



## I. INTRODUCTION

Invited by Algorand to participate in the Algorand Greenhouse Hack 2, we had the chance to explore a thriving multi-chains event.

Our project, Algoperability, allows users to manage digital assets that live on a different blockchain than the blockchain on which those users are. For example managing and owning an NFT on blockchain Ethereum while the user is on Solana. This technology opens various possibilities, allowing people to send and exchange NFTs and other digital assets to people on other blockchains, as well as being able to execute DeFi orders and to use dApps on other blockchains. It also enables commercial companies to target audiences scattered on several blockchain all at once in releasing digital assets on Algorand and using our Central Database of users spread among different blockchains. If those released assets are NFTs, targeted users can directly mint them from the blockchain they are.

The principal difference between a classical bridge and our infrastructure is that we do not lock the initial asset, as we still allow the owner to manage the asset and move it. We also don't mint a new synthetic asset on the destination blockchain. All the control of the original asset is achieved via Wormhole messages, a central database stored on Algorand, and smart-contracts managers on the various blockchains supported thanks to the infrastructure we imagined. The user experience is at the core of our project, allowing a multi-chain future accessible to everyone.

### PRESENTATION OF ALGORAND & WORMHOLE ECOSYSTEMS

The Wormhole Network is a generic message-passing protocol connecting high-value blockchains together, with applications leveraging the messaging layer to facilitate interoperability between ecosystems. Secured by 19 guardians, developers are able to leverage the protocol to send arbitrary cross-chain data, including tokens, NFTs, oracle data, governance decisions and more. Developers can leverage the Wormhole SDK to build decentralized applications (dApps) and protocols that can move value seamlessly across nine major blockchain networks without fees.

## II. PROBLEMS AND CURRENT SITUATION

### A) Number of Blockchains Increasing

The number of blockchains is constantly evolving, allowing the emergence of many different communities/ecosystems. It is also interesting to note that despite a significant development in the number of blockchains, it is still very complicated for some blockchains (even historical ones) to attract new users to their ecosystems.

One of the reasons is that it is not always easy for those ecosystems to communicate with each other and that leaves a lot of inter-chain developments untouched. This impermeability between blockchains also has the direct consequence of complicating the user experience, that constantly has to create new dedicated wallets to enter new specific blockchains.

Algo-perability makes inter-chain use and communication more fluid and user friendly, helping for the mass adoption of Web3.

### B) Current bridged assets lose some of their properties

On current bridges, transferred assets are locked in a SC, then a synthetic is emitted on the destination blockchain. Therefore, the new synthetic can't give their owner all the privileges the original asset could have. For example, let's take a NFT that gives access to a Chat Room in a dApp. If that NFT is bridged and a synthetic is minted on the destination blockchain, the owner of the synthetic on the new blockchain won't be able to enter that Chat Room.

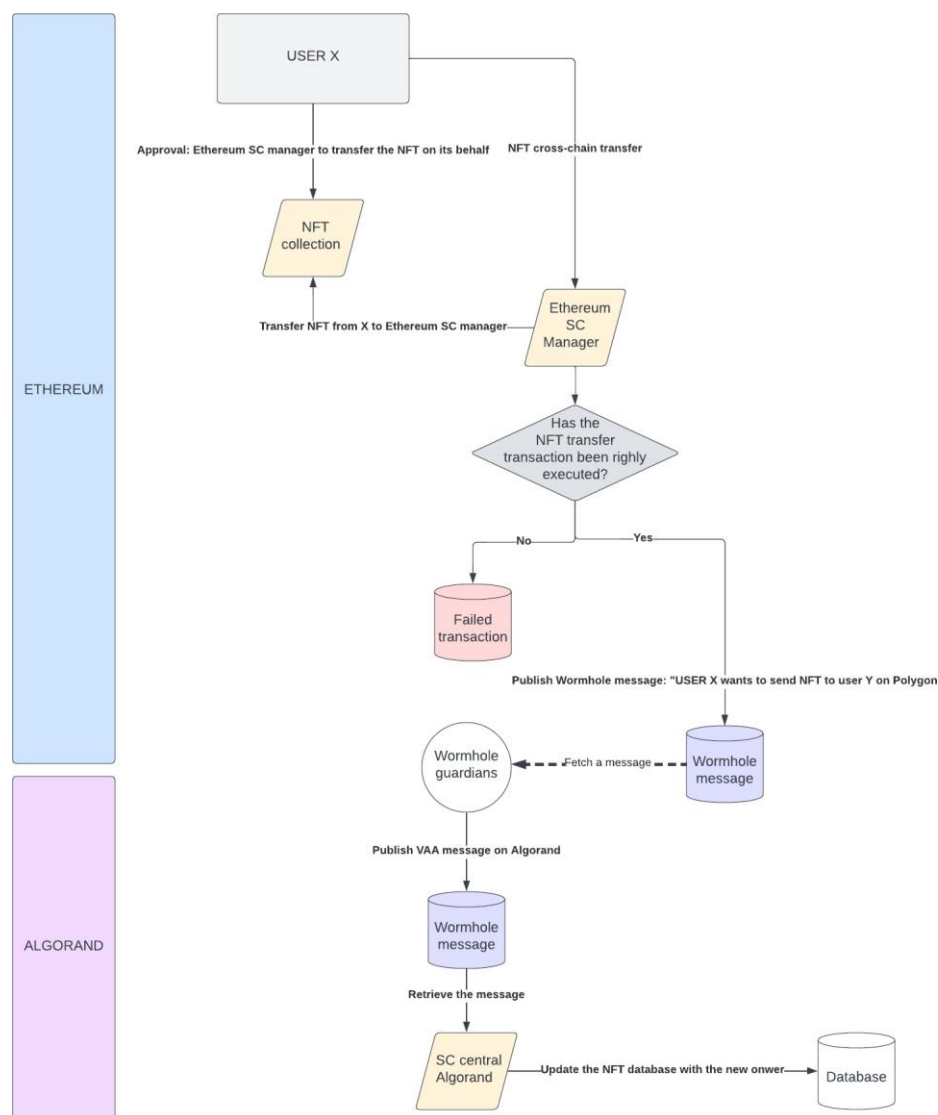
### C) Current bridges decrease transparency on the blockchains

Moreover, when a NFT is bridged, it becomes more complicated for someone to identify all the holders of that NFT collection, because now that person will need to scan all the different blockchains where the NFTs of that collection were bridged, and will have to identify the different synthetics emitted as well as their owner. There is a lack of a unified database that keeps track of all the holders of an NFT collection (or other assets such as stablecoins that are bridged everyday).

### III. OUR SOLUTION

#### A) Cross-chain digital assets ownership transfer

Our first functionality is allowing users to transfer ownership of a digital asset from a blockchain to another. The architecture workflow of that operation is shown in the Figure below. We took the example case and did the implementation for an NFT ERC721 (with the image and NFT metadata hosted on Storj) transfer, and it can be extended to any kind of digital asset.



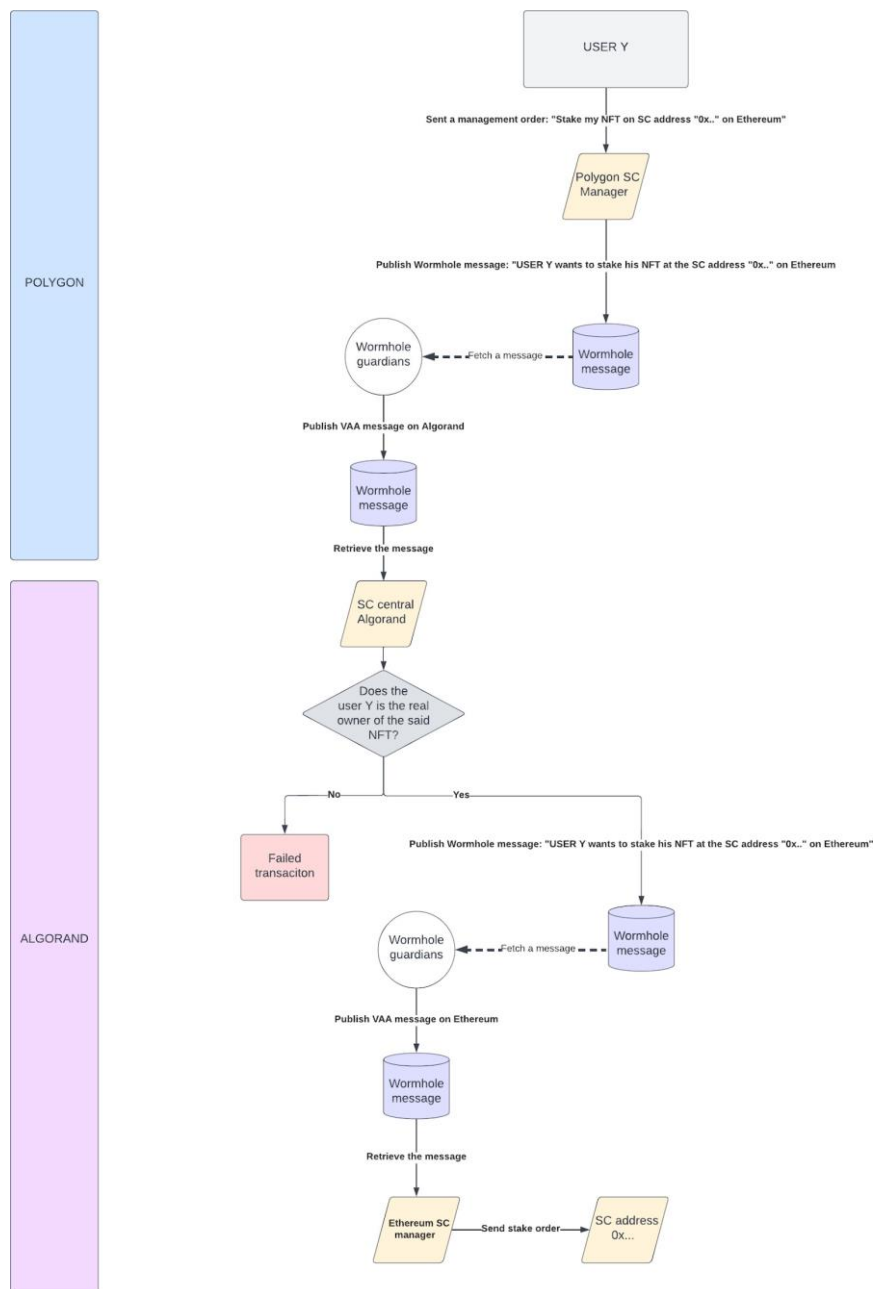
#### Instructions:

1. User X sends NFT on his NFT collection
2. The Ethereum smart contract verify if the transaction transfer successful
3. User X receives a wormhole message

4. User X selects an option (i.e user X wants to send NFT to user Y on blockchain B)
5. The Wormhole guardians publish VAA message on Algorand
6. The Algorand smart contract retrieves the wormhole message
7. The Algorand smart contract updates the NFT database with the new owner

## B) Cross-chain digital assets Management

Now that we enabled users to own digital assets on different blockchains than the blockchain they are in, we developed a Cross-chain digital asset Management service. The figure below shows the workflow of that service, with the example use case taken of a DeFi operation of NFT Staking. With that service, the user is able to seamlessly use any dApp existing on the other blockchain, whether it is DeFi trading and operations or even selling a digital asset.



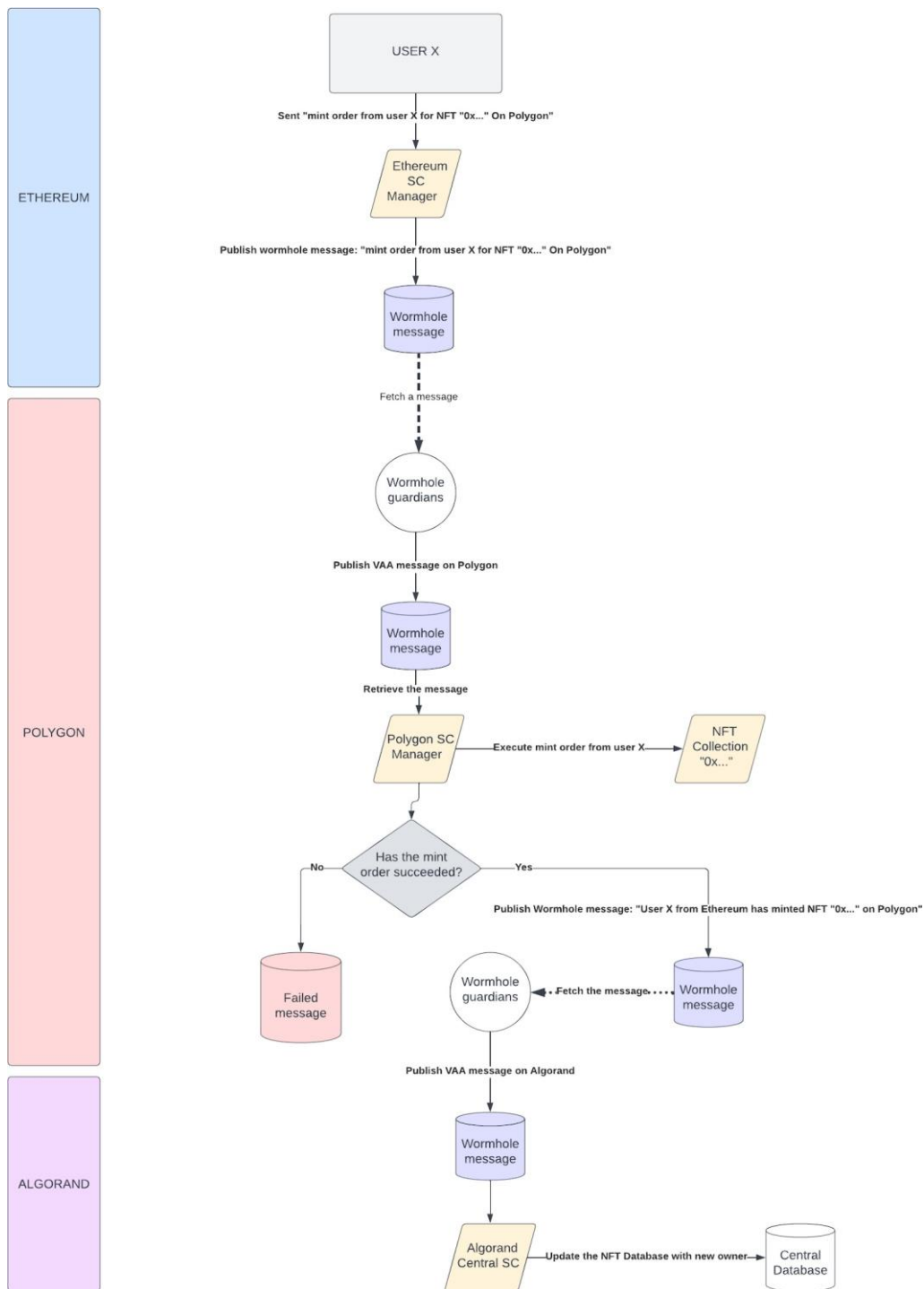
### Instructions:

1. User Y sends a management order
2. The Polygon smart contract publish the Wormhole message with the management order
3. User Y receives a Wormhole message
4. User Y selects an option (i.e user Y wants to stack his NFT on the smart contract X)
5. The Wormhole guardians publish VAA message on Polygon
6. The Algorand smart contract retrieves the Wormhole message
7. The Algorand smart contract verify if the user Y is the real owner of the NFT

8. The order is confirmed or an error message is published
9. The Algorand smart contract publish the Wormhole message with the result
10. The Wormhole guardians publish VAA message on Polygon
11. The Polygon smart contract retrieves the Wormhole message
12. The Polygon smart contract send the stake order to the smart contract X

### C) Global All-Chain Commercial Targeting System

By centralizing and keeping tracks of the holders of digital assets that are bridged, we can easily know all the users that share common traits and that are scattered among several blockchains. We developed a functionality for commercial companies to retrieve all the holders addresses of a targeted audience (for example audience that is interested into sport), and allow the company to release an NFT collection on a supported blockchain. Those NFT that target the said audience, will be mintable by all those users, directly from their blockchain. The Figure below shows the workflow of the Cross-chain NFT minting through Algoperability.



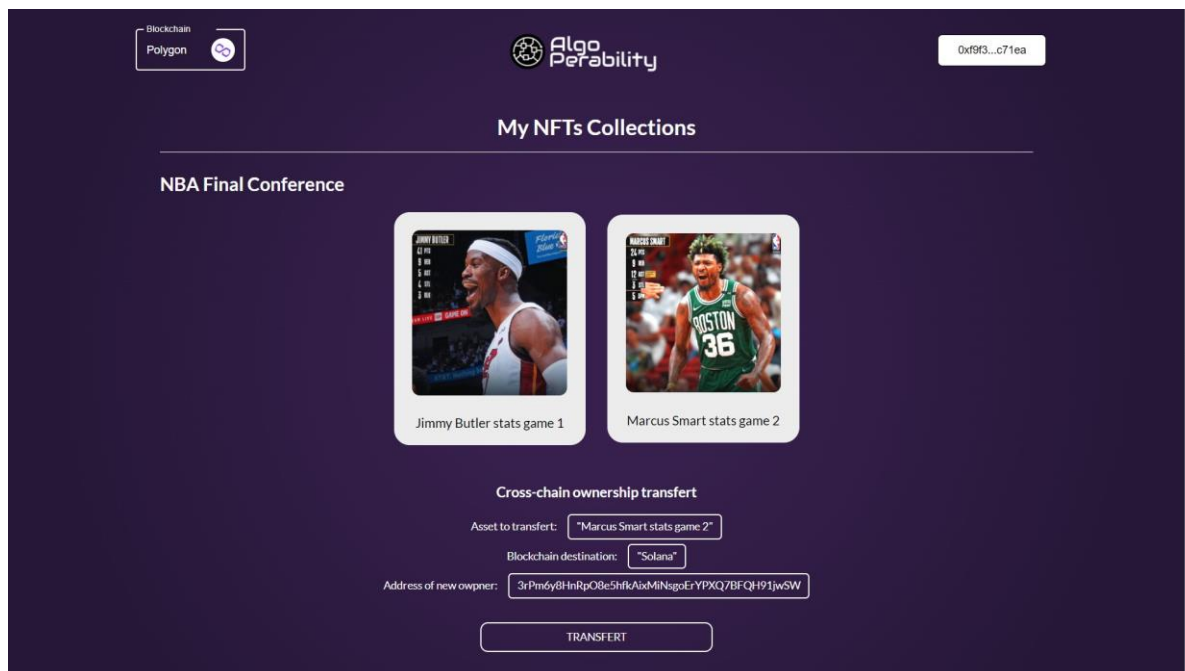
### Instructions:

1. User X sent a mint order on Ethereum
2. The Ethereum smart contract publish the Wormhole message with the mint order
3. User X receive a Wormhole message
4. The Wormhole guardians publish VAA message on Polygon

5. The Polygon smart contract retrieves the Wormhole message
6. The Polygon smart contract execute the mint order
7. User X receive the NFT on Polygon or an error message is published
8. The Polygon smart contract publish the Wormhole message with the result
9. The Wormhole guardians publish VAA message on Polygon
10. The Algorand smart contract retrieves the Wormhole message
11. The Algorand smart contract updates the NFT database with the new owner

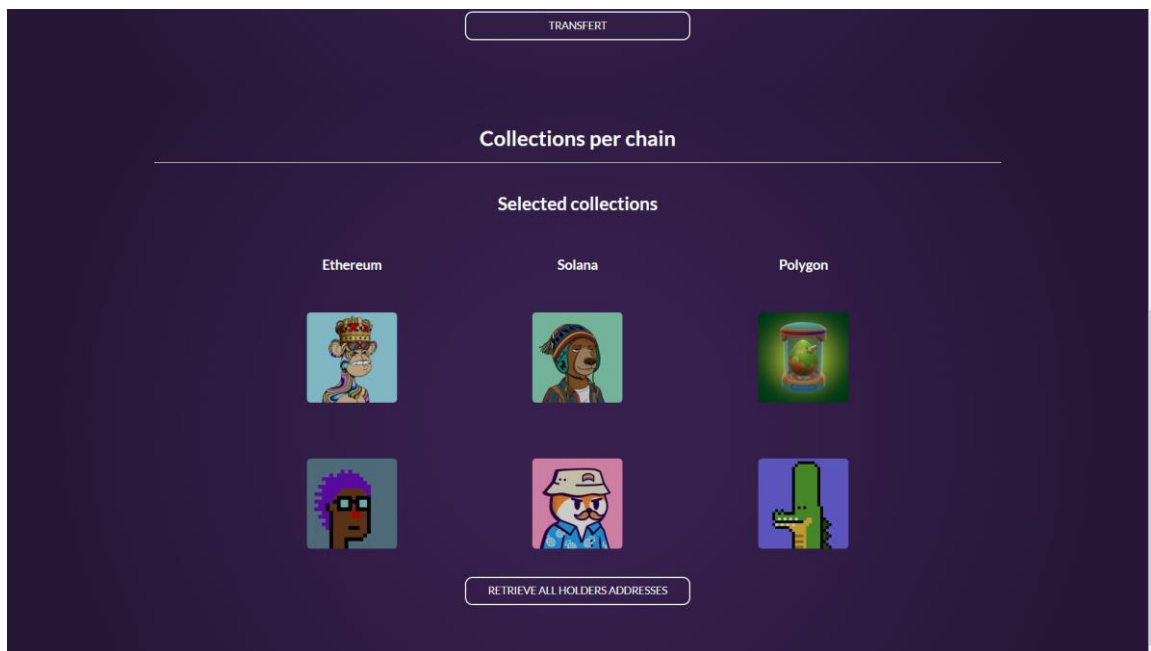
#### User Interface for that service:

The dApp displays all the NFTs possessed by the user connected on every blockchain on which he has linked his NFTs. You will be able to manage these NFTs, for example by sending the right of ownership on another account in another blockchain.

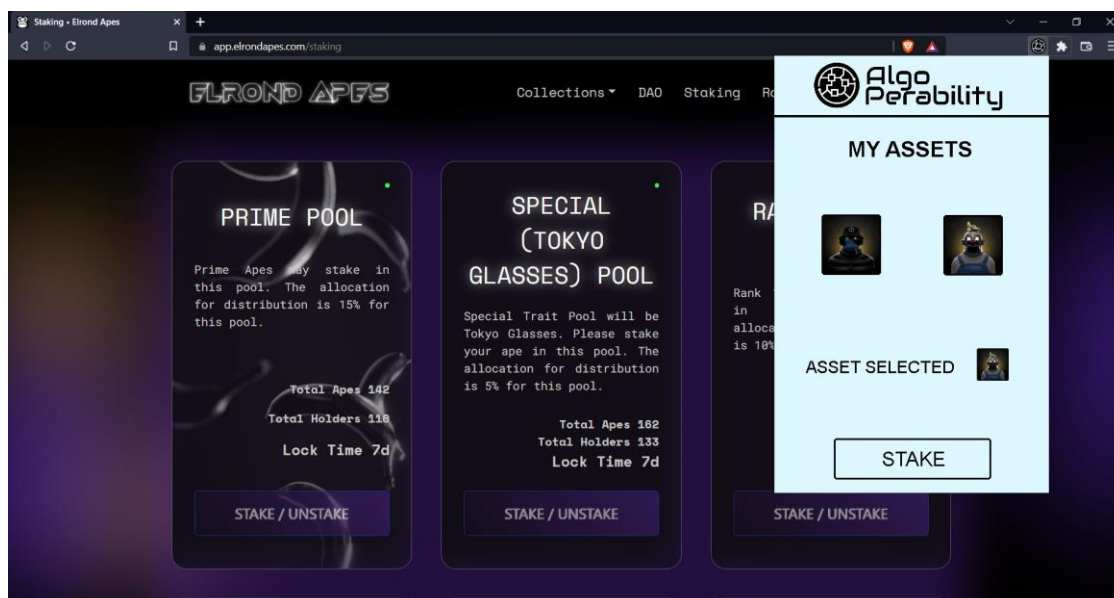




The users have to select the NFT collection for which they want to target the audience and they will receive a list with all the holders addresses of the collection targeted.



We also have a web extension to simplify the usage of our innovation by directly recognizing the available functionalities matching the user's NFTs, without having to transfer his NFT from a Blockchain to another.



## D) Ensuring Financial Positivity

Throughout all of those processes we are always ensuring the financial stability of our smart contracts. For every service call a user wants to make, a gas estimation is performed in order to know the cost of the execution of the transactions that will happen on the other blockchains. That amount is paid in the native currency of the blockchain where the user calls Algorperability and that payment is received by the Blockchain Smart-Contract Manager. We also monitor the balance of our Blockchain Smart Contract Managers and we inject funds if needed in some SC and take our benefits from.

**They are multiples benefits which stems from those Cross chain innovations and developed services:**

- Scalability
- User ease
- Standardization across multiple applications
- Improved chain efficiency
- Incentivize blockchain activity

**The sum of all these advantages allows us to offer a unique user experience that could become the standard for a multi-chain future.**

## IV. BUSINESS PLAN & BUSINESS MODEL

We charge a fixed commission per call of our Algorperability services, and we collect the leftover from the gas estimation payment by the user. We are also charging a fee on the companies that want to use our smart contract for their commercial purpose.

## V. NEXT STEPS

Establish Partnerships with blockchains like Oasis, Solana and other non-EVM blockchains to increase their attractiveness in building our cross-chain interoperability revolution.

Establish Partnerships with brands that are already working in web3 like Nike, Adidas to help them target better their preferred audience.

Extend our functionalities to all digital assets (currently only NFT ERC 721 are supported) for our Use case A "Transfer of Ownership of Digital assets"

Allowing the leftover of a gas estimation paid by a user to be discounted on its next service call in order to reduce the interoperability fees while still being a profitable business.

## VI) Conclusion

During this hackathon we were able to imagine, analyse, research and develop an innovative infrastructure that would make inter-chain interactions more valuable to users while facilitating their use in order to multiply the exchange of information between different ecosystems.