ETHGlobal SuperHack 2023

Ghost NFTs

Enabling multichain NFTs

Summary

Solo / Team

- Zapaz :
  - co-founder and lead dev @Kredeum
  - ETHGlobal finalist early 2021 with Best AAVE FlashLoan Project
  - currently Formal Verification Audits contests with Certora for AAVE, GMX
- Kredeum :
  - team of 5 Web2 entrepreneurs passionate about Web3
  - Kredeum NFT Factory : existing Open Source platform with multichain NFTs (BUT only for Soulbound NFT)
  - Grants via GitCoin, Polygon, Swarm and The Graph

Use Cases

Vision : NFTs should be multichain: you own an NFT on one chain, you should be able to own it on any other chains.

Typically for services like ENS, PFP or Token Gating

Ghost NFTs

GhostNFTs is a registery of NFTs, available on any chain.

A ghost NFT is a lite copy of the original NFT: containing it's two main properties: owner and tokenURI plus the timestamp of the snapshot.

Ghost NFTs are synced threw different networks with the help of inter-blockchain communication service like: LayerZero, Hyperlane or Chainlink CCIP

With Ghost NFTs data, most of NFT service like ENS, PFP or Token Gating can be use on any other chain

Ghost Data

With this structure synced threw chains

```
    struct GhostData {
        uint256 ghostId;
        uint256 chainId;
        address collection;
        uint256 tokenId;
        address owner;
        string uri;
        uint256 timestamp;
    }
```

Ghost NFTs Properties (1/3)

GhostNFTs is a registery of NFTs with these properties :

- GhostNFTs is an ERC721 Metadata NFT collection
- one GhostNFTs singleton may exists on each evm chain with same deterministic address
- ghost NFT can be registered on same or another evm chain than original NFT
- ghost NFT owner is synced to NFT owner AT a specific timestamp of original chain
- ghost NFT tokenId (also named ghostId) is a hash of chainId, collection address and tokenId of original NFT

Ghost NFTs Properties (2/3)

- when original NFT collection is ERC721Metadata : ghost NFT tokenURI is original NFT tokenURI
- GhostNFTs communicates from any chain to the chain of the original NFT with the help of inter-blockchain communication service like:
  LayerZero, Hyperlane or Chainlink CCIP
- GhostNFTs only communication function is `ghostSync`, that enable to propagate NFT metadata (or ghostData) threw chains
- ghostData is only synced / updated when timespamp is bigger thant last one
- Only orginal NFT chain can update ghostData timestamp, with online NFT data and snapshot timestamp

Ghost NFTs Properties (3/3)

- GhostData have fixed fields : chainId, collection address, tokenId and ghostId (a combination of 3 previous ones)
- GhostData, for this first version, has 3 snapshops data fields : owner, uri and timestamp (i.e. last timestamp of the snapshot data on the original chain)

SmartContract

- Reference smartcontract implementation is available here : GhostNFTs.sol
- Local demo via foundry scripts can be run on GhostNFTs repo.

Currently multi-chain communication is only simulated, tests with LayerZero are coming

Future 1/2

- Continue testing and development multichain
- Implement ENS specific feature
  (as ENS is not an ERC721 metadata collection)
- Full implemention with at least one communication layer
- Propose Ghost NFTs as an EIP
- GhostNFTs could be combined with ERC6551 registry...
- enhance multichain transfer

Future 2/2

- propose UI requirement : Ghost NFT could be forced to be « grey », with no color
- Implement in Kredeum Factory
- develop transferEverywere function inside ERC6551 Bound Accounts
- Implement specific feature to any specific NFT collection

Contact

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