" function (which mints a new NFT with a given URI), and a return statement. The bottom of the code editor shows accessible libraries: "web3.js", "ethers.js", and "sol-gpt <your Solidity question here>". The bottom navigation bar includes links for "Scam Alert", "Initialize as git repo", "Did you know?", "RemixAI Copilot (enabled)", and a support message "I'm here to help you!".

```
// SPDX-License-Identifier: MIT
pragma solidity ^0.8.0;

import "@openzeppelin/contracts/token/ERC721/ERC721.sol";
import "@openzeppelin/contracts/utils/Counters.sol";
import "@openzeppelin/contracts/access/Ownable.sol";
import "@openzeppelin/contracts/token/ERC721/extensions/ERC721URIStorage.sol";

contract SaluNFT is ERC721URIStorage, Ownable(address(msg.sender)) {
    using Counters for Counters.Counter;
    Counters.Counter private _tokenIds;

    constructor() ERC721("SaluNFT", "NFT") {} infinite gas 1893000 gas

    function mintNFT(address recipient, string memory tokenURI) infinite gas
        public onlyOwner
        returns (uint256)
    {
        _tokenIds.increment();

        uint256 newItemId = _tokenIds.current();
        _mint(recipient, newItemId);
        _setTokenURI(newItemId, tokenURI);

        return newItemId;
    }
}
```

SaluNFT_flattened.sol

Remix - Ethereum IDE

remix.ethereum.org/#lang=en&optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.26+commit.8a97fa7a.js

FILE EXPLORER

WORKSPACES Sign in

Playground

.deps

artifacts

build-info

SaluNFT_metadata.json

SaluNFT.sol

SaluNFT_flattened.sol

1

2

```
1 // SPDX-License-Identifier: MIT
2 // File: OpenZeppelin Contracts /utils/introspection/IERC165.sol
3
4 pragma solidity ^0.8.20;
5
6 /**
7  * @dev Interface of the ERC-165 standard, as defined in the
8  * https://eips.ethereum.org/EIPS/eip-165[ERC].
9  *
10 * Implementers can declare support of contract interfaces, which can then be
11 * queried by others ({ERC165Checker}).
12 *
13 * For an implementation, see {ERC165}.
14 */
15
16 interface IERC165 {
17     /**
18      * @dev Returns true if this contract implements the interface defined by
19      * `interfaceId`. See the corresponding
20      * https://eips.ethereum.org/EIPS/eip-165#how-interfaces-are-identified[ERC section]
21      * to learn more about how these ids are created.
22      *
23      * This function call must use less than 30 000 gas.
24  }
```

The following libraries are accessible:

- [web3.js](#)
- [ethers.js](#)
- [sol-gpt <your Solidity question here>](#)

0 Listen on all transactions Filter with transaction hash or address

I'm here to help you!

Scam Alert Initialize as git repo Did you know? To learn new contract patterns and prototype, you can activate and try the cookbook plugin! RemixAI Copilot (enabled)

SaluNFT_flattened.sol

The screenshot shows the Remix Ethereum IDE interface. The top bar displays the URL `remix.ethereum.org/#lang=en&optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.26+commit.8a97fa7a.js`. The left sidebar includes a FILE EXPLORER, WORKSPACES (with 'Playground' selected), and a list of files including `.deps`, `artifacts`, and `SaluNFT_flattened.sol`, which is highlighted with a red box and labeled '1'. The main workspace shows a Solidity code editor with the following content:

```
// SPDX-License-Identifier: MIT
// OpenZeppelin Contracts (last updated v5.1.0) (utils/introspection/IERC165.sol)
pragma solidity ^0.8.20;

/**
 * @dev Interface of the ERC-165 standard, as defined in the
 * https://eips.ethereum.org/EIPS/eip-165[ERC].
 *
 * Implementers can declare support of contract interfaces, which can then be
 * queried by others ({ERC165Checker}).
 *
 * For an implementation, see {ERC165}.
 */
interface IERC165 {
    /**
     * @dev Returns true if this contract implements the interface defined by
     * `interfaceId`. See the corresponding
     * https://eips.ethereum.org/EIPS/eip-165#how-interfaces-are-identified[ERC section]
     * to learn more about how these ids are created.
     *
     * This function call must use less than 30 000 gas.
    
```

A red box highlights the first two lines of the code, and a blue circle with the number '2' is positioned above it. A red arrow points from this highlighted area to a red box containing the word 'Paste', indicating where the SPDX license should be pasted.

At the bottom of the IDE, there is a footer bar with the following items: a Scam Alert icon, Initialize as git repo, Did you know? (with a note about the cookbook plugin), a RemixAI Copilot (enabled) icon, and a button that says 'I'm here to help you!' with a small icon.

Compile Smart Contract

The screenshot shows the Remix Ethereum IDE interface with the following steps highlighted:

- 1** Click the **Compile** icon (a circular arrow) in the sidebar.
- 2** Set the compiler version to **0.8.26+commit.8a97fa7a** and enable **Auto compile**.
- 3** Select the contract **SaluNFT (SaluNFT_flattened.sol)**.
- 4** Click the **Compile SaluNFT_flattene...** button.

The code editor displays the `IERC165.sol` file, which is part of the OpenZeppelin Contracts library. The code defines the `IERC165` interface with its methods and documentation.

```
// SPDX-License-Identifier: MIT
// File: @openzeppelin/contracts/utils/introspection/IERC165.sol

// OpenZeppelin Contracts (last updated v5.1.0) (utils/introspection/IERC165.sol)

pragma solidity ^0.8.20;

/**
 * @dev Interface of the ERC-165 standard, as defined in the
 * https://eips.ethereum.org/EIPS/eip-165[ERC].
 *
 * Implementers can declare support of contract interfaces, which can then be
 * queried by others ({ERC165Checker}).
 *
 * For an implementation, see {ERC165}.
 */
interface IERC165 {
    /**
     * @dev Returns true if this contract implements the interface defined by
     * `interfaceId`. See the corresponding
     * https://eips.ethereum.org/EIPS/eip-165#how-interfaces-are-identified[ERC section]
     * to learn more about how these ids are created.
     *
     * This function call must use less than 30 000 gas.
     */
}
```

At the bottom, there is a note about accessible libraries:

- `web3.js`
- `ethers.js`
- `sol-gpt <your Solidity question here>`

Other UI elements include a **Scam Alert** warning, a **Did you know?** tip, and a **RemixAI Copilot (enabled)** status indicator.

Deploy an ERC-721 Token

The image shows a composite screenshot of the Ethereum development environment. On the left, the **Remix - Ethereum IDE** window is open, displaying the Solidity code for the SaluNFT contract. On the right, the **MetaMask** extension window is open, showing the deployment interface.

Remix - Ethereum IDE (Left):

- 1:** Shows the **Deploy & Run Transactions** sidebar.
- 2:** Shows the **ENVIRONMENT** dropdown set to **Sepolia (1115111) network**.
- 3:** Shows the **ACCOUNT** dropdown with the address **0x4CE...6ae71 (1.55209630727794)**.
- 4:** Shows the **Deploy** button.
- 4:** Shows the status message **creation of SaluNFT pending...**.

MetaMask (Right):

- 2:** Shows the **Salu1** account selected.
- 2:** Shows the **建立新合約** (Create New Contract) button.
- 5:** Shows the **Estimated changes** section indicating **No changes predicted for your wallet**.
- 5:** Shows the **Estimated fee** of **5.06** SepoliaETH.
- 5:** Shows the **自訂 NONCE** field with value **18**.
- 5:** Shows the **確認** (Confirm) button highlighted.

Deploy an ERC-721 Token

The image shows a composite screenshot illustrating the deployment of an ERC-721 token. On the left, the Remix Ethereum IDE interface is displayed. Key components highlighted with red boxes include:

- Injected Provider - MetaMask**: Shows the network selected as **Sepolia (11155111) network**.
- Account**: Shows the account address **0x4CE1...6ae71 (1.51193082890127)**.
- Contract**: Shows the contract selected as **SaluNFT - SaluNFT_flattened.sol**.
- Deploy** button.

An arrow points from the **Deploy** button towards the right side of the image, indicating the flow of the process.

On the right, a wallet interface for **Salu 1** is shown. It displays the account address **0x4CE1...6ae71**. A prominent red box highlights the **1.5119 SepoliaETH** balance. Below the balance, a red box highlights a transaction from **Nov 21, 2024** labeled **部署合約 已確認** (Deployment confirmed). A blue circle with the number **1** is overlaid on this transaction. Further down, another transaction is listed for **Nov 19, 2024** labeled **Issue Token 已確認** (Token issued confirmed).

Deploy an ERC-721 Token

The screenshot shows the Remix Ethereum IDE interface. On the left, the 'DEPLOY & RUN TRANSACTIONS' sidebar is visible, showing the environment set to 'Injected Provider - MetaMask' (Sepolia network), account '0x4CE...6ae71', gas limit '3000000', and value '0 Wei'. The central area displays two Solidity files: 'SaluNFT.sol' and 'SaluNFT_flattened.sol'. The code in 'SaluNFT.sol' includes the SPDX license header, a pragma solidity statement, and an interface declaration for IERC165. A red box highlights the 'view on etherscan' button at the bottom of the deployment log, which reads 'creation of SaluNFT pending...' and '[block:121520 txIndex:44] from: 0x4ce...6ae71 to: SaluNFT.(constructor) value: 0 wei data: 0x'. On the right, a modal window titled '部署合約' (Deployment Contract) shows deployment details: Status (Confirmed), Source Account (0x4CE13...6e71), Destination Account (建立新合約), Transaction (Nonce 18, Value -0 SepoliaETH), Gas Limit (Gas 上限 2200249, Gas 用量 2181766), and Fees (Base fee 16.909617886 GWEI, Priority fee 1.5 GWEI, Total gas fee 0.040165 SepoliaETH / 4.73 ETC, Max fee per gas 0.000000026 SepoliaETH / 0 ETC). A red box highlights the 'View on block explorer' button in the top right of the modal.

remix.ethereum.org/#lang=en&optimize=false&runs=200&evmVersion=null&version=soljson-v0.8.26+commit.8a97fa7a.js

DEPLOY & RUN TRANSACTIONS

ENVIRONMENT
Injected Provider - MetaMask
Sepolia (11155111) network

ACCOUNT
0x4CE...6ae71 (1.51193082890127)

GAS LIMIT
Estimated Gas
Custom 3000000

VALUE
0 Wei

CONTRACT
SaluNFT - SaluNFT_flattened.sol

evm version: canary

Deploy

Publish to IPFS

At Address Load contract from Address

creation of SaluNFT pending...

view on etherscan

[block:121520 txIndex:44] from: 0x4ce...6ae71 to: SaluNFT.(constructor) value: 0 wei data: 0x

Did you know? To learn new contract patterns and prototype, you can activate and try the cookbook plugin!

Status
已確認

來源帳戶
0x4CE13...6e71

目的帳戶
建立新合約

交易

項	值
Nonce	18
數量	-0 SepoliaETH
Gas 上限 (單位)	2200249
Gas 用量 (單位)	2181766
Base fee (GWEI)	16.909617886
Priority fee (GWEI)	1.5
Total gas fee	0.040165 SepoliaETH 4.73 ETC
Max fee per gas	0.000000026 SepoliaETH 0 ETC

View on block explorer

部署合約

已確認

Did you know? To learn new contract patterns and prototype, you can activate and try the cookbook plugin!

Scam Alert Initialize as git repo

RemixAI Copilot (enabled)

View Transaction on Sepolia

The screenshot shows a web browser displaying the Etherscan Sepolia Testnet transaction details for the hash `0x5e07056ab8270b02d0e69138d9e2e6c8535de6c84a7fa88fc06dfdc1e8f3cabe`. The transaction was successful, having 34 block confirmations at the time of capture. A red box highlights the status "Success". Another red box highlights the "Contract Address" field, which contains the value `0x4d3b77fd...67c0` and the note "[Created]". A blue box with the text "Click contract address" has a red arrow pointing to this field.

[This is a Sepolia **Testnet** transaction only]

Transaction Hash: `0x5e07056ab8270b02d0e69138d9e2e6c8535de6c84a7fa88fc06dfdc1e8f3cabe`

Status: Success

Block: 7121520 | 34 Block Confirmations

Timestamp: 7 mins ago (Nov-21-2024 08:46:48 AM UTC)

Transaction Action: Call `0x60806040` Method by `0x4CE135aB...64E06ae71`

From: `0x4CE135aB2eB8e482D16B8011ba9415D64E06ae71`

To: `[0x4d3b77fd...67c0 Created]`

Click contract address

Smart Contract Information

The screenshot shows the Etherscan.io interface for the Sepolia Testnet. The URL in the browser is <https://sepolia.etherscan.io/address/0x4d3b77fd>. The page displays information for a smart contract at address **Contract 0x4d3b77FdAa0EAE2cAC296557394e6B71d39a67c0**.

Annotations in red boxes highlight key details:

- A red box surrounds the **Contract** address **0x4d3b77FdAa0EAE2cAC296557394e6B71d39a67c0**, with a red arrow pointing to a blue box containing the text: **記下此Contract id，等一下Opensea會用到** (Remember this Contract id, it will be used by Opensea).
- A red box surrounds the **CONTRACT CREATOR** section, which lists the address **0x4CE135aB...64E06ae71** and the transaction hash **0x5e07056ab8...**.
- A red box surrounds the **SaluNFT (NFT)** section, with a red arrow pointing to a blue box containing the text: **click**.
- A red box surrounds the first transaction listed under **Transactions**, which is a **Contract Creation** from **0x4CE135aB...64E06ae71** to **0x4d3b77FdAa0EAE2cAC296557394e6B71d39a67c0** at block **7121520** for **0 ETH** with a **Txn Fee** of **0.04016547**.

Below the annotations, the URL <https://sepolia.etherscan.io/address/0x4d3b77fd> is displayed again.

Smart Contract Information

The screenshot shows a browser window displaying the Etherscan Token Tracker for the Sepolia Testnet. The URL in the address bar is <https://sepolia.etherscan.io/token/0x4d3b77fdAA0eae2cac296557394e6b71d39a67c0>. The page is titled "SaluNFT (NFT) Token Tracker".

The main content area is divided into several sections:

- Token SaluNFT (NFT)**: A red box highlights this section.
- ERC-721**: A small button.
- Overview**:
 - MAX TOTAL SUPPLY**: A red box highlights this section. It shows "0 NFT".
 - HOLDERS**: Shows "0".
 - TOTAL TRANSFERS**: Shows "0".
- Market**:
 - ONCHAIN MARKET CAP**: Shows "\$0.00".
 - CIRCULATING SUPPLY MARKET CAP**: Shows "-".
- Other Info**:
 - TOKEN CONTRACT**: Shows the address [0x4d3b77fdAA0eae2cac296557394e6b71d39a67c0](#).

At the bottom, there are tabs for **Transfers**, **Holders**, and **Contract**. A large red box highlights the search bar at the bottom right of the page.

View & Publish

The screenshot shows a web browser displaying the Etherscan interface for a Sepolia Testnet contract. The URL in the address bar is <https://sepolia.etherscan.io/address/0x4d3b77fdcaa0eae2cac296557394e6b71d39a67c0#code>. The page content includes:

- Overview:** ETH BALANCE: 0 ETH.
- More Info:** CONTRACT CREATOR: 0x4CE135aB...64E06ae71 (at tx 0x5e07056ab8...), TOKEN TRACKER: SaluNFT (NFT).
- Multichain Info:** N/A.

Below the tabs (Transactions, Token Transfers (ERC-20), Contract, Events), there is a call-to-action: "Are you the contract creator? Verify and Publish your contract source code today!" with a red box around the text.

At the bottom, there are buttons for "Decompile Bytecode", "Switch to Opcodes View", and "Similar Contracts".

View & Publish Contract Source Code

The screenshot shows a web browser window titled "Verify & Publish Contract Sou" with the URL <https://sepolia.etherscan.io/verifyContract?a=0x4d3b77fd...>. The page is titled "Verify & Publish Contract Source Code". It explains that source code verification provides transparency by matching uploaded code with blockchain data. The process is divided into two steps: "Enter Contract Details" (highlighted) and "Verify & Publish".

Step 1: Enter Contract Details

- Please enter the Contract Address you would like to verify:
0x4d3b77fd... (highlighted)
- Please select Compiler Type:
Solidity (Single file) (highlighted)
- Please select Compiler Version:
v0.8.26+commit.8a97fa7a (highlighted)
- Uncheck to show all nightly commits
- Please select Open Source License Type (i):
3) MIT License (MIT) (highlighted)
- I agree to the [terms of service](#)

Buttons: Continue (highlighted), Reset

View & Publish Contract Source Code

The screenshot shows a web browser window for the Sepolia Solidity Contract Source Code verification page on Etherscan. The URL in the address bar is <https://sepolia.etherscan.io/verifyContract-solc?a=0x4d3b77fd...>. The page title is "Verify & Publish Contract Source Code". The main content area has two steps: "Enter Contract Details" (step 1) and "Verify & Publish" (step 2). A red box highlights the "Contract Address" field, which contains the value `0x4d3b77fd...a67c0`. Below it, the "Compiler Type" is listed as "SINGLE FILE / CONCATENATED METHOD" and the "Compiler Version" as "v0.8.26+commit.8a97fa7a". The page also includes instructions for contract compilation and a link to the Contract API Endpoint.

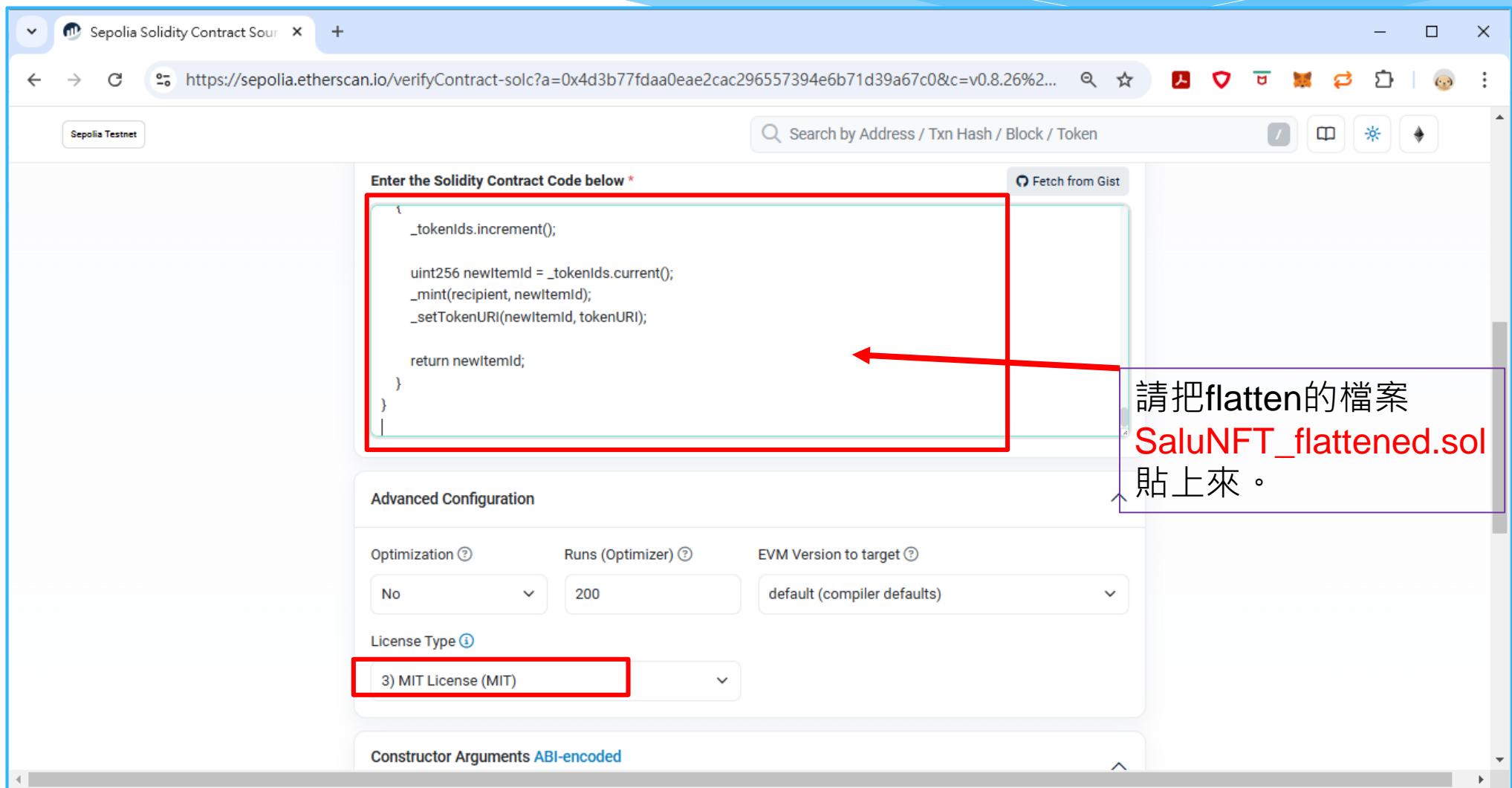
1 Enter Contract Details — 2 Verify & Publish

Upload Contract Source Code

1. If the contract compiles correctly at [REMX](#), it should also compile correctly here.
2. We have limited support for verifying contracts created by another contract and there is a timeout of up to 45 seconds for each contract compiled.
3. For programmatic contract verification, check out the [Contract API Endpoint](#).

Contract Address:	<code>0x4d3b77fd...a67c0</code>
Compiler Type:	SINGLE FILE / CONCATENATED METHOD
Compiler Version:	v0.8.26+commit.8a97fa7a

View & Publish Contract Source Code



The screenshot shows a browser window for the Sepolia Testnet on etherscan.io. The URL in the address bar is <https://sepolia.etherscan.io/verifyContract-solc?a=0x4d3b77fd...&c=v0.8.26%2...>. The main form is titled "Enter the Solidity Contract Code below *". A red box highlights the contract code area, which contains the following Solidity code:

```
_tokenIds.increment();

uint256 newItemId = _tokenIds.current();
_mint(recipient, newItemId);
_setTokenURI(newItemId, tokenURI);

return newItemId;
}
```

A red arrow points from a callout box to the code area. The callout box contains the text: "請把flatten的檔案 SaluNFT_flattened.sol 貼上來。"

Below the code area is an "Advanced Configuration" section with three dropdowns:

- Optimization: No
- Runs (Optimizer): 200
- EVM Version to target: default (compiler defaults)

Under "License Type", a red box highlights the selected option: "3) MIT License (MIT)".

At the bottom of the form, there is a "Constructor Arguments ABI-encoded" section.

View & Publish Contract Source Code

The screenshot shows a web browser window titled "Sepolia Solidity Contract Sour" with the URL <https://sepolia.etherscan.io/verifyContract-solc?a=0x4d3b77fd...&c=v0.8.26%2...>. The page is for the Sepolia Testnet. It displays a form for verifying a Solidity contract. At the top, there is a section for "Constructor Arguments ABI-encoded" which is currently empty. Below it, a note says "For additional information on Constructor Arguments, see our KB entry". Underneath, there is a section for "Contract Library Address (for contracts that use libraries, supports up to 10 libraries)". At the bottom, there is a success message from Cloudflare with a checkmark icon and the text "成功!". Below the message are two buttons: a blue "Verify and Publish" button with a red border, and a "Reset" button.

View & Publish Contract Source Code

The screenshot shows a web browser window for the Sepolia Testnet on Etherscan. The URL in the address bar is <https://sepolia.etherscan.io/verifyContract-solc?a=0x4d3b77fd...>. The page title is "Verify & Publish Contract Source Code". The main content area has two steps: "1 Enter Contract Details" and "2 Verify & Publish". Step 1 is completed, showing a green box with a checkmark and the text "Successfully generated Bytecode and ABI for Contract Address [0x4d3b77fd...]. Step 2 is labeled "click". Below step 1, there's a note about verifying contracts on multiple blockchains with a single API key. At the bottom, there's a "Code Reader" section.

1 Enter Contract Details — 2 Verify & Publish

Successfully generated Bytecode and ABI for Contract Address
[0x4d3b77fd...]

Learn how to verify your contract on multiple blockchains with a single API key [here](#).

Code Reader [?](#)

View Contract Source Code

The screenshot shows a web browser window displaying the Etherscan interface for a Solidity contract named "SaluNFT". The URL in the address bar is <https://sepolia.etherscan.io/address/0x4d3b77fdAA0eae2cac296557394e6b71d39a67c0#code>. A red box highlights the URL.

Key information displayed:

- Contract Source Code Verified (Exact Match)**
- Contract Name:** SaluNFT
- Compiler Version:** v0.8.26+commit.8a97fa7a
- Optimization Enabled:** No with 200 runs
- Other Settings:** default evmVersion, MIT license

The **Contract Source Code (Solidity)** section shows the following code:

```
1  /**
2   *Submitted for verification at Etherscan.io on 2024-11-21
3   */
4
5 // SPDX-License-Identifier: MIT
6 // File: @openzeppelin/contracts/utils/introspection/IERC165.sol
7
8
9 // OpenZeppelin Contracts (last updated v5.1.0) (utils/introspection/IERC165.sol)
10
11 pragma solidity ^0.8.20;
12
13 /**
14  * @dev Interface of the ERC-165 standard, as defined in the
15  * https://eips.ethereum.org/EIPS/eip-165[EIP]
16 */
```

UI elements include tabs for IDE, Outline, and More Options, along with copy, download, and refresh icons.

View & Publish Contract Source Code

The screenshot shows the Etherscan interface for the Sepolia Testnet. The address being viewed is 0x4d3b77fdAA0eae2cac296557394e6b71d39a67c0. The 'Source Code' tab is selected. The page displays the following information:

- Overview:** ETH BALANCE: 0 ETH.
- More Info:** CONTRACT CREATOR: 0x4CE135aB...64E06ae71 at tx 0x5e07056ab8...
TOKEN TRACKER: SaluNFT (NFT)
- Multichain Info:** N/A

Below the tabs, there are buttons for **Transactions**, **Token Transfers (ERC-20)**, **Contract** (which is highlighted with a red box), and **Events**. A secondary set of buttons below these includes **Code** (highlighted with a red box), **Read Contract**, and **Write Contract**. A search bar for source code is also present.

At the bottom, it says **Contract Name: SaluNFT**, **Optimization Enabled: No with 200 runs**, and **Contract Source Code Verified (Exact Match)**.

Connect to Web3

sepolia.etherscan.io 顯示

Please take note that this is a beta version feature and is provided on an "as is" and "as available" basis. Etherscan does not give any warranties and will not be liable for any loss, direct or indirect through continued use of this feature.

確定 取消

Transactions Token Transfers (ERC-20) **Contract** Events

Code **Read Contract** Write Contract

● Connect to Web3

Read Contract Information [Expand all] [Reset]

1. balanceOf

Connect a Wallet-MetaMask

The screenshot shows a web browser window displaying the Etherscan interface for the Sepolia Testnet. The URL in the address bar is <https://sepolia.etherscan.io/address/0x4d3b77fdcaa0eae2cac296557394e6b71d39a67c0#readContract>. A modal window titled "Connect a Wallet" is open in the center. The modal contains the following text: "Connecting wallet for read function is optional, useful if you want to call certain functions or simply use your wallet's node." Below this text, there are three options: "MetaMask" (which is highlighted with a red box), "WalletConnect", and "Coinbase Wallet". The "MetaMask" option is labeled as "Popular" and has a small orange fox icon next to it. The "WalletConnect" option has a blue wave icon, and the "Coinbase Wallet" option has a blue square icon.

Connected Web3 using account

The image shows two web-based interfaces side-by-side, connected by a large red arrow pointing from the left to the right.

Left Interface (Etherscan):

- Address: SaluNFT | Address 0x4d3b77f...
- Network: Sepolia Testnet
- ETH BALANCE: 0 ETH
- CONTRACT CREATOR: 0x4CE135aB...64E06ae71 (txn 0x5e07056ab8...)
- TOKEN TRACKER: SaluNFT (NFT)
- Buttons: Transactions, Token Transfers (ERC-20), Contract (highlighted), Write Contract, Read Contract Information, 1. balanceOf, 2. getApproved.

Right Interface (Salu1 Wallet):

- Address: 0x4CE13...6ae71 (highlighted with a red box)
- Balance: 1.5522 SepoliaETH
- Portfolio: Portfolio (link)
- Actions: Buy & Sell, Swap, Bridge, 發送 (Send), 接收 (Receive)
- Sections: Tokens, NFTs, 交易紀錄 (Transactions) (highlighted with a blue underline)
- Transactions (Nov 19, 2024):
 - 部署合約 (Deploy Contract) -0 SepoliaETH, -0 ETC (已確認 Confirmed)
- Transactions (Oct 30, 2024):
 - 接收 (Receive) 0.01 SepoliaETH, 1.18 ETC (已確認 Confirmed)
 - 接收 (Receive) 0.05 SepoliaETH, 5.91 ETC (已確認 Confirmed)

Read Contract

The screenshot shows a web browser window for the Sepolia Testnet on etherscan.io. The URL in the address bar is <https://sepolia.etherscan.io/address/0x4d3b77fdःaa0eae2cac296557394e6b71d39a67c0#readContract>. The page displays a list of contract functions with their corresponding values:

- 2. getApproved
- 3. isApprovedForAll
- 4. name
SaluNFT string
- 5. owner
0x4CE135aB2eB8e482D16B8011ba9415D64E06ae71 address
- 6. ownerOf
- 7. supportsInterface
- 8. symbol
NFT string

Red boxes highlight the values for 'name', 'owner', and 'symbol' fields.

Connected Web3 using account

The image shows a browser window with two tabs open. The left tab is on the Sepolia Testnet version of Etherscan, displaying the details of a specific contract. The right tab is on a wallet application showing the user's SepoliaETH balance and a history of transactions. A red arrow points from the 'Connected - Web3' message in the browser's address bar to the wallet tab, indicating the connection between the two.

SaluNFT | Address 0x4d3b77f...

https://sepolia.etherscan.io/address/0x4d3b77fd...

Sepolia Testnet

Contract 0x4d3B77FdAa0EAE2cAC296557394e6B71d39a67c0

Source Code

Overview

ETH BALANCE
0 ETH

Transactions

Token Transfers (ERC-20)

Contract

Events

Code

Read Contract

Write Contract

Connected - Web3 [0x4ce1...ae71]

1. approve (0x095ea7b3)

Search by Address

More Info

CONTRACT CREATOR
0x4CE135aB...64E0...ae71 at tx 0x5e07056ab8...

TOKEN TRACKER
SaluNFT (NFT)

1.5522 SepoliaETH

Portfolio

Buy & Sell

Swap

Bridge

發送

接收

Tokens

NFTs

交易紀錄

Nov 19, 2024

部署合約
已確認

-0 SepoliaETH
-0 ETC

Oct 30, 2024

接收
已確認

0.01 SepoliaETH
1.19 ETC

接收
已確認

0.05 SepoliaETH
5.93 ETC

前置準備事項

- 需先上傳IPFS的images or video檔案，或是上傳至一般的網站。
- 將metadata檔案內的image value指向至已上傳至IPFS的images or video檔案，或是上傳至一般的網站URL。
- 需先上傳pinata IPFS的metadata檔案(延伸檔名有.json或無)，或是上傳至一般的網站。
- 把前面上傳pinata的URL的BaseURI記錄下來，等一下提供給setBaseUri設定用，如下：



- 1. 延伸檔名無.json：(往下的smart contract 範例使用這一個)
<https://magenta-retired-roundworm-860.mypinata.cloud/ipfs/Qmbmr2QqNnL3L5FYMcjkLSD82Pj6aLaEsSPt3uphT6X5F/>
- 2. 延伸檔名有.json：
<https://magenta-retired-roundworm-860.mypinata.cloud/ipfs/QmXhNA3b5wqt5nycRRno4uTBFDfxi8CpkmSFk2fFeUJGh/>

因為以下範例的smart contract code內沒有指定metadata延伸檔名為.json的檔案，所以上述2項的URL格式都可使用

NFT Metadata folder

The screenshot shows a web browser window displaying an IPFS directory. The address bar contains the URL <https://magenta-retired-roundworm-860.myipnata.cloud/ipfs/Qmbmr2QqNnL3L5FYMccjkLSD82Pj6aLaEsSPt3uphT6X5F/>. A red box highlights the URL, and a blue circle with the number '1' is positioned above it. The page title is 'IPFS'. The main content is a file listing titled 'Index of /ipfs/Qmbmr2QqNnL3L5FYMccjkLSD82Pj6aLaEsSPt3uphT6X5F'. The table lists several files:

File Name	Description	Size
..		0 B
0	QmY1...TKeC	563 B
1	NFT#1 metadata : https://magenta-retired-roundworm-860.myipnata.cloud/ipfs/Qmbmr2QqNnL3L5FYMccjkLSD82Pj6aLaEsSPt3uphT6X5F/1	511 B
10	QmRF...cfzg	565 B
11	QmS7...scxv	565 B
12	QmVg...9wTA	565 B
13	QmdA...am94	565 B
14	QmUE...6ryZ	565 B
15	QmZc...3h4V	565 B
16	QmZR...9eha	565 B
17	QmSF...FCXb	565 B
2	NFT#2 metadata : https://magenta-retired-roundworm-860.myipnata.cloud/ipfs/Qmbmr2QqNnL3L5FYMccjkLSD82Pj6aLaEsSPt3uphT6X5F/2	511 B
3	Qmbn...SM8S	563 B
4	QmVQ...kaaQ	563 B

NFT #2 Metadata

1 magenta-retired-roundworm-860.mypinata.cloud/ipfs/Qmbmr2QqNnL3L5FYMcjkLSD82Pj6aLaEsSPt3uphT6X5F/2

2 NFT#2的image

```
{  
  "dna": "0c6a737b64e862da3b6a8971f84fea42",  
  "name": "MyNFT #2",  
  "description": "My first NFT project.",  
  "image": "https://magenta-retired-roundworm-860.mypinata.cloud/ipfs/QmYjCVxZarVZpQCLuZBtYJ9BZZ91GeuYGmokjpHf9AP9C7/2.png",  
  "date": "1720148482982",  
  "attributes": [  
    {  
      "trait_type": "Background",  
      "value": "2"  
    },  
    {  
      "trait_type": "Body",  
      "value": "2"  
    },  
    {  
      "trait_type": "Flag",  
      "value": "2"  
    },  
    {  
      "trait_type": "Animal",  
      "value": "1"  
    }  
,  
  "compiler": "mintables.club"  
}
```

Write Contract - mintNFT

The screenshot shows a browser window with the URL <https://sepolia.etherscan.io/token/0x4d3b77fdAA0eae2cac296557394e6b71d39a67c0#writeContract>. The browser tab is titled "SaluNFT (NFT) Token Tracker". The page displays a list of contract interactions:

1. approve (0x095ea7b3)
2. mintNFT (0xeacab14)

Below the interactions, there are input fields for "recipient (address)" and "tokenURI (string)". The "recipient (address)" field contains the value `0x7BeeE5F42F617503730d9Fba6117E301EAad8f0C`, and the "tokenURI" field contains the value `https://magenta-retired-roundworm-860.mypinata.cloud/ipfs/Qmbmr2QqNnL3L5FYMccjkLSD82Pj6aLaEsSPt3uphT6X5F/2`.

At the bottom left, there is a "Write" button with a red border and a blue circle containing the number "1". To its right, the text "NFT#2的metadata使用這一個當tokenURI" is displayed in red.

On the right side of the browser window, a MetaMask wallet overlay is visible. It shows the wallet name "Salu 1" and address "0x4d3B7...a67c0". A red box highlights this address. Below it, the MetaMask interface shows "Estimated changes" (No changes predicted for your wallet), "Estimated fee" (0.04983043 SepoliaETH), and two buttons: "拒絕" (Decline) and "確認" (Confirm), with the "確認" button also highlighted by a red box.

Write Contract - mintNFT

The screenshot shows a web browser window titled "SaluNFT (NFT) Token Tracker" on the Sepolia Testnet. The URL in the address bar is <https://sepolia.etherscan.io/token/0x4d3b77fdःaa0eae2cac296557394e6b71d39a67c0#writeContract>. The "Contract" tab is selected, and within it, the "Write Contract" sub-tab is active. A message at the top indicates "Connected - Web3 [0x4ce1...ae71]". Below this, two steps are listed: "1. approve (0x095ea7b3)" and "2. mintNFT (0xeacabe14)". The "mintNFT" step has two input fields: "recipient (address)" containing "0x7BeeE5F42F617503730d9Fba6117E301EAad8f0C" and "tokenURI (string)" containing "<https://magenta-retired-roundworm-860.myipnata.cloud/ipfs/Qmbmr2QqNnL3L5FYMccjkLSD82Pj6aLaEsSPt3uphT6X5F/2>". Both input fields are highlighted with red boxes. At the bottom of the form are two buttons: "Write" and "View your transaction", with "Write" also highlighted by a red box.

View Transaction

The screenshot shows the Etherscan Transaction Details page for a Sepolia Testnet transaction. The transaction hash is `0xb0c31e9640b288ace4509cd6fcf2660411805ba4905cbd27b668681a368bbddc`. The status is marked as "Success". The transaction was included in block `7124075` with 9 block confirmations. It was timestamped 2 mins ago (Nov-21-2024 05:44:48 PM UTC). The transaction action was a call to mint an NFT, function by `0x4CE135aB...64E06ae71` on contract `0x4d3B77Fd...1d39a67c0`. The transaction originated from address `0x4CE135aB2eB8e482D16B8011ba9415D64E06ae71` and interacted with address `0x4d3B77FdAa0EAE2cAC296557394e6B71d39a67c0`. Three ERC-721 tokens were transferred, with SaluNFT(NFT) being the recipient.

1

[This is a Sepolia Testnet transaction only]

Transaction Hash: `0xb0c31e9640b288ace4509cd6fcf2660411805ba4905cbd27b668681a368bbddc`

Status: Success

Block: `7124075` 9 Block Confirmations

Timestamp: 2 mins ago (Nov-21-2024 05:44:48 PM UTC)

Transaction Action: Call Mint NFT Function by `0x4CE135aB...64E06ae71` on `0x4d3B77Fd...1d39a67c0`

From: `0x4CE135aB2eB8e482D16B8011ba9415D64E06ae71`

Interacted With (To): `0x4d3B77FdAa0EAE2cAC296557394e6B71d39a67c0`

ERC-721 Tokens Transferred:

- ERC-721 Token ID [3] SaluNFT(NFT)
From `0x00000000...00000000` To `0x7BeeE5F4...1EAad8f0C`

Query tokenURI #2

1

2

3

copy

5. owner

6. ownerOf

7. supportsInterface

8. symbol

9. tokenURI

tokenId (uint256)

2

Query

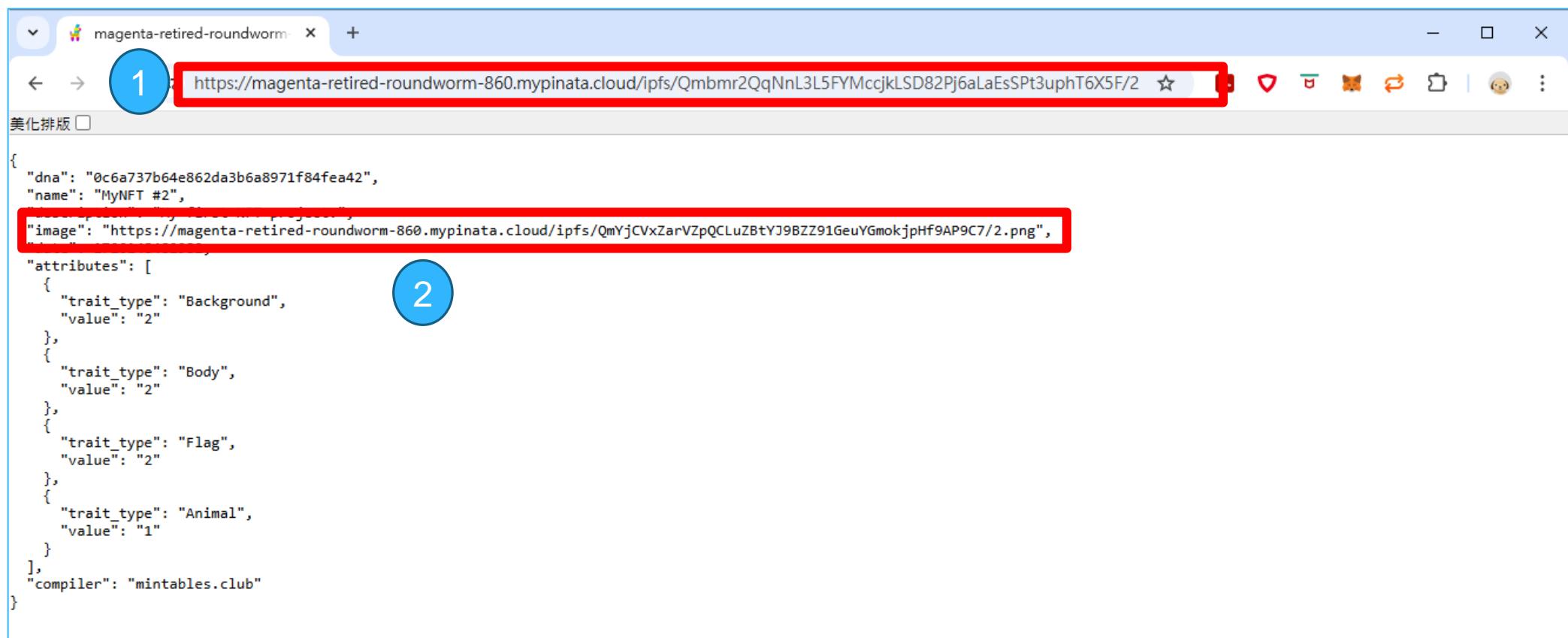
string

[tokenURI (256)] string

https://magenta-retired-roundworm-860.myipnata.cloud/ipfs/Qmbmr2QqNnL3L5FYMcCjkLSD82Pj6aLaEsSPt3uphT6X5F/2

https://sepolia.etherscan.io/token/0x4d3b77fdAA0eae2cac296557394e6b71d39a67c0#readContract

Query tokenURI #2 metadata

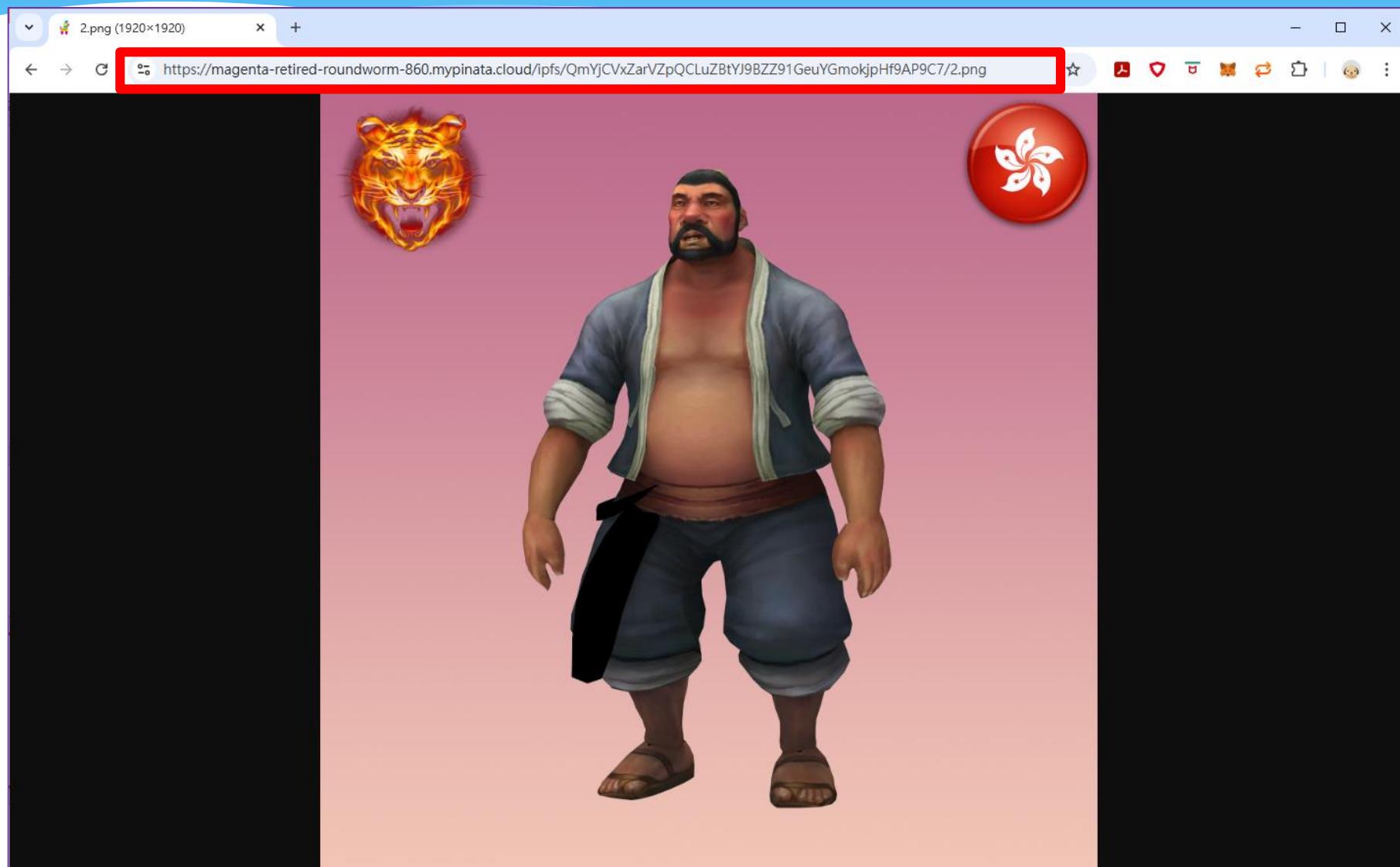


1 https://magenta-retired-roundworm-860.my.pinata.cloud/ipfs/Qmbmr2QqNnL3L5FYMcCjkLSD82Pj6aLaEsSPt3uphT6X5F/2

2

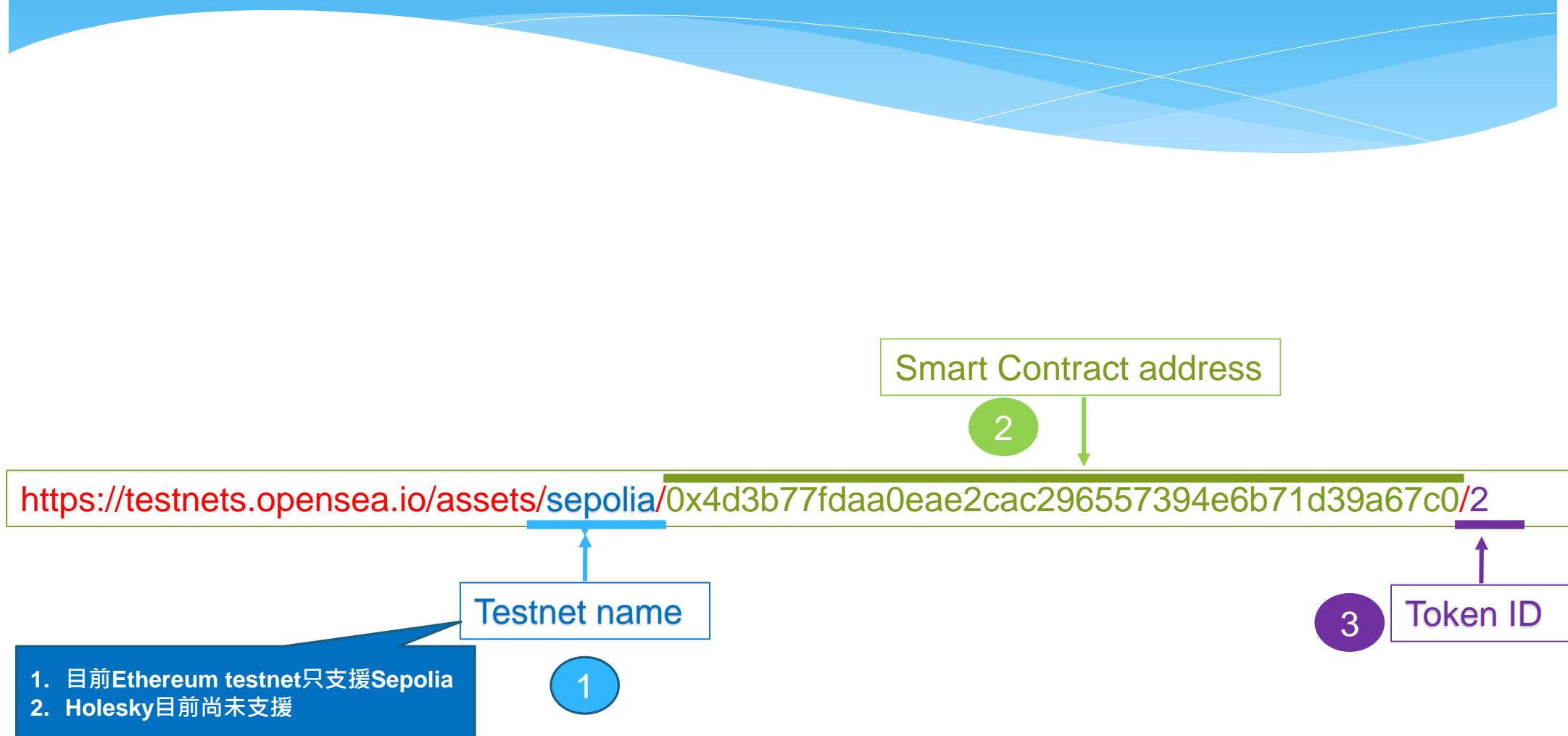
```
{  
  "dna": "0c6a737b64e862da3b6a8971f84fea42",  
  "name": "MyNFT #2",  
  "image": "https://magenta-retired-roundworm-860.my.pinata.cloud/ipfs/QmYjCVxZarVZpQCLuZBtYJ9BZZ91GeuYGmokjpHf9AP9C7/2.png",  
  "attributes": [  
    {  
      "trait_type": "Background",  
      "value": "2"  
    },  
    {  
      "trait_type": "Body",  
      "value": "2"  
    },  
    {  
      "trait_type": "Flag",  
      "value": "2"  
    },  
    {  
      "trait_type": "Animal",  
      "value": "1"  
    }  
  ],  
  "compiler": "mintables.club"  
}
```

Token #2 Image

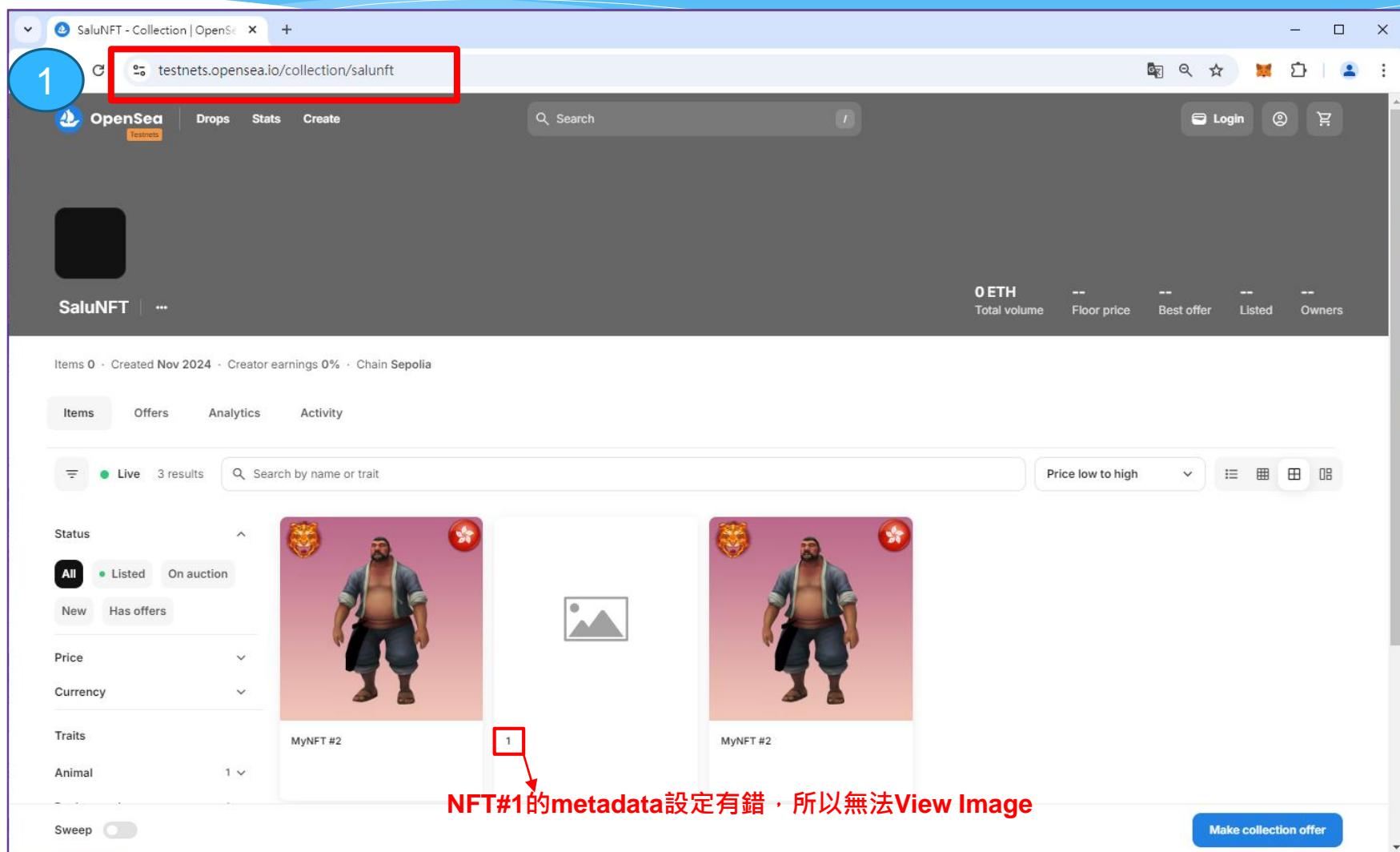


OpenSea testnet

OpenSea URL



SaluNFT Collection



Token # 2-NFT

MyNFT #2 - SaluNFT | OpenSea

testnets.opensea.io/assets/sepolia/0x4d3b77fdःaa0eae2cac296557394e6b71d39a67c0/2

OpenSea Testnets

Drops Stats Create Search

1

SaluNFT

MyNFT #2

Owned by 7BEEES

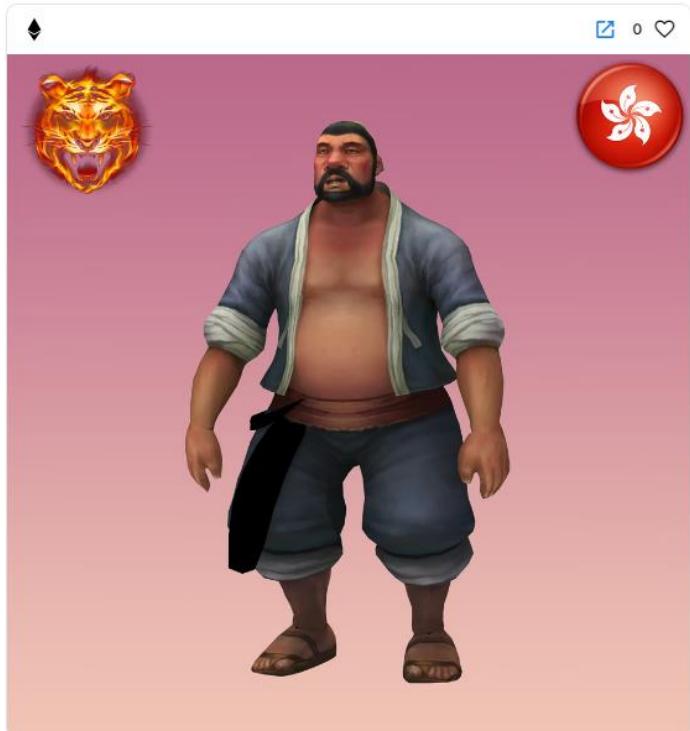
1 view

Make offer

Price History

No events have occurred yet
Check back later.

Description Listings



https://testnets.opensea.io/assets/sepolia/0x4d3b77fdःaa0eae2cac296557394e6b71d39a67c0/2

Token # 2-NFT

The screenshot illustrates the relationship between an NFT's metadata and its listing on a platform like OpenSea.

Left Panel (Browser View):

- Address Bar:** magenta-retired-roundworm-860.mypinata.cloud/ipfs/Qmbmr2QqNnL3L5FYMccjkLSD82Pj6aLaEsSPt3uphT6X5F/2
- Content:** A JSON representation of the NFT's metadata. A red box highlights the "description" field: "My first NFT project." A blue circle with the number 1 is positioned over the address bar.
- Bottom Address Bar:** https://magenta-retired-roundworm-860.mypinata.cloud/ipfs/Qmbmr2QqNnL3L5FYMccjkLSD82Pj6aLaEsSPt3uphT6X5F/2

Right Panel (OpenSea Listing):

- Title:** MyNFT #2 - SaluNFT | OpenSea
- Image Preview:** A 3D rendering of a character wearing a tattered shirt and pants.
- Description:** By 4CE135
My first NFT project.
- Traits:** A table showing the traits:

ANIMAL	BACKGROUND	BODY
1 100%	2 100%	2 100%
Floor: --	Floor: --	Floor: --

FLAG
2 100%
Floor: --
- Offers:** No offers yet.

Red arrows point from the highlighted fields in the JSON metadata to their corresponding sections in the OpenSea listing.

Token # 2-NFT

The screenshot shows a web browser window for the OpenSea testnet. The URL in the address bar is highlighted with a red box and labeled '1'. The main content area displays a token listing for 'Test Token' (ID #2). The token is owned by the user and has 2 views. A placeholder image icon is shown. To the right of the token details is a 'More' button (three dots) and a 'Refresh metadata' button, both of which are also highlighted with red boxes and labeled '2' and '3' respectively. A callout box with a green background and black text provides instructions in Chinese: '當你碰到已有上傳 metadata & images 至IPFS，卻在 OpenSea無法看到 image 時，請做 Refresh metadata'.

Token # 2-NFT

The screenshot shows a web browser displaying an NFT listing on OpenSea. The URL in the address bar is highlighted with a red box and labeled '1'. The NFT is a character from the game 'Mortal Kombat' (Sub-Zero). The title 'MyNFT #2' is also highlighted with a red box. A red arrow points from the 'MyNFT #2' text on the listing page to the 'name' field in the adjacent metadata editor window. Another red arrow points from the 'Price History' section on the listing page to a green callout box containing the following text:

正常情形下做完
Refresh metadata
即可看到image和
metadata內的其他
資料

The metadata editor window shows the following JSON data:

```
{  
  "dna": "0c6a737b64e862da3b6a8971f84fea42",  
  "name": "MyNFT #2",  
  "description": "My first NFT project.",  
  "image": "https://magenta-retired-roundworm-860.myipinata.cloud/i",  
  "date": 1720148482982,  
  "attributes": [  
    {  
      "trait_type": "Race",  
      "value": "Human"  
    },  
    {  
      "trait_type": "Species",  
      "value": "Human"  
    },  
    {  
      "trait_type": "Gender",  
      "value": "Male"  
    },  
    {  
      "trait_type": "Skin Color",  
      "value": "White"  
    },  
    {  
      "trait_type": "Eye Color",  
      "value": "Blue"  
    },  
    {  
      "trait_type": "Hair Color",  
      "value": "Black"  
    },  
    {  
      "trait_type": "Body Type",  
      "value": "Athletic"  
    },  
    {  
      "trait_type": "Build",  
      "value": "Athletic"  
    },  
    {  
      "trait_type": "Muscle Mass",  
      "value": "High"  
    },  
    {  
      "trait_type": "Fat Percentage",  
      "value": "Low"  
    },  
    {  
      "trait_type": "Skin Texture",  
      "value": "Smooth"  
    },  
    {  
      "trait_type": "Skin Tone",  
      "value": "Light"  
    },  
    {  
      "trait_type": "Skin Veins",  
      "value": "None"  
    },  
    {  
      "trait_type": "Skin Pores",  
      "value": "None"  
    },  
    {  
      "trait_type": "Skin Wrinkles",  
      "value": "None"  
    },  
    {  
      "trait_type": "Skin Acne",  
      "value": "None"  
    },  
    {  
      "trait_type": "Skin Scars",  
      "value": "None"  
    },  
    {  
      "trait_type": "Skin Lines",  
      "value": "None"  
    },  
    {  
      "trait_type": "Skin Blemishes",  
      "value": "None"  
    },  
    {  
      "trait_type": "Skin Dark Spots",  
      "value": "None"  
    },  
    {  
      "trait_type": "Skin Redness",  
      "value": "None"  
    },  
    {  
      "trait_type": "Skin Dryness",  
      "value": "None"  
    },  
    {  
      "trait_type": "Skin Oiliness",  
      "value": "None"  
    },  
    {  
      "trait_type": "Skin Elasticity",  
      "value": "Normal"  
    },  
    {  
      "trait_type": "Skin Firmness",  
      "value": "Normal"  
    },  
    {  
      "trait_type": "Skin Smoothness",  
      "value": "Normal"  
    },  
    {  
      "trait_type": "Skin Radiance",  
      "value": "Normal"  
    },  
    {  
      "trait_type": "Skin Hydration",  
      "value": "Normal"  
    },  
    {  
      "trait_type": "Skin Brightness",  
      "value": "Normal"  
    },  
    {  
      "trait_type": "Skin Evenness",  
      "value": "Normal"  
    },  
    {  
      "trait_type": "Skin Softness",  
      "value": "Normal"  
    },  
    {  
      "trait_type": "Skin弹力",  
      "value": "正常"  
    },  
    {  
      "trait_type": "Skin紧致度",  
      "value": "正常"  
    },  
    {  
      "trait_type": "Skin光滑度",  
      "value": "正常"  
    },  
    {  
      "trait_type": "Skin亮度",  
      "value": "正常"  
    },  
    {  
      "trait_type": "Skin均匀度",  
      "value": "正常"  
    },  
    {  
      "trait_type": "Skin柔软度",  
      "value": "正常"  
    }  
  ]  
}
```

NFT Contract address

The screenshot shows an NFT listing on the OpenSea platform. The URL in the browser bar is [https://testnets.opensea.io/assets/sepolia/0x4d3b77fd...\[/2\]\(https://testnets.opensea.io/assets/sepolia/0x4d3b77fd...\)](https://testnets.opensea.io/assets/sepolia/0x4d3b77fd...). A red box highlights the 'Traits' section, which displays the following data:

Trait Type	Value	Percentage	Floor
ANIMAL	1	67%	--
BACKGROUND	2	67%	--
BODY	2	67%	--
FLAG	2	67%	--

A green box labeled "metadata內的其他資料" (Other data in the metadata) points to the "Contract Address" field, which is highlighted with a yellow box and contains the value `0x4d3b...67c0`.

Contract Address: 0x4d3b...67c0

Token ID: 2

Token Standard: ERC-721

Chain: Sepolia

Last Updated: 3 days ago

Creator Earnings: 0%



Import NFT token in MetaMask

Find the NFT's address

The screenshot shows a web browser window displaying an NFT item on the OpenSea testnet. The URL in the address bar is highlighted with a red box and labeled '1'. A blue circle with the number '2' points to the 'Contract Address' field, which contains the value '0x4d3b...67c0'. A yellow box labeled 'Click on this' with a red arrow points to the 'ERC-721' status indicator. The page includes sections for Details, Item Activity, and a sidebar with Stats and Create buttons.

MyNFT #2 - SaluNFT | OpenSe

1

testnets.opensea.io/assets/sepolia/0x4d3b77fd.../2

OpenSea

Drops Stats Create

Testnets

Details

Contract Address

0x4d3b...67c0

2

Token ID

Token Standard

Chain

Last Updated

Creator Earnings

ERC-721

Sepolia

3 days ago

0%

Item Activity

Find the NFT's address

The screenshot shows a browser window displaying the Etherscan interface for a SaluNFT contract. The URL in the address bar is highlighted with a red box and labeled '1'. The contract address, `0x4d3b77fdAA0eae2cac296557394e6b71d39a67c0`, is also highlighted with a red box and labeled '2'. A blue arrow points from the highlighted URL in the address bar to the highlighted contract address on the page. A red button labeled 'Copy Contract Address' is visible on the right side of the page. The page includes sections for Overview, More Info, and Multichain Info, along with tabs for Transactions, Token Transfers (ERC-20), Contract, and Events.

1

2

sepolia.etherscan.io/address/0x4d3b77fdAA0eae2cac296557394e6b71d39a67c0

Contract `0x4d3b77fdAA0eae2cac296557394e6b71d39a67c0`

Copy Contract Address

Source Code

Overview

ETH BALANCE
0 ETH

More Info

CONTRACT CREATOR
`0x4CE135aB...64E06ae71` at txn `0x5e...`

TOKEN TRACKER
SaluNFT (NFT)

Multichain Info
N/A

Transactions

Token Transfers (ERC-20)

Contract

Events

Import NFT in MetaMask

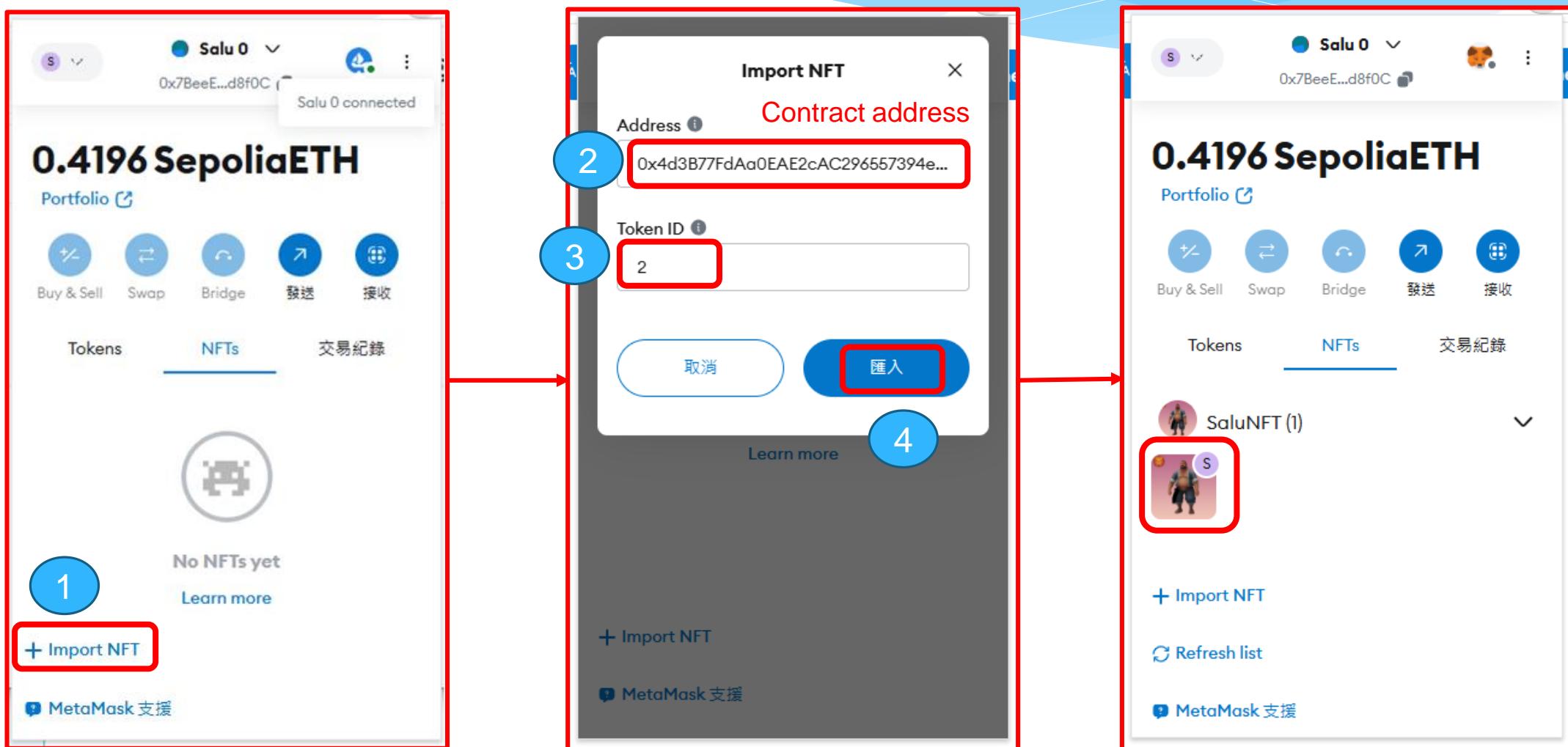
The screenshot illustrates the steps to import an NFT from OpenSea into MetaMask.

- 1** The URL [https://testnets.opensea.io/assets/sepolia/0x4d3b77fd.../2](https://testnets.opensea.io/assets/sepolia/0x4d3b77fd...) is highlighted in red, indicating the specific NFT being viewed.
- 2** The "Owner Address" field shows the address `0x7BeeE...d8f0C`, which is also highlighted in red. A red box labeled "Sepolia" points to the chain name in the top right of the OpenSea interface.
- 3** The MetaMask extension icon in the browser toolbar is highlighted in red, with the word "connected" displayed next to it.

OpenSea Testnets Interface Details:

- Header:** MyNFT #2 - SaluNFT | OpenSea
- Address Bar:** testnets.opensea.io/assets/sepolia/0x4d3b77fd.../2
- Search:** Search (with a magnifying glass icon)
- Navigation:** Back, Forward, Home, Refresh
- Top Bar:** OpenSea (Testnets), Drops, Stats, Create, Sepolia (highlighted in red)
- Left Sidebar:**
 - Floor: --
 - About SaluNFT
 - Details
 - Contract Address: 0x4d3b...67c0
 - Token ID: 2
 - Token Standard: ERC-721
 - Chain: Sepolia
 - Last Updated: 3 days ago
 - Creator Earnings: 0%
 - Item Activity
- Right Sidebar:**
 - 0.4196 SepoliaETH**
 - Portfolio (with a link icon)
 - Buy & Sell, Swap, Bridge, 發送, 接收
 - Tokens, **NFTs** (highlighted in red), 交易紀錄
 - No NFTs yet
 - Learn more
 - + Import NFT (highlighted in red)
 - MetaMask 支援

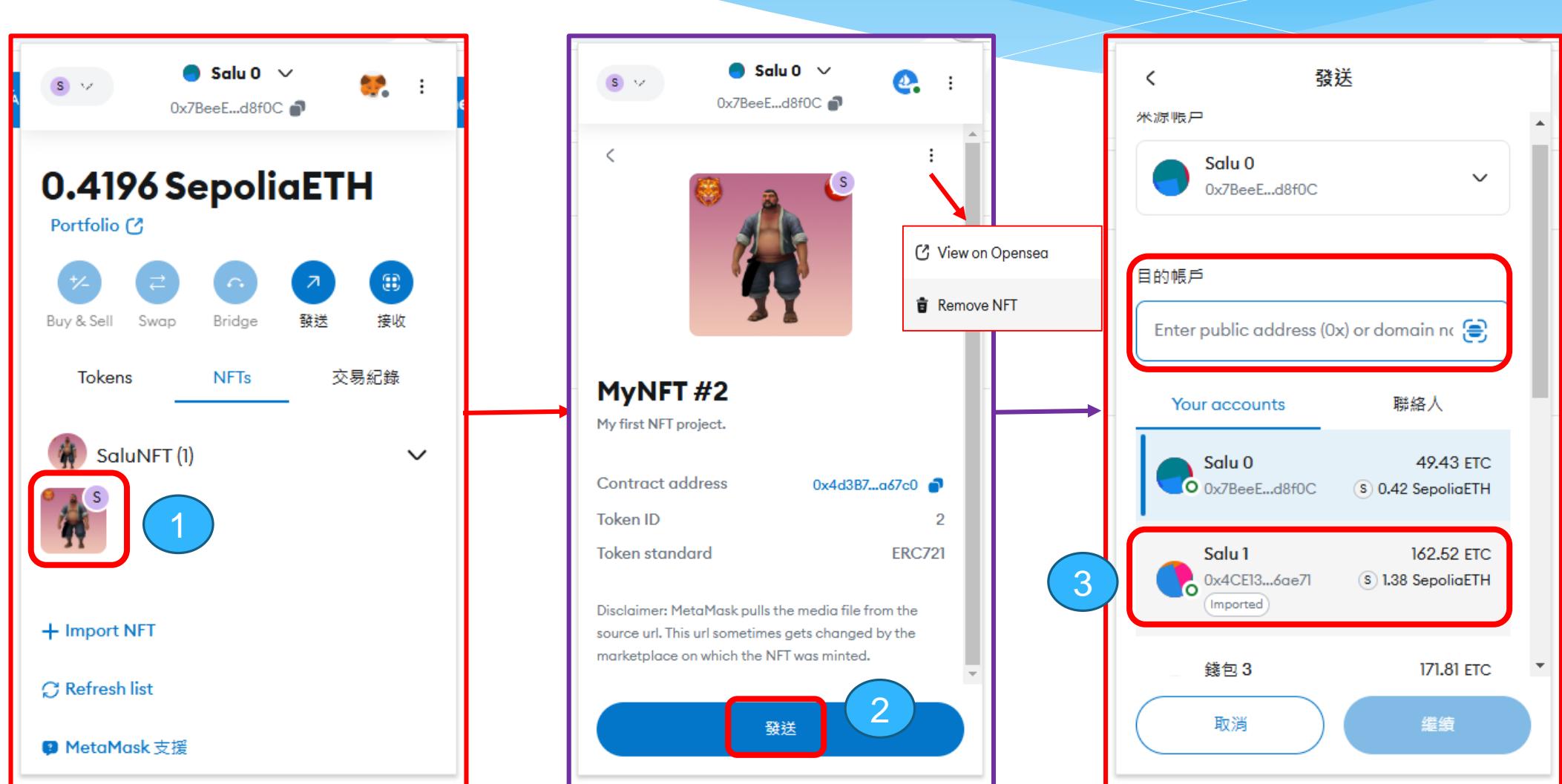
Import NFT in MetaMask



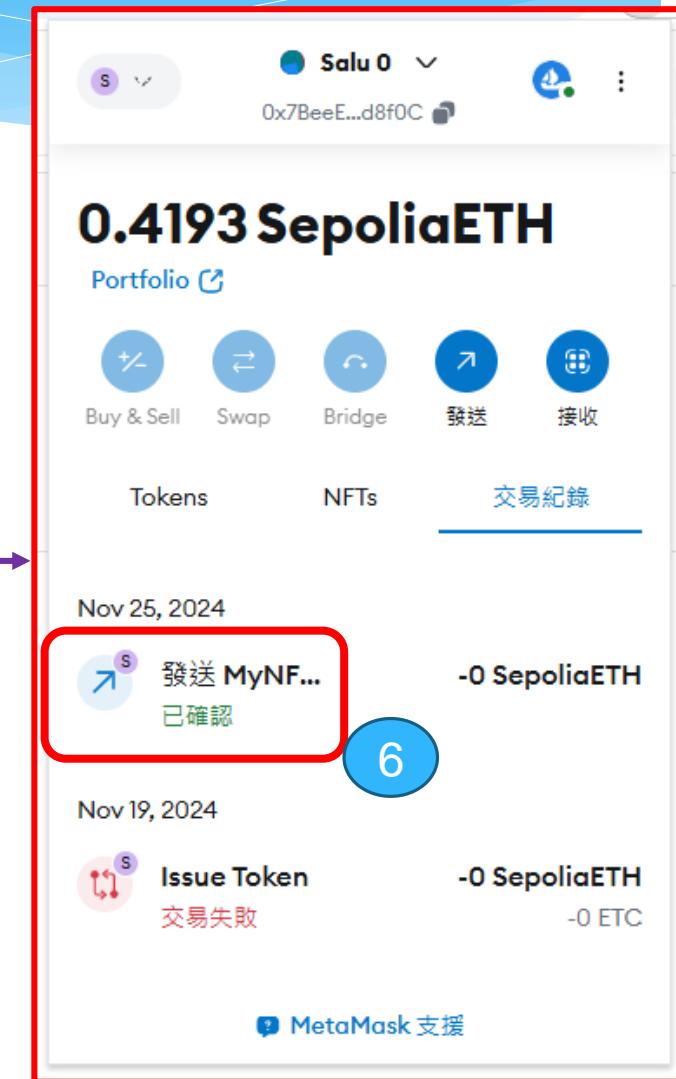
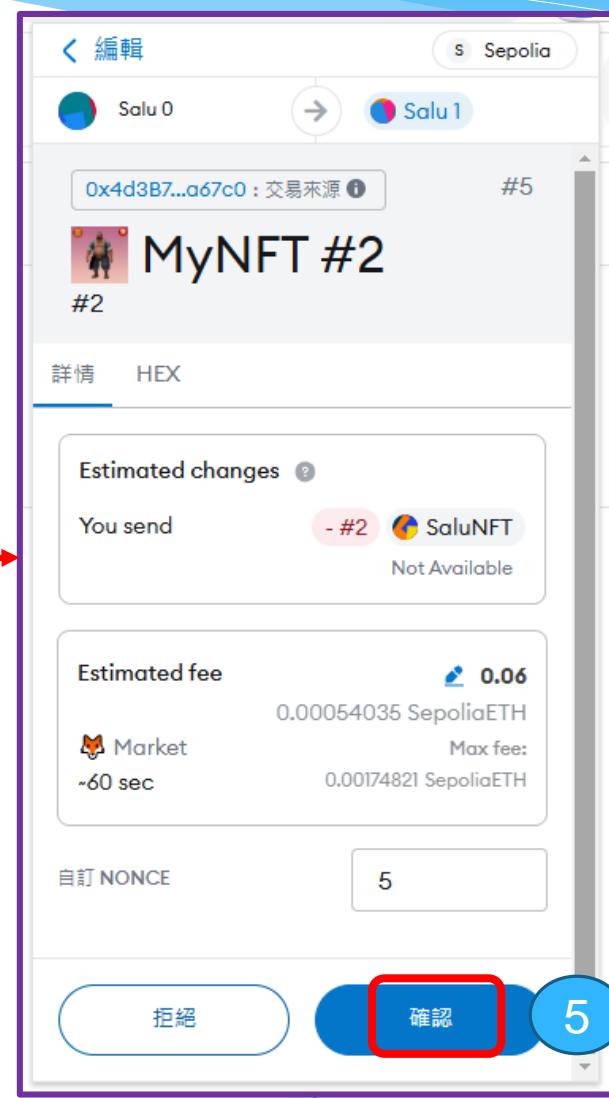
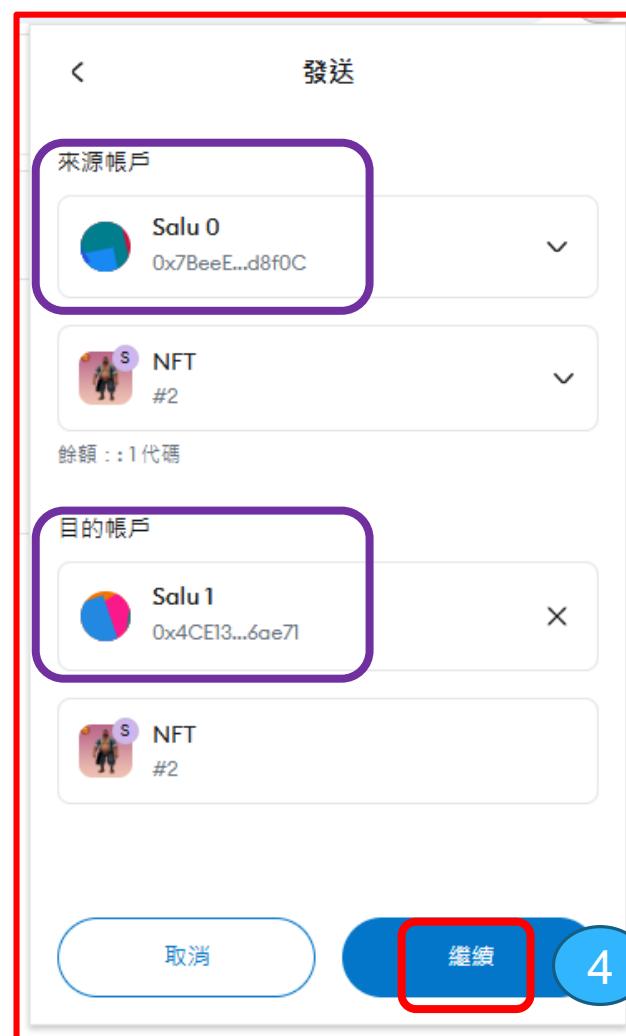


Transfer NFT in MetaMask

Transfer NFT in MetaMask



Transfer NFT in MetaMask



Transfer NFT in MetaMask

The image shows two screenshots illustrating the process of transferring an NFT from MetaMask to an external blockchain.

Screenshot 1 (Left): MetaMask Transaction Confirmation

A MetaMask transaction confirmation window titled "發送 MyNFT #2". It displays the following details:

欄位	內容
Status	已確認
來源帳戶	0x7BeeE...d...
目的帳戶	Salu 1
交易	
Nonce	5
數量	-0 SepoliaETH
Gas 上限 (單位)	91818
Gas 用量 (單位)	60389
Base fee (GWEI)	4.065527426
Priority fee (GWEI)	1.5
Total gas fee	0.000336 SepoliaETH 0.04 ETC
Max fee per gas	0.000000018 SepoliaETH 0 ETC

A red arrow points from the "View on block explorer" button (circled with a blue circle labeled 7) to the Etherscan transaction page.

Screenshot 2 (Right): Etherscan Transaction Details

An Etherscan transaction details page for a Sepolia Testnet transaction. The transaction hash is 0x3e9b29cb6ef9a3e490ce7641758bdae1087e8668402071282301af57a3b950ef. The status is marked as "Success" (circled with a blue circle labeled 8). The transaction transferred an ERC-721 token from 0x7BeeE5F4...1EAad8f0C to 0x4CE135aB...64E06ae71.

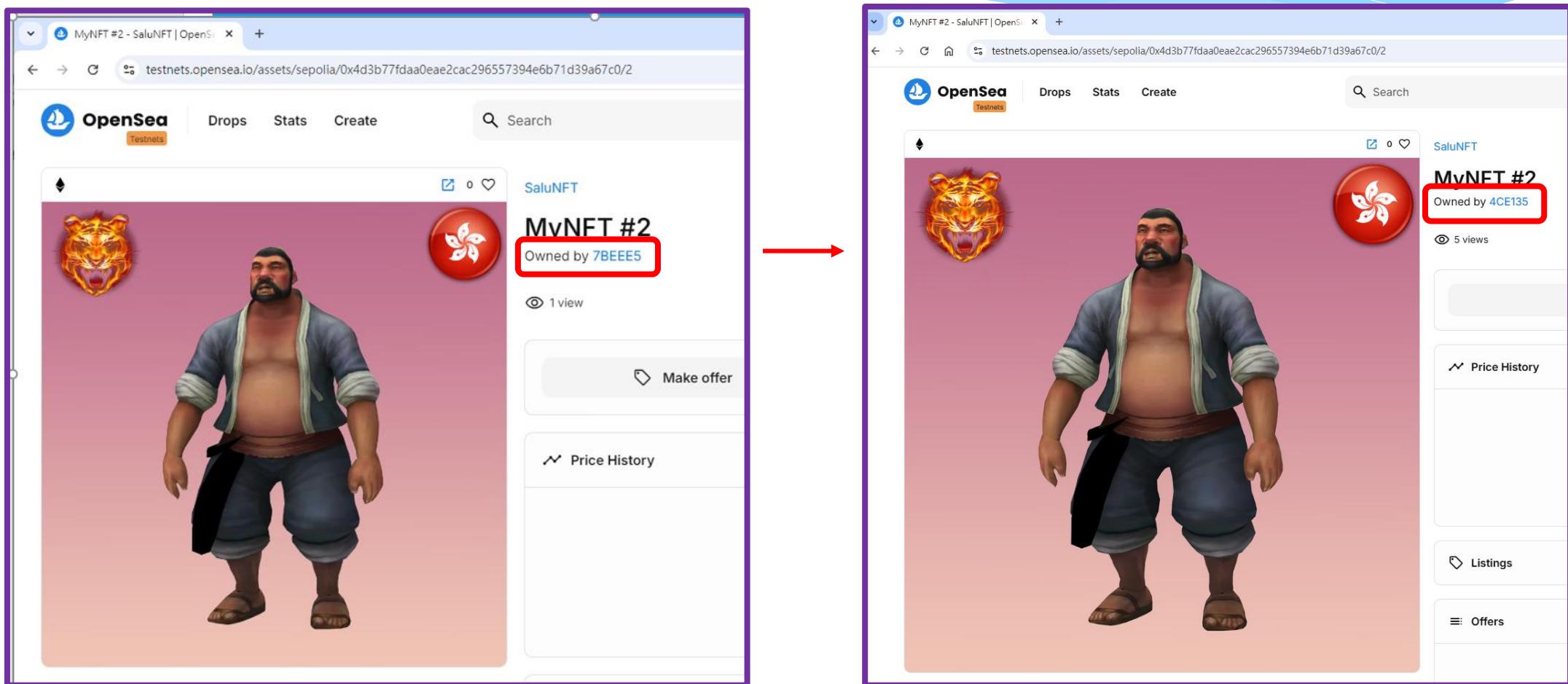
<https://sepolia.etherscan.io/tx/0x3e9b29cb6ef9a3e490ce7641758bdae1087e8668402071282301af57a3b950ef>

Transfer NFT Transaction

The screenshot shows the Etherscan.io interface for the SaluNFT contract on the Sepolia Testnet. The URL in the address bar is highlighted with a red box and circled with a blue number 1. The transaction list table is highlighted with a red box and circled with a blue number 2. A purple box labeled "Transfer NFT Address" with a red arrow points to the "To" column of the table.

Transaction Hash	Method	Age	From	To	Amount	Txn Fee	
0x3e9b29cb6ef...	Transfer From	7147296	4 hrs ago	0x7BeeE5F4...1EAad8f0C	0x4d3B77Fd...1d39a67c0	0 ETH	0.00033609
0xb0c31e9640...	Mint NFT	7124075	3 days ago	0x4CE135aB...64E06ae71	0x4d3B77Fd...1d39a67c0	0 ETH	0.05818443
0x7a5c4c035d...	Mint NFT	7124022	3 days ago	0x4CE135aB...64E06ae71	0x4d3B77Fd...1d39a67c0	0 ETH	0.0382807
0xfd859f83e1...	Mint NFT	7123918	3 days ago	0x4CE135aB...64E06ae71	0x4d3B77Fd...1d39a67c0	0 ETH	0.03592173
0xe07056ab8...	0x60806040	7121520	3 days ago	0x4CE135aB...64E06ae71	Create: SaluNFT	0 ETH	0.04016547

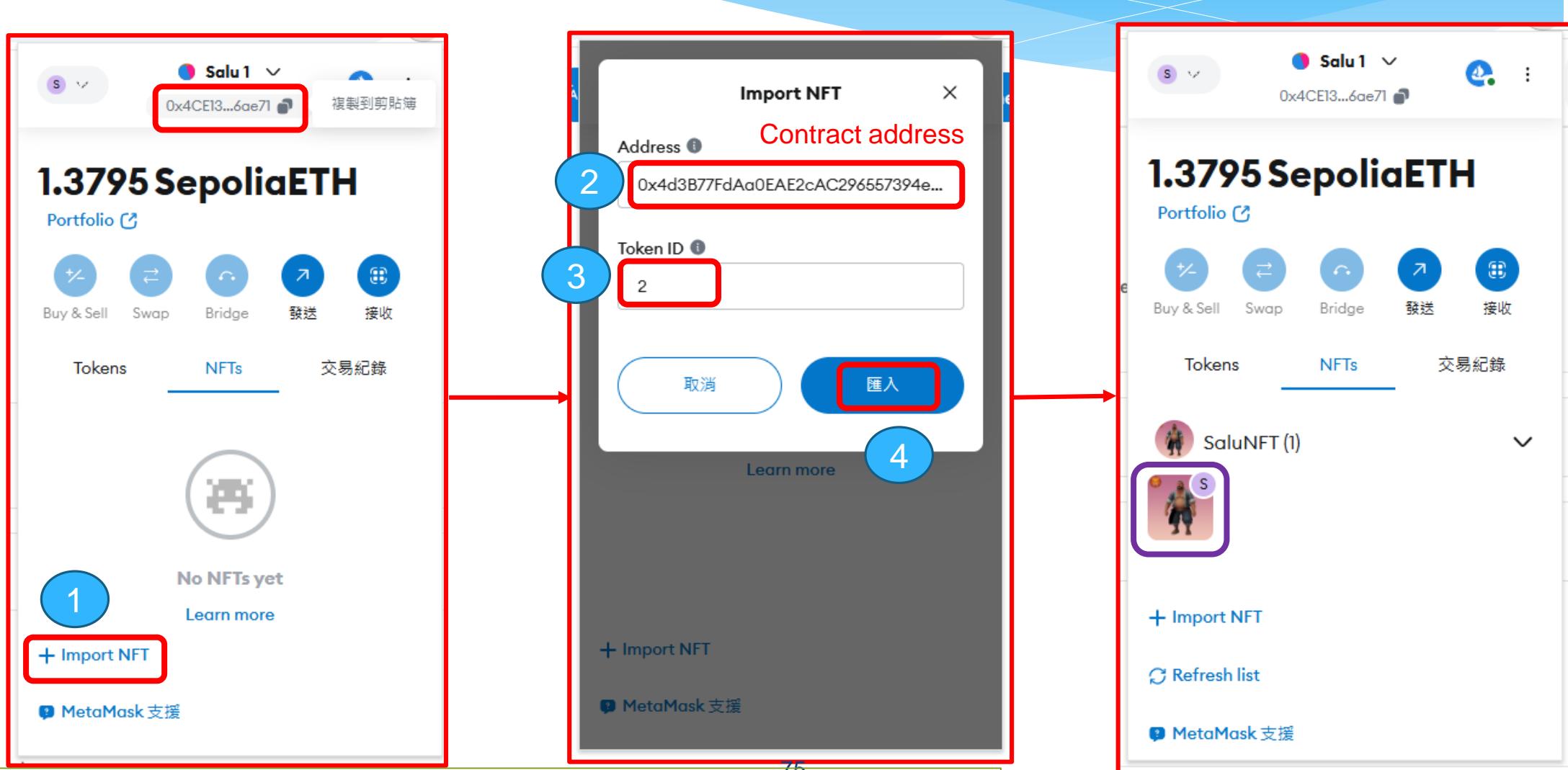
NFT #2 Owner Changed



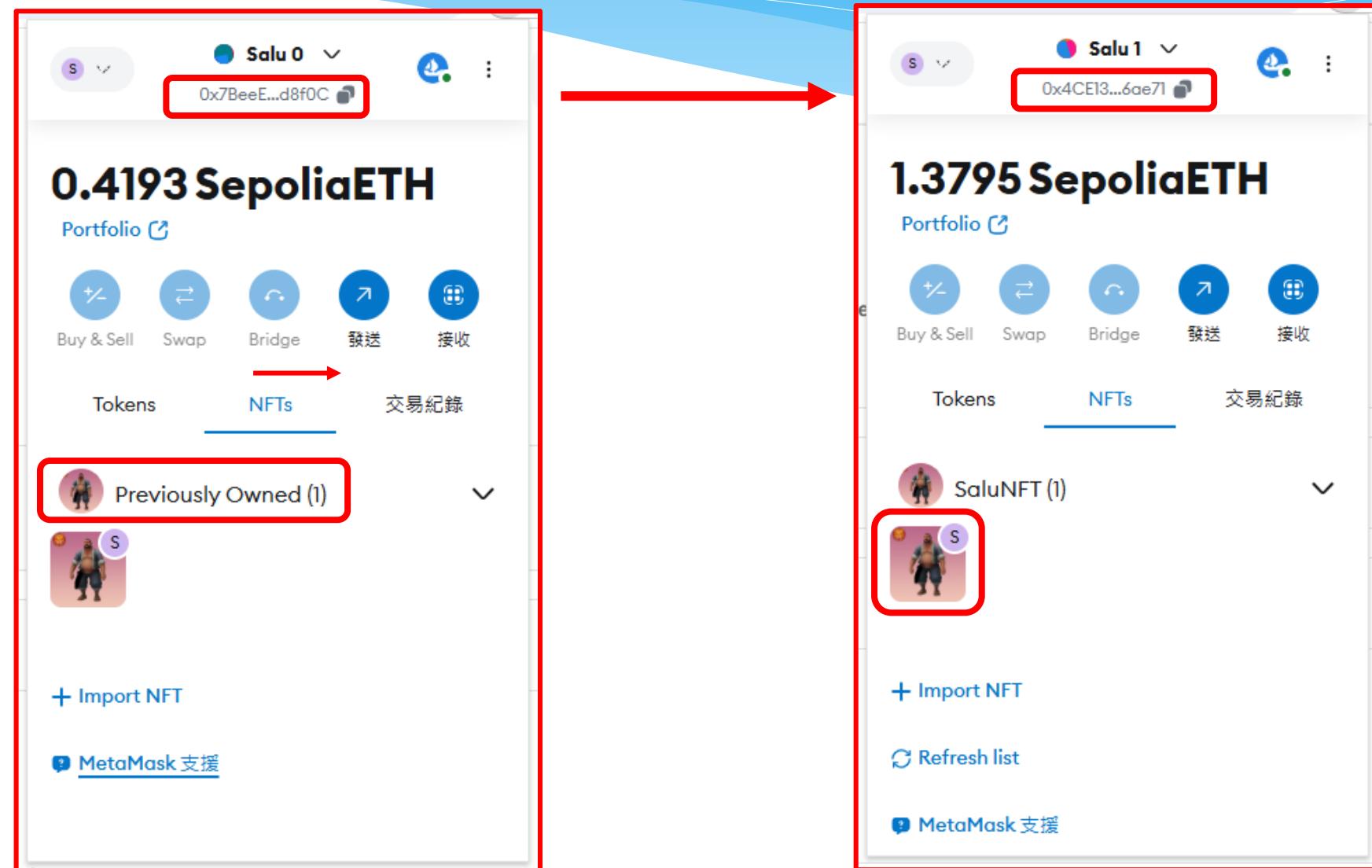


Verify NFT's Owner in MetaMask

Import NFT in New Owner



NFT #2 Owner Changed



Thank you !



References

References

■ MetaMask

<https://github.com/MetaMask/metamask-extension>

■ Remix

<https://github.com/ethereum/browser-solidity>

■ Openzeppelin

<https://docs.openzeppelin.com/>

<https://github.com/OpenZeppelin/openzeppelin-contracts>

References

■ Ethereum

<https://github.com/ethereum/>

<https://github.com/ethereum/go-ethereum>

<https://ethereum.org/en>

<https://geth.ethereum.org/docs/fundamentals/private-network>

■ Solidity Documentation

<https://solidity.readthedocs.io>

<https://docs.soliditylang.org/en/v0.8.28/>

■ Smart Contract

<https://www.quicknode.com/guides/tags/ethereum>

https://bshare.io/nft/erc20_721_1155/