

ISWS 2024 Summer School- MetaMask and Token Creation

Installing MetaMask

MetaMask (<https://metamask.io/>) is a free web and mobile crypto wallet that allows users to store and swap cryptocurrencies, interact with the Ethereum blockchain ecosystem, and host a growing array of decentralized applications (dApps)

You will need to install Metamask in your browser to interact with our demo and any experiments of your own that you undertake. It is currently available as a plugin for Chrome, Firefox, Edge, Opera and Brave: <https://metamask.io/download/>.

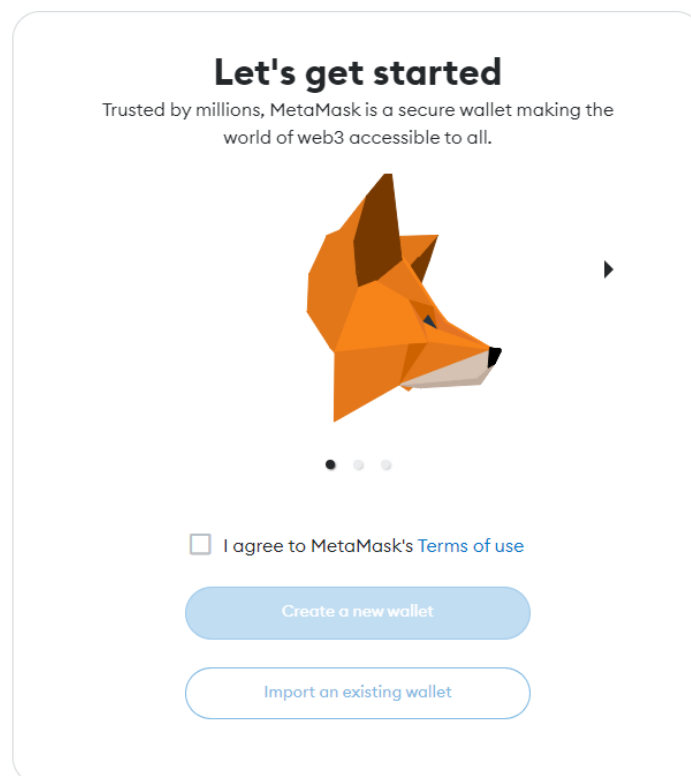
Once installed in your browser you should see a fox head icon appear in your browser bar. Here is an example of what it looks like in FireFox:



Click the icon to open the MetaMask app. You should see something similar to this:




English



Click the box beside "I agree to MetaMask's Terms of Use" and the buttons below will be available to click.

Let's get started

Trusted by millions, MetaMask is a secure wallet making the world of web3 accessible to all.



I agree to MetaMask's [Terms of use](#)

[Create a new wallet](#)

[Import an existing wallet](#)

Click **'Import an existing wallet'**, and this will open a page similar to this:

Help us improve MetaMask

MetaMask would like to gather usage data to better understand how our users interact with MetaMask. This data will be used to provide the service, which includes improving the service based on your use.

MetaMask will...

- ✓ Always allow you to opt-out via Settings
- ✓ Send anonymized click and pageview events
- ✗ **Never** collect information we don't need to provide the service (such as keys, addresses, transaction hashes, or balances)
- ✗ **Never** collect your full IP address*
- ✗ **Never** sell data. Ever!

This data is aggregated and is therefore anonymous for the purposes of General Data Protection Regulation (EU) 2016/679.

*When you use Infura as your default RPC provider in MetaMask, Infura will collect your IP address and your Ethereum wallet address when you send a transaction. We don't store this information in a way that allows our systems to associate those two pieces of data. For more information on how MetaMask and Infura interact from a data collection perspective, see our update [here](#). For more information on our privacy practices in general, see our [Privacy Policy here](#).

[I agree](#)

[No thanks](#)

Then you will be asked to Help them improve MetaMask. Select whichever option you prefer.

The next screen will ask you for your Secret Recovery Phrase.

1 Confirm secret recovery phrase 2 Create password

Access your wallet with your Secret Recovery Phrase

MetaMask cannot recover your password. We will use your Secret Recovery Phrase to validate your ownership, restore your wallet and set up a new password. First, enter the Secret Recovery Phrase that you were given when you created your wallet. [Learn more](#)

Type your Secret Recovery Phrase I have a 12-word phrase

i You can paste your entire secret recovery phrase into any field

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.

Confirm Secret Recovery Phrase

A Secret Recovery Phrase should have been supplied to you by the person running this ISWS workshop. You can copy the entire phrase and past it into the first box and it will auto-fill the words correctly into the remaining boxes.

1

Confirm secret recovery phrase

2

Create password

Access your wallet with your Secret Recovery Phrase

MetaMask cannot recover your password. We will use your Secret Recovery Phrase to validate your ownership, restore your wallet and set up a new password. First, enter the Secret Recovery Phrase that you were given when you created your wallet. [Learn more](#)

Type your Secret Recovery Phrase

I have a 12-word phrase

i You can paste your entire secret recovery phrase into any field

| | | | | | | | | |
|-----|------------------------------------|--|-----|------------------------------------|--|-----|------------------------------------|--|
| 1. | <input type="text" value="..."/> | | 2. | <input type="text" value="....."/> | | 3. | <input type="text" value="....."/> | |
| 4. | <input type="text" value="....."/> | | 5. | <input type="text" value="....."/> | | 6. | <input type="text" value="....."/> | |
| 7. | <input type="text" value="...."/> | | 8. | <input type="text" value="..."/> | | 9. | <input type="text" value="....."/> | |
| 10. | <input type="text" value="...."/> | | 11. | <input type="text" value="....."/> | | 12. | <input type="text" value="....."/> | |

Confirm Secret Recovery Phrase

Click on 'Confirm Secret Recovery Phrase'

1 ————— 2
Confirm secret recovery phrase Create password

Create password

This password will unlock your MetaMask wallet only on this device. MetaMask can not recover this password.

New password (8 characters min) [Show](#)

Confirm password

I understand that MetaMask cannot recover this password for me. [Learn more](#)

Import my wallet

The next screen will ask you to enter a password. This is your password for access to your wallet on your local device. As with all online accounts, you should ensure that you are using a strong password. Then click the checkbox 'I understand that MetaMask cannot recover this password for me.'

1 ————— 2
Confirm secret recovery phrase Create password

Create password

This password will unlock your MetaMask wallet only on this device. MetaMask can not recover this password.

New password (8 characters min) [Show](#)

Password strength: **Weak**

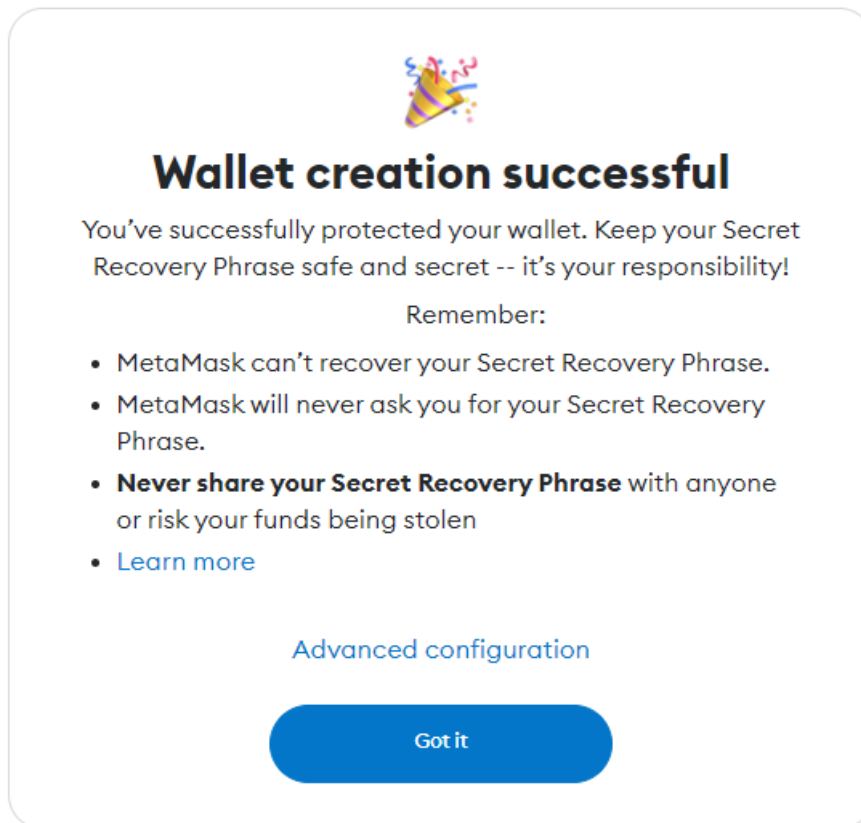
A strong password can improve the security of your wallet should your device be stolen or compromised.


Confirm password [✓](#)

I understand that MetaMask cannot recover this password for me. [Learn more](#)

Import my wallet

Once available, click the button 'Import my wallet'.





Wallet creation successful

You've successfully protected your wallet. Keep your Secret Recovery Phrase safe and secret -- it's your responsibility!

Remember:

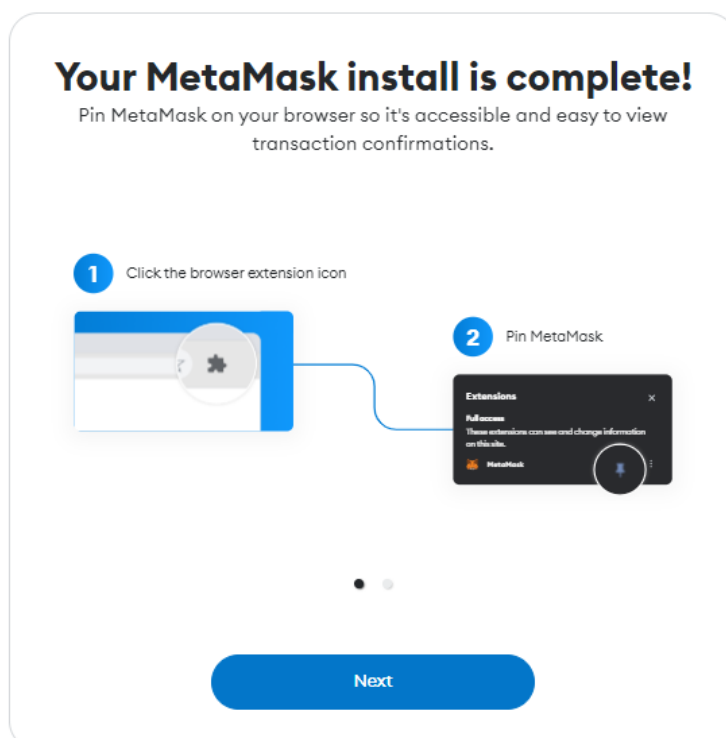
- MetaMask can't recover your Secret Recovery Phrase.
- MetaMask will never ask you for your Secret Recovery Phrase.
- **Never share your Secret Recovery Phrase** with anyone or risk your funds being stolen
- [Learn more](#)

[Advanced configuration](#)

Got it

[Follow us on Twitter](#) 

You should be told that the wallet create was successful. Read this screen carefully and then click the button 'Got it'.



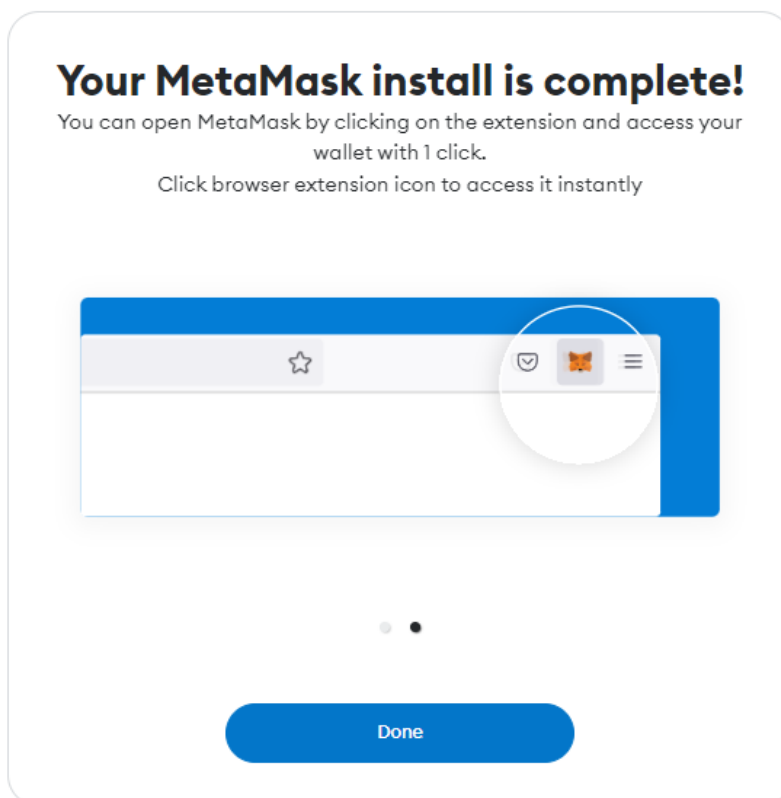
Your MetaMask install is complete!

Pin MetaMask on your browser so it's accessible and easy to view transaction confirmations.

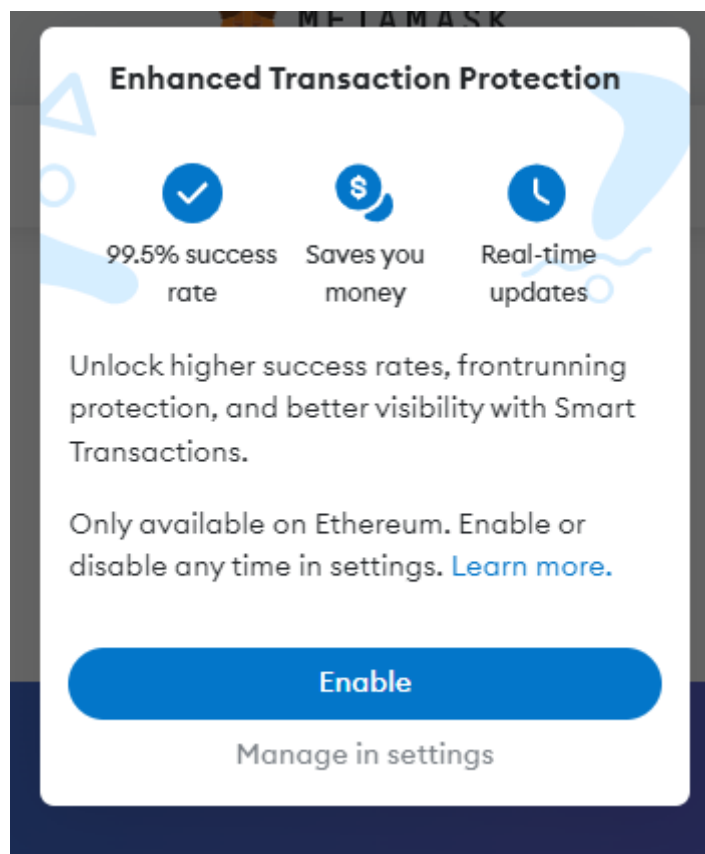
- 1 Click the browser extension icon
- 2 Pin MetaMask

Next

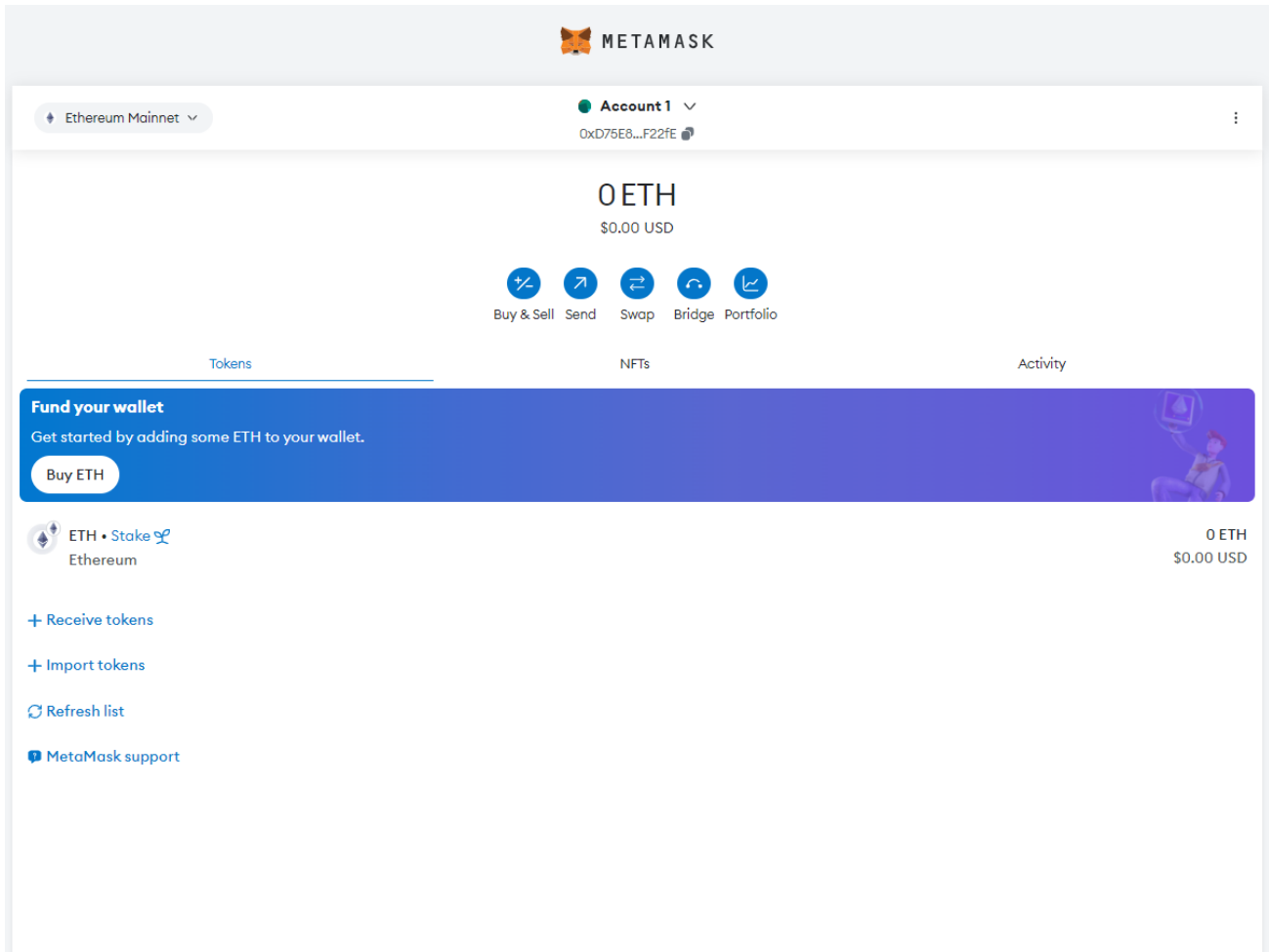
Then Click **'Next'** through the first information screen.



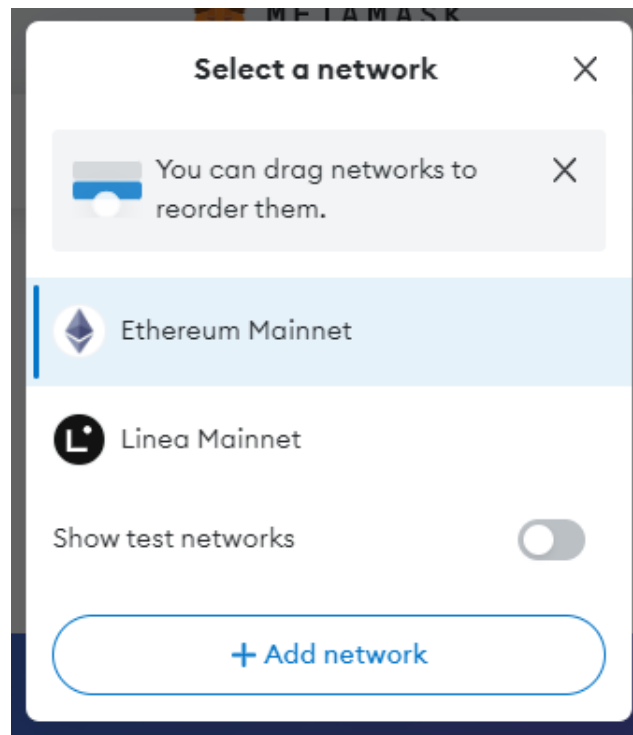
Then, click **'Done'**.



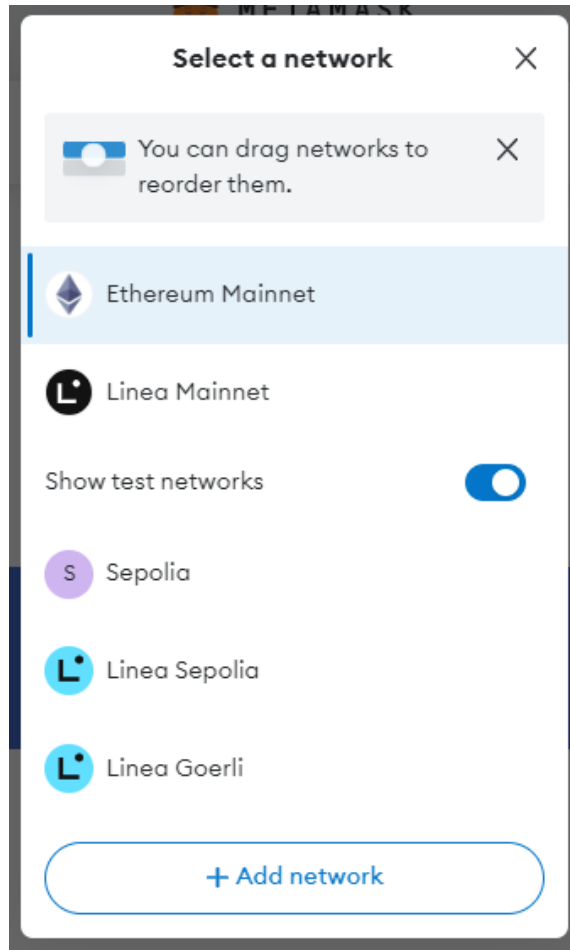
You will then be asked to enable Enhanced Transaction Protection. Click **'Enable'**.



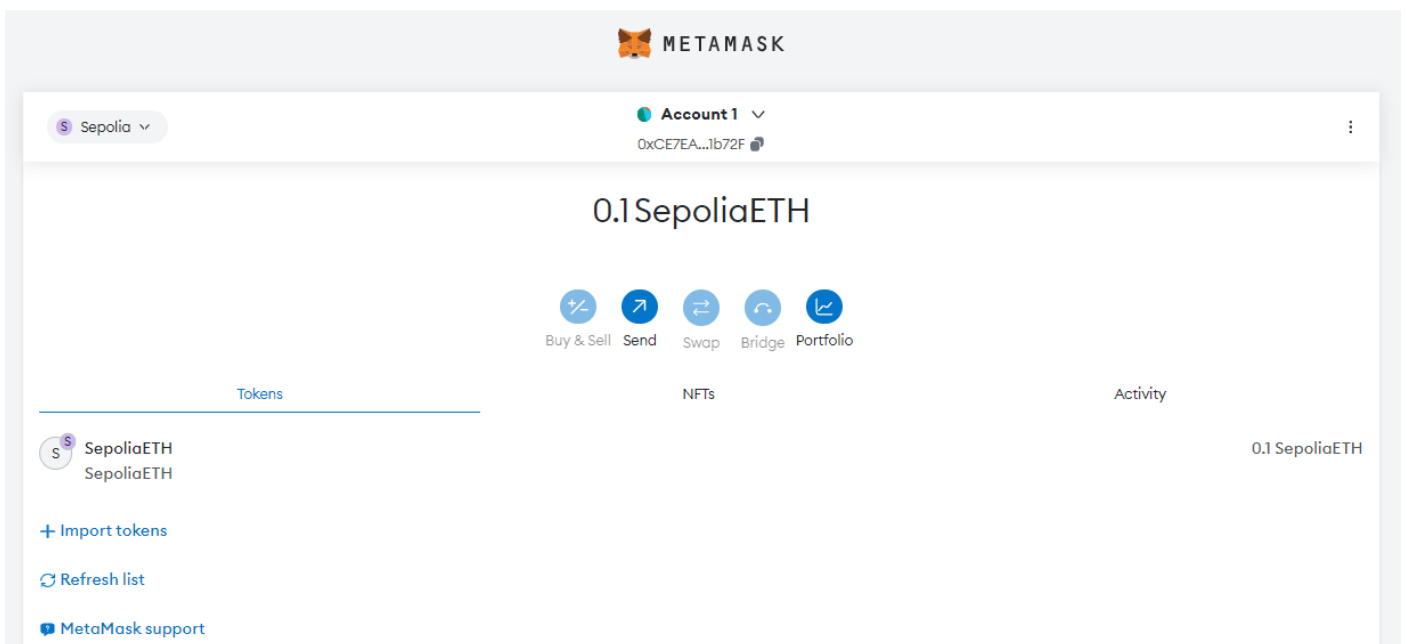
You will then see your MetaMask Wallet in the webpage view of it, initially set to the Ethereum Mainnet. Click the dropdown on the top-left, where it says '**Ethereum Mainnet**'. This will open the following popup:



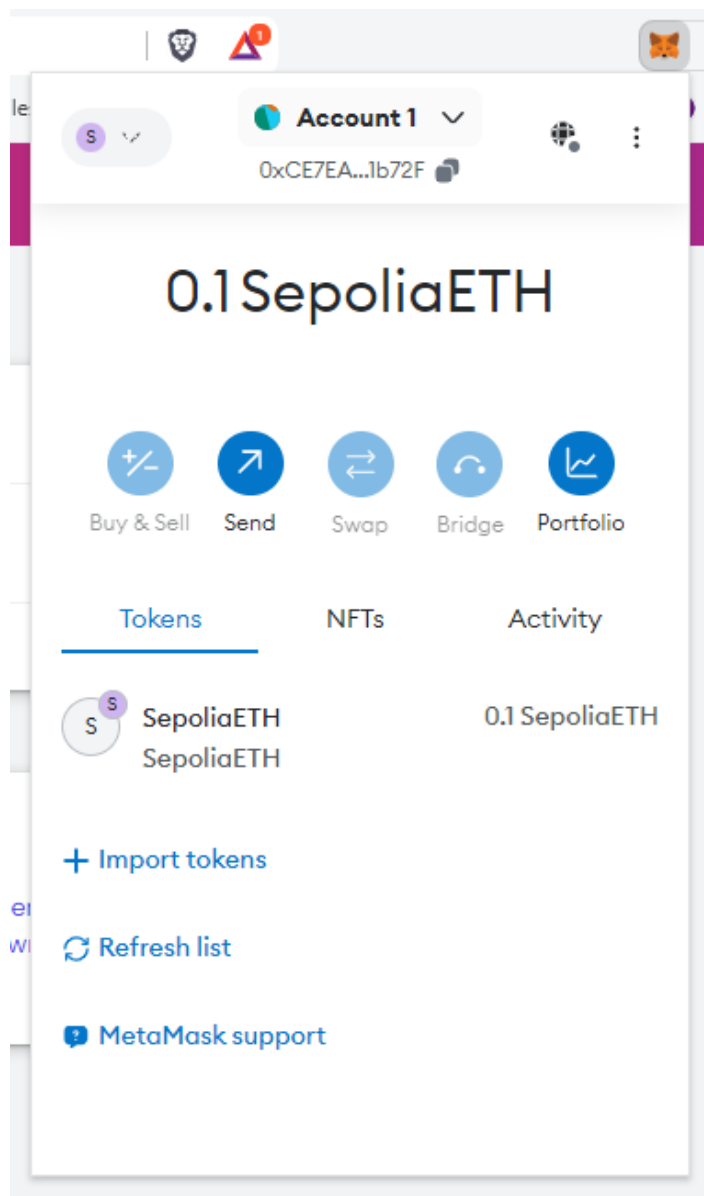
Click on the item that says '**Show test networks**'.



Then select the first network listed: **Sepolia**. Your provided test account will have been pre-seeded with 0.1 SepoliaEth.



Your MetaMask wallet setup is now complete. Note that usually, the MetaMask wallet will open as a smaller interface over the current page, and can be triggered in the usual way with an extension shortcut – or from the extensions menu of you browser.

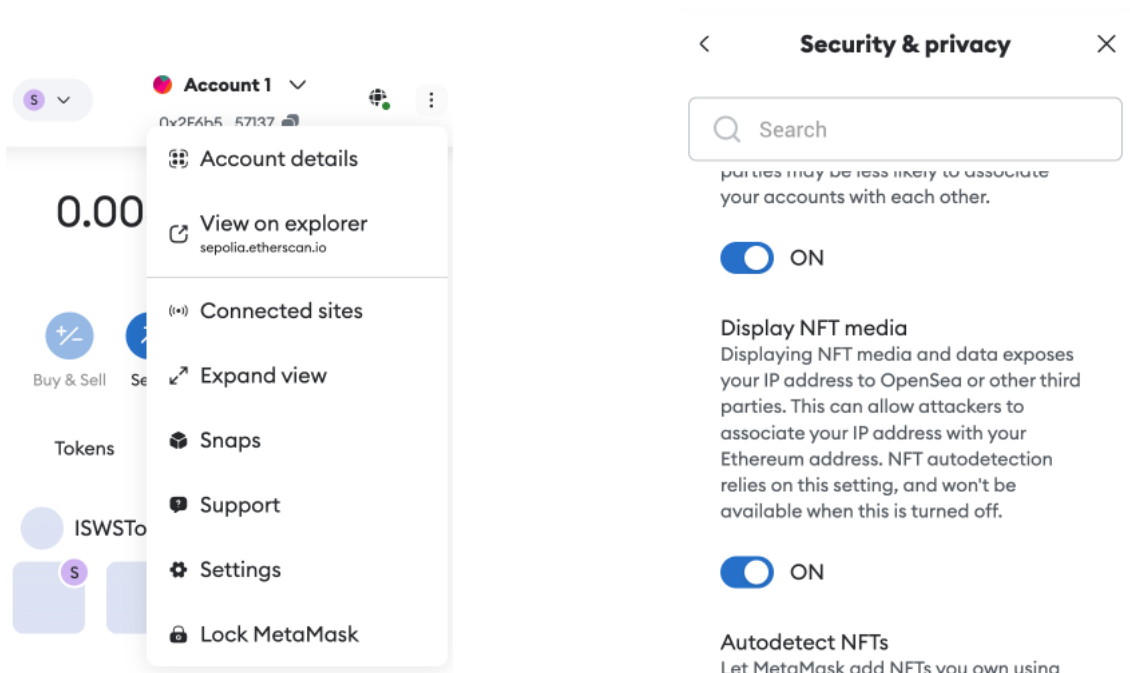


If you need more Sepolia Eth than was pre-seeded on the MetaMask account you were provided with, you will need to get it from a Sepolia Faucet, such as one of the following:

- <https://cloud.google.com/application/web3/faucet/ethereum/sepolia>
- <https://www.sepoliafaucet.io/>
- If you have or create an Infura Account you can use: <https://www.infura.io/faucet/sepolia>
- If you have or create an Alchemy Account you can use: <https://sepoliafaucet.com/>
- If you have or create a Twitter Account you can use: <https://faucet-sepolia.rockx.com/>

IMPORTANT: Before interacting with our ISWS Token Issuing webpage, please make sure you have selected Sepolia testnet in your MetaMask Wallet and make sure your account has some eth on that network.

When you create NFTs for your images during the summer school, images will not be displayed in MetaMask unless you have enabled it. To do so, open the MetaMask settings and select Security and Privacy. Scroll down (near the bottom) and switch Display NFT media to ON.



Creating an ISWS Token

Connect to MetaMask

Before you can use the webpage to Issue an ISWS Token, you must have logged into MetaMask in your browser. In our token issuer webpage, you will see a button called '**Connect To MetaMask**'.



Issue an ISWS Token

Connect to MetaMask (Select the Sepolia network)

Connect to MetaMask Ethereum Account:

Create a Token

This button will only be available if you have not already logged into MetaMask in your current browser session. Clicking this will launch the MetaMask app and you will be asked to login and permission the website to interact with it.

Issue an ISWS Token

Connect to MetaMask (Select the Sepolia network)

[Connect to MetaMask](#) Ethereum Account:

Create a Token

Make sure you are on the **Sepolia** Network in MetaMask before you Create your Token!

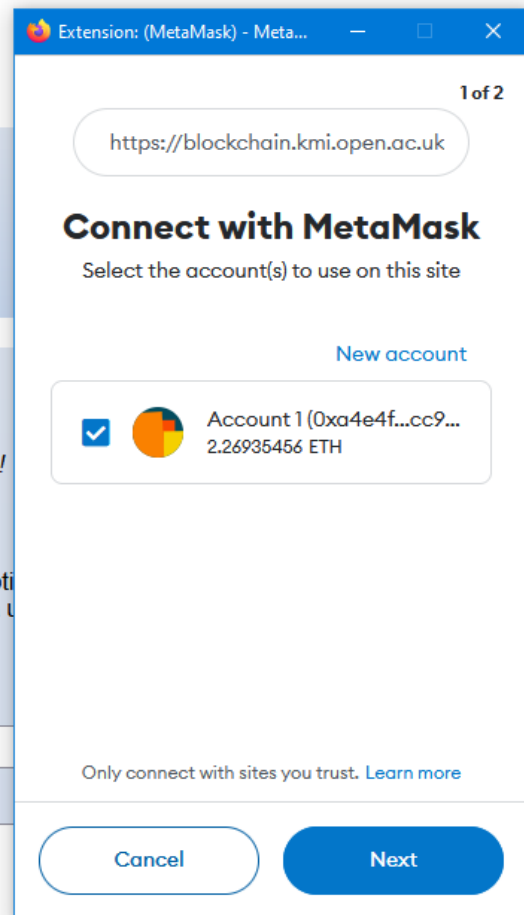
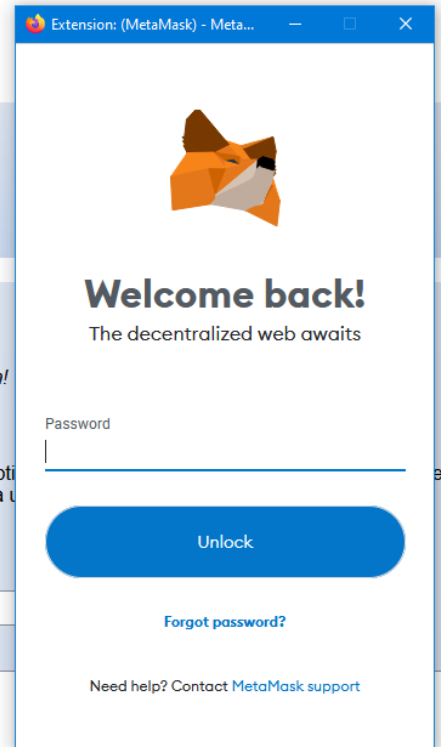
Token Details

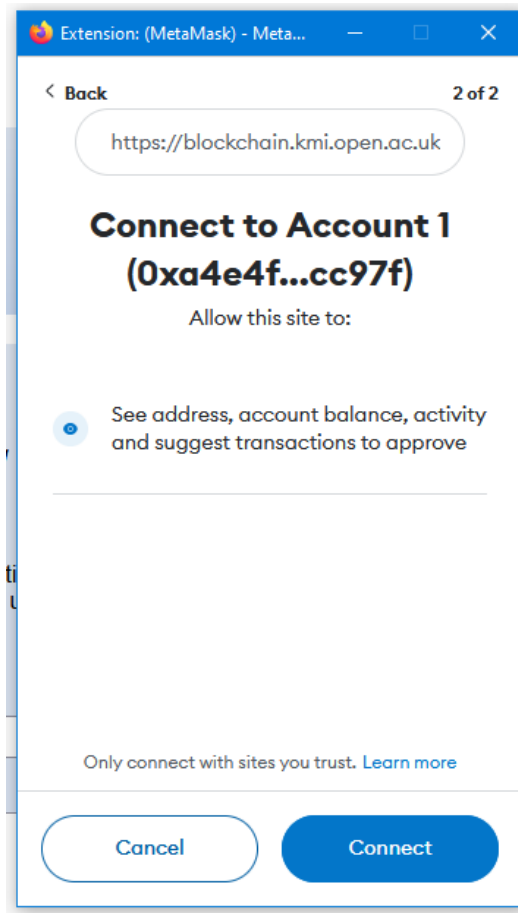
Each Non-Fungible token represents a unique asset. Each token needs a name, description. You also need additional metadata that anchors your item, e.g. a hash of the item file, a URL.

Please enter the details below to issue a token to represent your item

Token Name:

Token Description:





Click **'Next'** and then on the following screen click **'Connect'**.



Issue an ISWS Token

Connect to MetaMask (Select the Sepolia network)

Connect to MetaMask

Ethereum Account: 0xa4e4f77fe6d5d8be5242b0d22f9d99e118ecc97f

The webpage will now show you are connected to MetaMask and display the wallet account you have connected with.

Issue a Token

Each Non-Fungible token you create with our webpage represents a unique asset. Each token needs a name, a description, and a token image to represent that unique asset.

You also need to add some additional metadata that anchors your item, e.g. a hash of the item file, a URL to your item, additional properties that describe your item's provenance, etc. What additional metadata properties you use will depend on what item your token represents. But the metadata properties must be expressed as a piece of Json that you must enter into the **'Additional Token Metadata Properties'** box. Since the NFT metadata will include the

hash of the image file, and the token and its contents will be immutable records on the blockchain, this provides a means to show verifiable metadata about the image.

Here, we used an image file of a uniform blue colour, with the following metadata to describe it using relevant RDF-compatible vocabularies or ontologies, expressed as expanded JSON-LD¹ using terms from the Dublin Core vocabulary²:



```
{
  "http://purl.org/dc/terms/title": "NFT in Blue",
  "http://purl.org/dc/elements/1.1/description": "All blue, all the
time",
  "https://w3id.org/security#digestMultibase":
"1b42a4db753d42031a3534015c489abebb6a0079435febf404ffbef3f95c46319408"
}
```

Below is a simple example:

Token Name:
Test

Token Description:
Some blue

Token Image URL:
If you chose to select an image file it will load your image file onto the public IPFS network and create an image url for you. Please ma ownership or check copyright for images you are uploading.

Choose a token image:
 blue

OR enter a URL directly

Additional Token Metadata Properties (as JSON):
{
 "http://purl.org/dc/terms/title": "NFT in Blue",
 "http://purl.org/dc/elements/1.1/description": "All blue, all the time",
 "https://w3id.org/security#digestMultibase": "1b42a4db753d42031a3534015c489abebb6a0079435febf404ffbef3f95c46319408"
}

If you wish to hash a file as part of your token metadata, we have create a utility webpage where you can upload a file and create a hash for it: [ISWS Summer School - Hash a File \(open.ac.uk\)](#)

We use digestMultibase to represent the hash, following [this](#), but note the comment there that this is not a settled W3C recommendation. The value is generated from the hash of the file as '1b' + hash length as number of bytes in hex + hash value in hex, where '1b' is a fixed value representing the hash algorithm used by Ethereum-compatible blockchains, KECCAK-256 – see [here](#) for details.)

¹ In practice, this is just JSON where the keys are RDF predicate terms, as full URLs, and the values are object terms, also as full URLs, or literals.

² <https://www.dublincore.org/specifications/dublin-core/dcmi-terms/>

Hash a File (Keccak-256)

Choose a file to hash: No file chosen

Hash of file

digestMultibase

Name:

Stored Data

| Date | Name | Hash | digestMultibase |
|--------------------------|----------|--|--|
| 05/06/2024
- 15:35:31 | blue.png | 0xa4db753d42031a3534015c489abebb6a0079435febf404ffbef3f95c46319408 | 1b42a4db753d42031a3534015c489abebb6a0079435febf404ffbef3f95c46319408 |

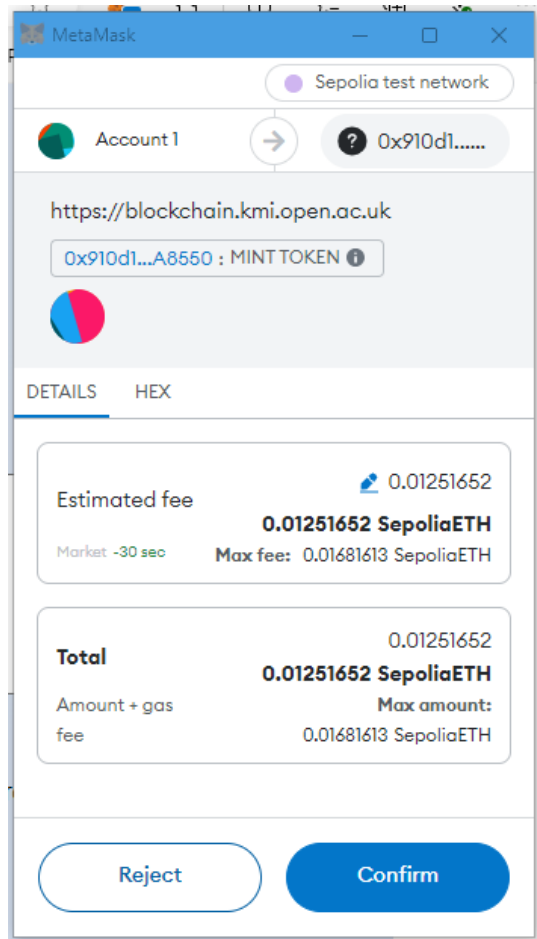
You can choose to store any hashes you create in your browser's local storage, and they will be displayed in a table at the bottom for later reference.

Once all your token data is ready to turn into an NFT, click the **'Create a Token'** button.

Additional Token Metadata Pr

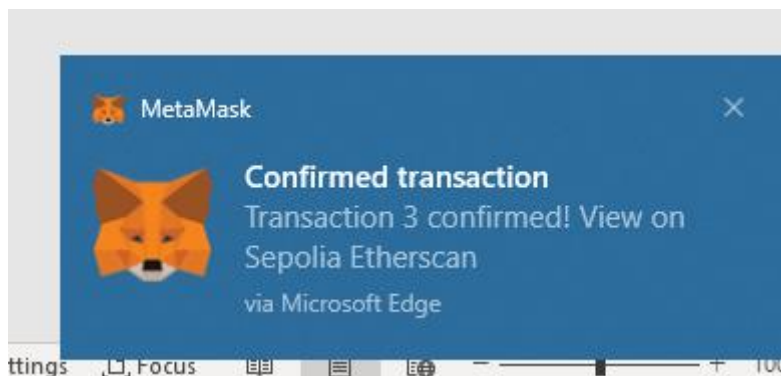
```
{  
  "http://purl.org/dc/terms:  
  "http://purl.org/dc/eleme  
  "https://w3id.org/securit  
}
```

MetaMask will then open (it may take a moment), and you will be asked to confirm the transaction to create your Token:



Click 'Confirm'. MetaMask will close, and then you will have to wait, while a block is mined containing your transaction.

Once it is mined you will get an alert:



You can choose to click to view the transaction details on the Sepolia Etherscan website.

Note: a link to the Sepolia Etherscan is also provided on the workshop webpage.

The transaction details and the Token details will be populated into the ISWS Token Issuing webpage. An example can be seen below:

Create a Token

Blockchain Transaction Details

```
{
  "to": "0x910d18BBab49d7F2B7C880FF5a83774D868A8550",
  "from": "0x2F6b506387467FC62de878CF72B5f34a1Aa57137",
  "contractAddress": null,
  "transactionIndex": 77,
  "gasUsed": {
    "type": "BigNumber",
    "hex": "0x025754"
  },
  "logsBloom":
}
```

Network Used:

```
{
  "chainId": 11155111,
  "name": "unknown"
}
```

New Token Details

Token ID:

Token Metadata URL:

They will also be stored into your browser's local storage and displayed in a table at the bottom of the webpage:

New Token Details

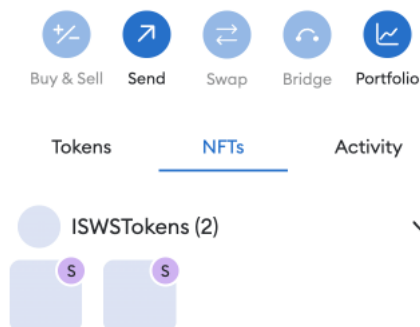
Token ID:

Token Metadata URL:

Stored Data

| Date | Network | Contract Address | Contract ABI | Token ID | Token URL | Token Receipt | MetaMask |
|-----------------------|---|--|---|----------|---|---|--|
| 03/06/2024 - 13:53:22 | <input type="button" value="View unknown Details"/> | 0x910d18BBab49d7F2B7C880FF5a83774D868A8550 | <input type="button" value="View ABI"/> | 3 | https://nftstorage.link/ipfs/bafkreif3c7e5cmvvhf2ofs eewb7qrrh2euy2r6bc3vm alfcq5hctrcpi3a | <input type="button" value="View Receipt"/> | <input type="button" value="Add To MetaMask"/> |
| 05/06/2024 - 14:33:08 | <input type="button" value="View unknown Details"/> | 0x910d18BBab49d7F2B7C880FF5a83774D868A8550 | <input type="button" value="View ABI"/> | 4 | https://nftstorage.link/ipfs/bafkreibtcoxd7johakub2c2llf4htxea7szlzmck65tsblxyzplpew74a | <input type="button" value="View Receipt"/> | <input type="button" value="Add To MetaMask"/> |

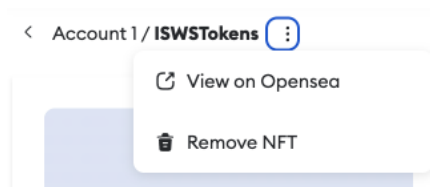
As NFTs are tokens, they can be stored, displayed, and transferred inside a wallet such as MetaMask – the Add To MetaMask button will let you save the NFT you have just issued. After doing so, you will see your NFTs listed in the wallet, with more details visible when you click on one.



with more details visible when you click on one



The NFT is visible on the public OpenSea directory, which scans public blockchains for tokens – the wallet generates a link there.



Your image and provenance metadata are now anchored to a publicly-visible (test) blockchain and can be verified!

IPFS

The ISWS Token Issuing webpage uses a public IPFS network to store any images you upload and to store your NFT metadata. Each IPFS file has a unique hash, which means the data cannot be altered. This IPFS hash is stored into the Token contract on the blockchain, thus providing an immutable storage for your NFT data.

We are using a public IPFS network provided by: [NFT.Storage](#) – for which we have obtained an access token to use with our webpage.

You can view the Token metadata, which has been stored onto IPFS, using the link provided after you issue the Token:

| | |
|--------------------------|---|
| New Token Details | |
| Token ID: | <input type="text" value="4"/> |
| Token Metadata URL: | <input type="text" value="https://nftstorage.link/ipfs/bafkreibtcoxd7johakub2c2lf4htxea7szlzmck65tsblxyzplpew74a"/> |

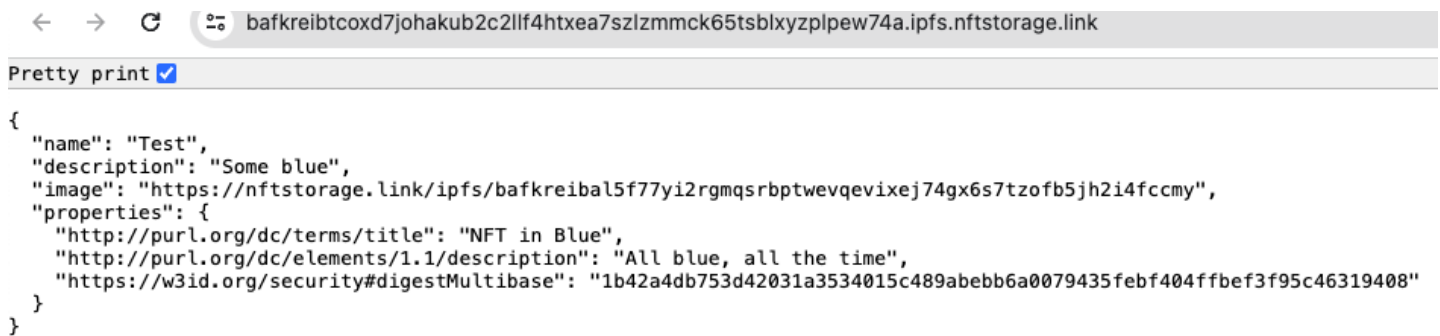
or from the links stored into your browser storage and displayed in the table:

Token URL

<https://nftstorage.link/ipfs/bafkreif3c7e5cmvvhf2ofseewb7qrrh2euy2r6bc3vmalfcq5hctrcpi3a>

<https://nftstorage.link/ipfs/bafkreibtcoxd7johakub2c2llf4htxea7szlzmck65tsblxyzplpew74a>

Below is an example IPFS file for the Token created above:



```
{
  "name": "Test",
  "description": "Some blue",
  "image": "https://nftstorage.link/ipfs/bafkreibal5f77yi2rgmqsrptwewqevixej74gx6s7tzofb5jh2i4fccmy",
  "properties": {
    "http://purl.org/dc/terms/title": "NFT in Blue",
    "http://purl.org/dc/elements/1.1/description": "All blue, all the time",
    "https://w3id.org/security#digestMultibase": "1b42a4db753d42031a3534015c489abebb6a0079435feb404ffbef3f95c46319408"
  }
}
```

Note: the additional metadata you provide as JSON will be stored in an element called **'properties'** in the final Token metadata.

For more information about IPFS, please see their documentation: [What is IPFS? | IPFS Docs](#)